Über dieses Buch

Dies ist ein digitales Exemplar eines Buches, das seit Generationen in den Regalen der Bibliotheken aufbewahrt wurde, bevor es von Google im Rahmen eines Projekts, mit dem die Bücher dieser Welt online verfügbar gemacht werden sollen, sorgfältig gescannt wurde.

Das Buch hat das Urheberrecht überdauert und kann nun öffentlich zugänglich gemacht werden. Ein öffentlich zugängliches Buch ist ein Buch, das niemals Urheberrechten unterlag oder bei dem die Schutzfrist des Urheberrechts abgelaufen ist. Ob ein Buch öffentlich zugänglich ist, kann von Land zu Land unterschiedlich sein. Öffentlich zugängliche Bücher sind unser Tor zur Vergangenheit und stellen ein geschichtliches, kulturelles und wissenschaftliches Vermögen dar, das häufig nur schwierig zu entdecken ist.

Gebrauchsspuren, Anmerkungen und andere Randbemerkungen, die im Originalband enthalten sind, finden sich auch in dieser Datei – eine Erinnerung an die lange Reise, die das Buch vom Verleger zu einer Bibliothek und weiter zu Ihnen hinter sich gebracht hat.

Nutzungsrichtlinien

Google ist stolz, mit Bibliotheken in partnerschaftlicher Zusammenarbeit öffentlich zugängliches Material zu digitalisieren und einer breiten Masse zugänglich zu machen. Öffentlich zugängliche Bücher gehören der Öffentlichkeit, und wir sind nur ihre Hüter. Nichtsdestotrotz ist diese Arbeit kostspielig. Um diese Ressource weiterhin zur Verfügung stellen zu können, haben wir Schritte unternommen, um den Missbrauch durch kommerzielle Parteien zu verhindern. Dazu gehören technische Einschränkungen für automatisierte Abfragen.

Wir bitten Sie um Einhaltung folgender Richtlinien:

+ *Nutzung der Dateien zu nichtkommerziellen Zwecken* Wir haben Google Buchsuche für Endanwender konzipiert und möchten, dass Sie diese Dateien nur für persönliche, nichtkommerzielle Zwecke verwenden.

+ *Keine automatisierten Abfragen* Senden Sie keine automatisierten Abfragen irgendwelcher Art an das Google-System. Wenn Sie Recherchen über maschinelle Übersetzung, optische Zeichenerkennung oder andere Bereiche durchführen, in denen der Zugang zu Text in großen Mengen nützlich ist, wenden Sie sich bitte an uns. Wir fördern die Nutzung des öffentlich zugänglichen Materials für diese Zwecke und können Ihnen unter Umständen helfen.

+ *Beibehaltung von Google-Markenelementen* Das "Wasserzeichen" von Google, das Sie in jeder Datei finden, ist wichtig zur Information über dieses Projekt und hilft den Anwendern weiteres Material über Google Buchsuche zu finden. Bitte entfernen Sie das Wasserzeichen nicht.

+ *Bewegen Sie sich innerhalb der Legalität* Unabhängig von Ihrem Verwendungszweck müssen Sie sich Ihrer Verantwortung bewusst sein, sicherzustellen, dass Ihre Nutzung legal ist. Gehen Sie nicht davon aus, dass ein Buch, das nach unserem Dafürhalten für Nutzer in den USA öffentlich zugänglich ist, auch für Nutzer in anderen Ländern öffentlich zugänglich ist. Ob ein Buch noch dem Urheberrecht unterliegt, ist von Land zu Land verschieden. Wir können keine Beratung leisten, ob eine bestimmte Nutzung eines bestimmten Buches gesetzlich zulässig ist. Gehen Sie nicht davon aus, dass das Erscheinen eines Buchs in Google Buchsuche bedeutet, dass es in jeder Form und überall auf der Welt verwendet werden kann. Eine Urheberrechtsverletzung kann schwerwiegende Folgen haben.

Über Google Buchsuche

Das Ziel von Google besteht darin, die weltweiten Informationen zu organisieren und allgemein nutzbar und zugänglich zu machen. Google Buchsuche hilft Lesern dabei, die Bücher dieser Welt zu entdecken, und unterstützt Autoren und Verleger dabei, neue Zielgruppen zu erreichen. Den gesamten Buchtext können Sie im Internet unter `http://books.google.com` durchsuchen.

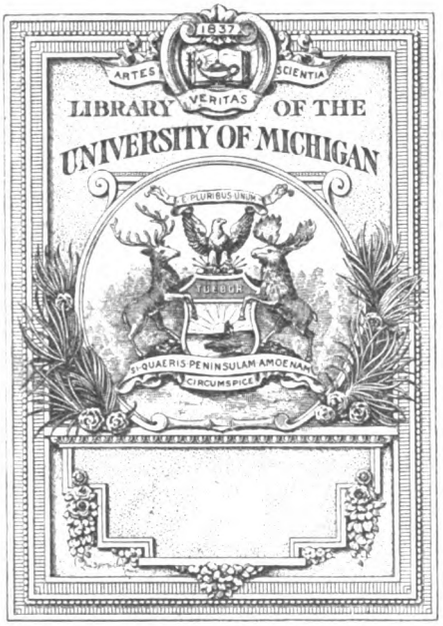
This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google™ books

https://books.google.com

C 3 9015 00358 666 9
University of Michigan – BUHR

Digitized by Google



Digitized by Google

TK
1
.F1

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

INDEX TO VOL. LXVII

Electrical Review and Western Electrician

JULY 3 TO DECEMBER 25, 1915

Published by
ELECTRICAL REVIEW PUBLISHING COMPANY, INC.,
608 South Dearborn Street, Chicago.

NEW YORK:
13 Park Row.

Digitized by Google

Digitized by Google

Index to Vol. LXVII

Electrical Review and Western Electrician

JULY 3 TO DECEMBER 25, 1915

Articles marked * are illustrated; (E) indicates "Editorial."

A

Accelerator for hardening concrete..... 1033
Accident, peculiar electric..... 791
Accident prevention, illumination and (E)..... 596
Accidents, analyzing electrical (E)..... 1095
Accidents, electrical, British Government inspector's report on..... 1112
Accidents, electrical, in English collieries, causes of*..... 903
Accidents in substation, unusual*..... 63
Accounting for central-station companies, system of..... 228
Addresses to commercial bodies (E).... 1002
Advantages of standard motor speeds, by Harry N. Gilbert..... 586
Advertisements that sold many irons* 469
Advertising display for combination company 792
Advertising, effective, by contractor*.. 20
Advertising, electrical, future of, by W. A. Wadsworth..... 1010
Advertising for business encouraged by Texas Power & Light Company* 321
Advertising game, electrical, playing a trump in*..... 1164
Advertising managers, central-station, suggestions for..... 889
Advertising, newspaper, used by Topeka company*..... 838
Advertising, public-policy (E)..... 880
Advertising, seasonable, in Brockton.. 60
Advertising stunt of Dayton company 276
Advertising, unique, central station adopts* 147
Advertising, value of..... 186
Advertising value of electric trucks, capitalizing (E)..... 1137
Aero-phone* 211
Again the electric vehicle (E)..... 597
Agriculture, electricity in (E)..... 220
Aid to export trade..... 686
Air, electric strength of, by J. B. Whitehead 69
Air-pressure and vacuum outfit, direct-acting* 32
Air warmers, electric*..... 442
Alabama Light and Traction Association, convention of..... 828
Alarm for air-blast transformers..... 195
Alaska mine, steam-electric power plant of*..... 1097
Alternating currents, non-sinusoidal.... 70
Alternators, fuses for..... 436
Aluminum alloys, light, exposure tests of 674
Aluminum Company of America purchases and will complete new North Carolina plant..... 951
Aluminum, increasing use of..... 68
Aluminum solder 670
Aluminum, United States production of 1037
Ambulance, electric, for Durban, South Africa* 46
American Association of Engineers, convention of 744, 1096
American Association of Engineers (E) 1095
American Electric Railway Association, convention of.....550, 727
American Electric Railway Association to hold midyear meeting in Chicago 1138
American Electrochemical Society, fall meeting of.....222, 380, 625
American Electrochemical Society, New York Section.....788, 928
American Institute of Chemical Engineers, winter meeting of..... 727
AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS:
Annual convention 69
Boston Section 767, 922
Chicago Section.....810, 902, 986
Coming convention of..... 1138
Convention of (E)..... 49
Lynn Section..... 715, 962, 1096
Meeting of.....722, 942, 1111
Meeting of board of directors..... 314
Panama-Pacific convention 567
Philadelphia meeting 763
Program for meetings..... 679
Program for Panama-Pacific convention 379
St. Louis meeting*..... 806
American machinery in foreign schools (E) 270
American Rotary Valve Company's sales convention* 169
American Society of Mechanical Engineers, annual meeting..... 828
Ammeters and voltmeters for battery charging* 948
Ammeters, voltmeters and wattmeters, Weston portable, electro-dynamometer-type* 778
Among the contractors (see Contractors).
Analyzing electrical accidents (E)..... 1095
Anchors, pole guy, test on, at Cleveland 492
Antennas, radiotelegraphic, resistance of 427, 905
Apparatus for transcontinental radiotelephony 828
Appliance campaign at Pueblo..... 147
Appliance campaign in Cincinnati..... 360
Appliance load, development of..... 531
Appliances, shall central station sell? by J. H. Moseley*..... 466
Appliances used in Canal Zone..... 662
Application of Crova's method of colored light photometry to modern incandescent illuminants, by Dr. H. E. Ives..... 621
Application of station power to large mills 578
Application for service (E)..... 649
Applications of hooded lamps (E)..... 459
Arc lamps (see Lamps).
Arc phenomena, by A. G. Collis..... 569
Arizona commission news (see Public Service Commissions).
Armory lighted for tennis..... 788
Asbestos, Arizona, for electrical insulation 32
Asbestos, production of..... 275
Asphalt plants and stone quarries, electricity in*..... 315
Associated Advertising Clubs, parade of* 59
Associated Manufacturers of Electrical Supplies 396
Associated Manufacturers of Electrical Supplies, meetong of..... 979
Association of Edison Illuminating Companies, convention of..... 510
Association of Edison Illuminating Companies re-elects officers..... 628
Association of Iron and Steel Electrical Engineers, convention of....356, 521
Association of Railway Electrical Engineers, convention of..... 805
Athens (Ohio) Electric Company's new display room..... 550
Attachment plug and receptacle, polarized* 1126
Attachment plug, new interchangeable* 122
Attachment plug, swiveling*..... 989
Attachment plug with swiveling flexible handle*..... 858
Attachment plug with soldered connections* 1032
Australian Electrical Trades Union..... 847
Auto show, Boston, in 1916..... 1052
Automatic control, by C. W. Place..... 807
Automatic telephone system of Los Angeles, by W. Lee Campbell..... 570
Automobile business, some interesting facts about, by G. Brewer Griffin.. 338
Automobile specialties, Presto*..... 951
Autotransformers, voltage diagrams of 435
Auxiliary steam plant of Vancouver Island Power Company, by H. W. Beecher* 373
Avo Club to celebrate Edison Day..... 652
Avoiding being at salesmen's or solicitors' mercy, by Elton J. Buckley 485
Ayton, Frank*..... 42

B

Baby bonds, stimulating friendly relations by sale of..... 510
Bakelite patents declared valid and infringed 246
Baking demonstration, electric, at Salt Lake City, results in twelve installations* 1061
Baking, electric, proves economical.... 465
Baltimore, proposed municipal electrical supply for..... 480
Baltimore stock-selling plan..... 1008
Bangkok's power houses..... 1027
Base, socket*..... 123
Batteries, electric-vehicle, charging of 535
Batteries, lead storage, installation and working of, by R. Rankin..... 1107
Batteries, Leclanche primary, investigations in..... 462
Batteries, storage, for fire and police purposes 429
Batteries, submarine, discussed at court martial..... 898
Batteries, vehicle, rented by Edison on monthly basis..... 586
Battery, another perpetual-motion primary 272
Battery-charging load, characteristics of* 710
Battery-charging motor-generator set, small* 383
Battery-charging outfits for automobile ignition and lighting batteries* 300
Battery-charging panel, series-parallel* 686
Battery charging, small ammeters and voltmeters for*..... 948
Battery, dry storage*..... 682
Battery electrolyte, gelatinous..... 370
Battery-exchange service in Boston.... 105
Battery lamp, "Fire Fly"*..... 1082
Battery, largest central-station..... 772
Battery, patented three-volt dry*..... 1126
Battery plant, storage, of Prestolite Company* 644
Battery rental system and price reduction announced by Chicago Electric* 641
Battery rental systems as aid to electric-vehicle development..... 793
Battery ruggedness, Edison*..... 646
Battery service for Salt Lake City.... 849
Battery-service system of General Vehicle Company..... 454
Battery, three-volt dry*..... 856
Battery vehicles as tramways adjunct 644
Bay State wire factory visited by Boston inspectors*..... 334
Beardslee, Frank D.*..... 104
Belt shifter, safety*..... 635
Belts, driving..... 973
Belts, static shocks from..... 975
Bench jointer, motor-driven*..... 816
Benjamin banquet..... 987
Benton Harbor, electric show in*..... 893
Berlin plant, municipality takes over... 946
Beverly (Mass.) Gas & Electric Company, new offices for*..... 361
Bid, meeting competitor's..... 934
Bill-posting campaign for Electrical Prosperity Week..... 681
Billing and collecting systems of small companies* 184
Bills, high cost of rendering..... 478
Blanket, Robinson electric..... 1085
Board of Electrical Examiners, Massachusetts 107
Bond issues, refunding (E)..... 94
Bonus systems for electricity employees (E)..... 1002
Boiler-room methods, efficiency of..... 526
Boilers, gas-fired, by E. C. Mills..... 675

BOOK REVIEWS:
Advanced Theory of Electricity and Magnetism, by William S. Franklin and Barry MacNutt..... 988
Alternating-Current Electricity and Its Applications to Industry, by W. H. Timpie and H. H. Higbie 298
American Handbook for Electrical Engineers, by Harold Pender and a staff of specialists..... 164
Applied Electrochemistry and Welding, by Charles F. Burgess and George W. Cravens..... 208
Arithmetic of Alternating Currents, by Ellis H. Crapper..... 988
Calcul des Lignes Aériennes au Point de Vue Mécanique par des Abaques, by André Blondel... 988
Conservation of Water by Storage, by George F. Swain..... 1165
Dielectric Phenomena in High-Voltage Engineering, by F. W. Peek, Jr..... 988
Directions for Designing, Making and Repairing High-Pressure Transformers, by F. E. Austin.... 338
Electric Cooking, Heating and Cleaning, by Maud Lancaster.... 855
Electric Light Fitting, by S. C. Batstone 1165

290125

Digitized by Google

BOOK REVIEWS—Continued.
Electric Railway Handbook, by Albert S. Richey, assisted by William C. Greenough ... 163
Electric Wiring Specifications, by J. H. Montgomery ... 1027
Electrical Instruments in Theory and Practice, by W. H. F. Murdoch and U. A. Oschwald ... 812
Electrical Measurements and Meter Testing, by David P. Moreton ... 946
Electrical Measurements, by O. J. Bushnell and A. G. Turnbull ... 812
Electricity in Coal Mining, by David R. Shearer ... 381
Elementary Electricity and Magnetism, by W. S. Franklin and Barry MacNutt ... 988
Examples in Alternating Currents, Vol. 1, by F. E. Austin ... 1027
Graphical Determination of Sags and Stresses for Overhead Line Construction, by Guido Semenza and Marco Semenza ... 81
How to Make a Transformer for Low Pressures, by F. E. Austin ... 338
Official Index to State Legislation ... 1165
Organization of Workshops and Factories, by Robert Grimshaw ... 81
Plane Geometry, by C. L. Palmer and Daniel P. Taylor ... 1027
Practical Applied Mathematics, by Joseph W. L. Hale ... 208
Practical Lessons in Electricity, by R. A. Millikan, F. B. Crocker and John Mills ... 164
Practical Mechanics and Allied Subjects, by Joseph L. Hale ... 338
Principles of Direct-Current Machines, by Alexander S. Langsdorf ... 1165
Resuscitation, by Charles A. Lauffer ... 81
Rubber Machinery, by Henry C. Pearson ... 946
Shrapnel and Other War Materials ... 338
Standard Handbook for Electrical Engineers, Frank F. Fowle, editor-in-chief ... 855
Telegraph Engineering, by Erich Hausmann ... 298
Telephone Appraisal Practice, by J. C. Slippy ... 988
The Book of Wireless, by A. Frederick Collins ... 855
The Electrical Nature of Matter and Radioactivity, by Harry C. Jones ... 812
The Mechanics of Electricity, by F. J. B. Cordeiro ... 164
The School of Practical Electricity, Vol. I, by Oscar Werwath, assisted by George J. Kirchgasser, F. C. Reath and W. E. Hennig ... 381
The Year Book of Wireless Telegraphy and Telephony, 1915 ... 988
Universal Methods for Computing the Speed of a Telegraphic Message Sent by Automatic Transmitter or Hand Key, by J. Rymer-Jones ... 946
Boston auto show, in 1916 ... 1052
Boston contractors and Edison Company plan for Prosperity Week ... 613
Boston Custom House Tower, electrical features of* ... 336
Boston Edison Company employees' outing ... 14
Boston Edison Company makes electric cooking demonstration ... 930
Boston Edison Company secures 2,600 house-wiring contracts in two years ... 1145
Boston Edison Company's steady growth ... 509
Boston Edison contracts, new ... 663
Boston electrical exposition, plans for ... 272
Boston electrical men hold outing ... 297
Boston, Electrical Prosperity Week in ... 1007
Boston Elevated Railway, new electrical equipment for ... 1032
Boston inspector's report ... 800
Boston inspectors visit wire factory* ... 334
Boston outing ... 768
Boudoir set, Hotpoint* ... 859
Bracket fixtures, showing* ... 285
Brake, alternating-current magnetic* ... 301
Branding iron, electric ... 717
Bridge at Portland, Me., electricity in construction of ... 229
Bridge, gigantic, built by aid of telephones* ... 1158
Bristol Company receives grand prize for recording instruments ... 302
British Association for Advancement of Science, electrical papers at Manchester meeting of ... 672
British electrical standardization ... 238
British Government and scientific organization (E) ... 270
British Government committee reports on factory lighting ... 810
British Government inspector's report on electrical accidents ... 1112
British standardization of meters ... 863
Bronze, electroplating ... 1056
Brooklyn central-station exhibit unique* ... 837
Brush-brass finish ... 116
Brush, Schweitzer multiplex* ... 382
Buenos Aires, cost of living in ... 405
Building congress in San Francisco ... 435
Building operations in United States ... 152
Bureau of Standards reports in case concerning fire and accident hazard of the Economy refillable fuse ... 1163
Bureau of Standards, work of ... 429
Busbar supports for large generating plants* ... 729
Busbar tap, Fargo* ... 165
Busch-Sulzer-Diesel engine day at Panama-Pacific Exposition ... 168
Bushing in canopy ... 975
Bushing, snap self-locking, for armored conduit or cable* ... 587
Business convention in February, 1916 ... 767
Business hints for dealer and contractor, by G. D. Crain, Jr. ... 188, 324, 475, 664, 932, 1148
Business outlook, general (E) ... 2
Business, outlook for ... 413
Buying goods, some interesting and important law about ... 486
Buying goods, some interesting and important law about, by Elton J. Buckley ... 335
By-laws of California Association of Electrical Contractors and Dealers ... 841
Byllesby properties, new-business gains made by ... 148, 557

C

Cabinets, switch and cutout* ... 814
Cable assemblies for motor cars* ... 123
Cables, flexible armored, in new residences ... 21
Cable telegraphy and intercontinental telephony, by Bela Gati ... 570
Cake, monster birthday, electricity used for lighting* ... 889
Calibration of current transformers by means of mutual inductances, by Charles L. Fortescue ... 74
California Association of Electrical Contractors and Dealers, by-laws of ... 841
California Association of Electrical Contractors, meeting of ... 612
California commission news (see Public Service Commissions).
Call system, practical ... 612
Cambridge (Mass.) Electric Company offers to sell property ... 752
Canadian government power plant at Niagara Falls ... 937
Canceled orders, paying commissions on, by Elton J. Buckley ... 234
Cap, improved strain-relief* ... 1166
Capacity of aerials of umbrella type ... 673
Capitalizing the advertising value of electric trucks (E) ... 1137
Caps for attachments plugs and receptacles* ... 123
Car, New Zealand gas-electric motor, electrical transmission on* ... 1034
Carbons, arc-lamp, present status of, by V. A. Clarke* ... 406
Carnegie Institute, wireless station for ... 343
Carty, John J., honoring* ... 1023
Cat silencer* ... 757
Cathode-ray tube, dielectric losses with, by John P. Minton ... 74
Causes of electrical accidents in English collieries* ... 903
Ceiling outlets, cutting out plaster for ... 19
Cement manufacture, electricity in, by Norman G. Meade* ... 273
Center of ceiling ... 1017
Central station adopts attractive emblem* ... 321
Central station adopts unique advertising* ... 147
Central station advertising managers, suggestions for ... 889
Central station and the electric vehicle (E) ... 3
Central-station assistants in England, shortage of (E) ... 1055
Central-station business, intensive cultivation of (E) ... 881
Central-station companies, commercial engineering course for ... 971
Central-station company encourages customers to advertise for business* ... 321
Central-station company in Spain, success of ... 854
Central-station development, by Charles P. Steinmetz ... 788
Central station, electric vehicle and, by John F. Gilchrist and A. Jackson Marshall ... 44
Central-station executive predicts returning prosperity ... 681
Central-station newspaper advertising, unique type of* ... 838
Central-station output figures ... 849
Central station participates in parade* ... 59
Central-station possibility, electric-furnace load as ... 13
Central-station power, isolated plant versus ... 577
Central-station practice in renting motors ... 605
Central-station rules for service connections, wiring, etc. ... 584
Central-station service for beef warehouse ... 361
Central-station steam heating development, by J. Grant DeRemer ... 525
Central station, value of domestic-appliance load to* ... 1062
Central stations of southern Illinois organize ... 314
Central stations, sale of current to municipally owned distributing systems by, by W. Rawson Collier* ... 890
Character of electrical service (E) ... 221
Charging panels, Cutler-Hammer* ... 732
Chattanooga, mayor of, advocates more electric signs for ... 1104
Chemical reactions in magnetic fields (E) ... 220
Chemists' Club entertains Thomas A. Edison ... 630
Chicago commissioner of electricity, report of ... 238
Chicago Electric announces price reduction and battery rental system* ... 641
Chicago Electric Club-Jovian League (see Electric Club, etc.).
Chicago electrical engineers to discuss naval preparedness ... 1164
Chicago electrification report ... 1080
Chicago grocer buys 11 electric trucks and sells 300 tons of coffee as result ... 1143
Chicago jobber's employees make merry* ... 629
Chicago, Milwaukee & St. Paul Railway, progress on electrification of* ... 769
Chicago report on electrification (E) ... 1053
Chicago, street lighting in* ... 481
Chicago Telephone Company gives demonstration of transcontinental service ... 159
Chicago Telephone Company maintains service during strike* ... 121
Chicago utilities send men to army training camp ... 506
Children, plan for interesting, in electricity* ... 1010
Chile, new electrical companies in ... 982
Chile Telephone Company to place lines underground ... 942
Christmas advertising, pertinent ... 1144
Christmas, merry (E) ... 1137
Christmas sign, attractive, for Boston store ... 1103
Christmas tree, municipal, for Louisville ... 1145
Churches, telephone equipment for* ... 488
Cincinnati Electric Club ... 4
Cincinnati electric show* ... 103
Cincinnati, plans for Electrical Prosperity Week in ... 602, 836
Cincinnati, utilities suffer from storm in ... 111
City inspectors cover more ground with automobiles ... 666
Civil service examination, New York ... 888
Classification of alternating-current motors, by Val A. Fynn ... 72
Classification of electromagnetic machinery, by Frederick Creedy ... 72
Classifications of technical literature wanted ... 6
Clerical error not libel ... 795
Coal, Arkansas, in 1914 ... 330
Coal consumption, ratio of, to energy generated ... 1064
Coal-mining service, application of rotary converters to* ... 84
Coal output, New Mexico ... 64
Coal output, Oklahoma ... 201
Coal, powdered, as central-station fuel ... 115, 193
Coal production, bituminous, in Pennsylvania ... 342
Coal production, Indiana ... 121
Coal production, Iowa ... 371
Coal production, North Dakota ... 229
Coal production, Ohio ... 338
Coal, West Virginia ... 303
Code, Portland ... 757
Coffee mill, electric* ... 815
Coil drift* ... 1017
Coil-winding machine, Leeson-Universal* ... 1127
Coils, transformer cooling, cleaning of ... 566
Coke production, wasteful ... 380
Coking of coal at low temperatures ... 208
Cold-storage plant, electricity in* ... 357
Coleman, Henry L* ... 663
Collecting and billing systems of small companies* ... 184
Collieries, South Wales, electric power in ... 754
Colorado Electric Light, Power and Railway Association, convention of ... 4, 715
Columbia, Tenn., new contract at ... 318
Columbia Company's employees, picnic of ... 477
Columbus Railway Company, offices of* ... 967
Columbus, results of safety work at ... 557
Commerce reports, daily government ... 477
Commercial engineering course for central-station employees ... 971

Digitized by Google

COMMERCIAL MANAGERS, SUCCESSFUL:*
Stannard, C. N. 14
McConnell, H. N. 61
Beardslee, Frank D. 104
Jones, T. I. 149
Young, A. K. 187
Montgomery, Robert 229
Yonts, Charles B. 279
Wallis, L. R. 323
Kelly, Thomas F. 362
Martin, A. C. 470
Kennedy, S. M. 510
Marlow, E. S. 557
Coleman, Henry L. 663
Young, H. E. 795
Wolls, W. A. 931
Commissions, state utility, power of (E) 94
Common fallacy 1015
Commonwealth Edison Company, new quarters of* 511, 584
Commonwealth Edison Company orders 30,000-kilowatt unit 696
Commonwealth Edison exhibit at Home Exposition* 840
Commonwealth Edison rules for service connections, etc. 584
Commutating device, self-adjusting 674
Commutating machinery, direct-current, physical limitations in, by B. G. Lamme 567
Commutators, cleaning* 760, 899
Commutators, slotted, what the operator should know about 1147
Comparisons between horse, gasoline and electric delivery costs, by Harry F. Thomson 874
Compass, emergency 286
Compensarc for motion-picture projectors, by C. Walford* 230
Competition, idealism in 235
Competition in rural districts (E) 395
Competition, unfair, first indication of what courts will consider, under recent laws, by Elton J. Buckley 296
Competition, unfair, prohibited in Germany 235
Concentric system, bare, public policy in regard to (E) 651
Concrete, accelerator for hardening 1033
Condensers, Helsby power* 856
Condon, Edward J.* 535
Conductors, 13,000-volt 935
Conduit, adjusting bend in* 975
Conduit and pipe supports, Appleton* 300
Conduit bends, special, outfit for making* 20
Conduits, separate, for two phases 719
Conference, English electricity works 295
Conference on Electrical Safety Code, proposed 678, 696
Conference on valuation (E) 920
Conference on valuation of public utilities 828, 939
Connecticut company's transmission voltage changed without interruption to service 905
Connecting devices, Fargo* 35
Connectors, Adapti, for armored cable and flexible metallic conduit* 247
Construction at night facilitated by tungsten lighting* 684
Construction, electrical and operating rules (E) 785
Construction, electrical, and operation, standards of 796
Construction, electrical, at Panama-Pacific Exposition (E) 353
Construction, electrical, in machine shops and foundries, by Norman G. Meade* 16
Construction job, electricity extensively used on 20
Construction started on new hydro-electric plant in Tennessee 1149
Consumer liable for prepayment-meter funds 322
Contact conductors and collectors, by C. J. Hixson 73
Contact system of Butte, Anaconda and Pacific, by J. B. Cox 73
Contact system of Portland Division, by Paul Lebenbaum 73
Contact systems, overhead—construction, maintenance and cost of, by E. J. Amberg and Ferdinand Zogbaum 73
Contract, new form of street-lighting, proposed for Racine 1144
Contractor and dealer, business hints for, by G. D. Crain, Jr. 188, 324, 475, 664, 755, 932, 1065, 1148
Contractor and dealer, should business of, be combined? 612
Contractor, effective advertising by 20
Contractor, electrical, office system and forms for, by Clovis M. Converse* 150
Contractor, electrical, who practices what he preaches* 431
Contractor wins prize* 800
Contractors, among the 189, 285, 327, 368, 471, 563, 613, 666, 717, 757, 800, 844, 896, 934, 974, 1067, 1107, 1149
Contractors and central stations, co-operation between 665
Contractors and jobbers, co-operation between 843
Contractors, California, meeting of 612
Contractors' co-operative window dressing in Boston 666
Contractors, Kansas City 973
Contractors, license laws for (E) 743
Contractors, local association for (E) 354
Contractors, meeting at Kansas City, joint 109
Contractors, Michigan, elect officers 107
Contractors, Missouri electrical, change meeting dates 20
Contractors of Cincinnati hold picnic 285
Contractors of Illinois, convention of* 18
Contractors of Massachusetts investigate licensees' qualifications 933
Contractors of New England, convention of 607
Contractors of Pennsylvania elect officers 152
Contractors office forms and systems, by M. J. Lavalle 62
Contractors, Toronto, meeting of 368
Contracts open 364
Contracts, some law regarding 946
Control, automatic, by C. W. Place 807
Control-board for series-parallel battery charging* 686
Control, electrical, for traverser car* 1168
Control of water powers (E) 93
Convenience of electrical service (E) 1094
Cook electrically, teaching young to 684
Cooker, automatic electric, for steam cooking on improved "fireless" principle* 249
Cookers, electric, for workmen's houses 275
Cooking and heating, electric, rates for (E) 95
Cooking apparatus, electric (E) 354
Cooking-appliance campaign at Augusta 465
Cooking appliances, Neuco* 343
Cooking demonstration in Canada 229
Cooking, electric (E) 51
Cooking, electric, cheaper than gas in Salt Lake apartment building 930
Cooking, electric, in West (E) 501
Cooking, electric, in Western Canada 322
Cooking prospects, electric, encouraging in Boston 1144
Cool weather affects consumption of current in Louisville 102
Co-operation, a lesson in (E) 1136
Co-operation between contractors and central stations 665, 756
Co-operation between electrical contractor and central station, by A. E. Loeb 555
Co-operation between electrical contractors and jobbers 843
Co-operation between electrical contractors and jobbers, by W. L. Goodwin 282
Co-operation of central stations with electrical contractors and dealers in electrical supplies, by S. V. Walton 281
Co-operation, organizing for (E) 826
Co-operation with schools (E) 742
Co-ordination of accounting and engineering departments, by E. D. Dreyfus 525
Copper deposit, electric operation at world's largest 226
Copper deposits of Ketchikan 34
Copper fittings for heavy cable connection* 252
Cord connector, Chelten* 487
Cords, portable, standardization of (E) 1001
Cores, welding defective, in paper mill 386
Correction 372
Corundum mining 974
Cost of business, analysis of 530
Cost of lighting and power service (E) 271
Cotton gins, electricity in, by J. H. Moseley* 139
Cotton mill to use central-station power 511
Courteous service, by Edward H. Mulligan 227
Courtesy by utility employees (E) 95
Cranes for steel mills 524
Crawford Cedar Company, concentration yard of* 993
Crayon factory run by central-station power 556
Credits, collections and cash discounts, by W. H. Vilett 106
Current electrical news 36, 86, 129, 171, 214, 256, 304, 346, 387, 445, 494, 541, 590, 636, 687, 736, 782, 819, 866, 913, 953, 996, 1039, 1087, 1129, 1171
Current, sale of, to municipally owned distributing systems, by W. Rawson Collier* 890
Current tap, composition* 906
Current tap, composition side-outlet* 1032
Currents, electric, calculation of strength of, when measured by Rayleigh current balance 404
Custom House Tower, Boston, electrical features of* 336
Customer, how can combination gas and electric company render best service to? by A. B. Spaulding and N. H. Potter 619
Customer question, small* 657
Customers, lighting, service to (E) 595
Customers, serving small 529
Cutler-Hammer lifting magnets, big increase in lifting capacities of* 1127
Cutting out plaster for ceiling outlets 19
Cutting sheet-steel piling with oxy-acetylene blowpipe 302
Cutout, automatic* 671, 759, 899
Cutout, high-capacity pole-type* 631
Cutout panels and cabinets, barrier* 772

D

Dayton city officials praise utility for good service 837
Dayton company, unique advertising stunt of 276
Dayton Power and Light picnic 12
Dayton, prosperity activities in 1162
Decorations, keeping clean 1017
Delta-cross connection of transformers, by G. P. Roux 572
Demand, importance of measuring (E) 500
Demonstration of electrical appliances by Tasmanian Hydroelectric Department 204
Denver company conducts strenuous Prosperity Week campaign 970
Denver Fireclay Company increases profits by use of central-station service 604
Depreciation reserve, by Judge J. L. Clark 535
Des Moines gas case (E) 311
Des Moines Gas Company case 329
Desirable intensity of illumination (E) 959
Determination of maximum demand 532, 535
Development and operation of outdoor substations, by F. L. Hunt 845, 936
Dielectric losses (E) 51
Dielectrics, effect of transient voltages on, by F. W. Peek, Jr. 569
Dielectrics, rupture of, by transient voltages (E) 549
Diesel engines for generator drive, by Charles Lagrand 572
Differential, Idaho commission rules in favor of (E) 1
Direct-current loads on alternating-current lines 536
Discharges, sustained radio-frequency high-voltage, by Harris J. Ryan and Roland G. Marx 628
Disposition of refuse from woodworking plants (E) 548
Distortion-factors 70
Distribution losses 1151
District heating (E) 499
District of Columbia commission news (see Public Service Commissions).
Ditcher, electric, for removing track obstruction* 209
Dollar wiring kinks (see Wiring Kinks).
Domestic science lectures to give impetus to electric range sales 61
Don'ts for meter readers and bill passers 228
Draftsman, electrical, civil service examination for 628
Drill, extension piece for* 286
Drill, small, light-weight* 1082
Drills, air and electric rock 480
Drive, electric, effects economy in large tire factory 104
Driving belts 973
Drop-of-potential method, locating faults by, by H. S. Percival* 983
Dropout, Dostal* 634

E

Earth resistance 674
Earth resistivity, measuring 416
Earth resistivity, method for measuring 980
Economic, social and political conditions in Europe which influence government ownership of the telephone, by James P. Duncan 1153
Economy refillable fuse, Bureau of Standards reports in case concerning fire and accident hazard of 1163
Edinburgh, first electric automobile in 96
Edison and the invention of electric incandescent lamp* 676
Edison Company of Boston, steady growth of 509
Edison Company of Brooklyn, exhibit of* 837
Edison Day celebrated at Texas State Fair 681
Edison Day prize contest, to popularize electric lighting by 629
Edison rents vehicle batteries on monthly charge basis 586
Edison storage battery ruggedness* 646
Educational value of sociability runs, by A. Jackson Marshall 458
Effect of variation of atmospheric pressure on candlepower of various flames, by E. B. Rosa, E. C. Crittenden and A. H. Taylor 620
Election results affect utilities at Toledo, Cincinnati and Detroit 882
Electric Appliance Company, picnic of* 629

Digitized by Google

Electric Club-Jovian League of Chicago ..6, 52, 120,528, 598, 788,962, 1056, 1096
Electric Club of Kansas City, Mo.....4, 604, 811, 882
Electric cooking (see Cooking).
Electric delivery company for Chicago 838
Electric drive (see Drive).
Electric garage versus stable (E)..... 1136
Electric heating (see Heating).
Electric lamps (see Lamps).
Electric makes fifteen hundred miles in fourteen days..... 456
Electric Power Club, meeting of.....721, 943
Electric service a la carte..... 1144
Electric service for city high school, by C. L. Vestal*..... 1024
Electric service on farm (E)..... 178
Electric shop, novel method of advertising*..... 276
Electric show, Cincinnati*..... 103
Electric show in Benton Harbor*..... 893
Electric show, Topeka..... 1056
Electric Storage Battery sales convention 1036

ELECTRIC VEHICLE ASSOCIATION OF AMERICA:
Chicago Section..... 6, 456, 462, 644, 680, 699, 793, 876, 1024
Cincinnati Section..... 701
Convention of.....268, 451, 764
Convention of (E)..... 741
Denver Section..... 702
Influence of..... 697
Los Angeles Section..... 701
Many sales prospects handled by.... 451
New England Section.....699, 882
New York Section.....701, 876
Philadelphia Section..... 902
Portland Section..... 702
St. Louis Section..... 702
Washington Section..... 700

Electric vehicle (see Vehicles).
Electric water-heater, new automatically regulated*..... 1169
Electric welding (see Welding).
Electrical appliances (see Appliances).
Electrical Clearing House, Louisville.....152, 325
Electrical code for New York, new..... 756
Electrical construction (see Construction).
Electrical contractors (also see Contractors).
Electrical Contractors' Association of Kansas City..... 973
Electrical Contractors' Association of Pennsylvania 152
Electrical Contractors' Association of State of Illinois, convention of*.... 18
Electrical Contractors' Association of State of Missouri..... 20
Electrical contractors' opportunity and responsibility (E)..... 269
Electrical control for traverser car*.... 1168
Electrical Credit Association of Chicago holds annual convention..... 1121
Electrical engineer (see Engineer).
Electrical equipment, latent development in, by K. A. Pauly..... 522
Electrical exports (see Exports).
Electrical exposition, Boston, plans for 272
Electrical exposition, New York.....272, 381, 679, 725
Electrical features of Boston Custom House Tower*..... 336
Electrical features of new office building of New Bedford central station* 507
Electrical Garden City in Scotland..... 462
Electrical improvements in small town (E) 135
Electrical industry, standardization in (E) 547
Electrical inspection (see Inspection).
Electrical papers at Manchester meeting of British Association for Advancement of Science..... 672
Electrical progress at Leeds, England.. 52
Electrical progress on Rand..... 462
Electrical Prosperity Week.....120, 163, 369, 396, 602, 613, 680, 723, 811, 834, 835, 836, 902, 904, 942, 943, 970, 981, 982, 1007, 1027, 1071, 1111
Electrical Prosperity Week (E).....137, 826, 960
Electrical Prosperity Week, additional returns on*..... 1115
Electrical Prosperity Week committeemen meet at Boston..... 835
Electrical Prosperity Week—its mission, and how you can profit*..... 829
Electrical Prosperity Week scores big success* 1071
Electrical Prosperity Week, what dealer and contractor can do to cash in on..... 797
Electrical service, character of (E)..... 221
Electrical show, Milwaukee..... 904
Electrical Supply Jobbers, Hot Springs meeting of..... 1027
Electrical Supply Jobbers' quarterly meeting 586
Electrical trade (see Trade).
Electrically driven waterworks plant recommended for Nashville..... 1145
Electrically operated general utility services 527
Electricians, examination of, in Massachusetts 364
Electricians' examination held in Massachusetts 471
Electricians, New York City board for examining and licensing..... 563
Electricians, rules of New York City board for licensing..... 606
Electricity extensively used on large construction job..... 20
Electricity for municipal pumping*..... 653
Electricity in agriculture (E)..... 220
Electricity in cement manufacture, by Norman G. Meade*..... 273
Electricity in cold-storage plant*..... 357
Electricity in cotton gins, by J. H. Moseley* 139
Electricity in harvesting machine works* 883
Electricity in harvesting machinery works* 745
Electricity in ice-cream manufacturing* 55
Electricity in ice harvesting*..... 1005
Electricity in implement manufacturing, by W. J. Kyle*..... 97
Electricity in large steel warehouses* 463
Electricity in lime manufacture, by Arthur C. Hewitt*..... 181
Electricity in manufacture of wood-pulp paper*..... 223
Electricity in marble quarrying*..... 963
Electricity in pump manufacture*..... 1057
Electricity in sand and gravel plants* 599
Electricity in soap manufacture*..... 1139
Electricity in stone quarries and asphalt plants*..... 315
Electricity in textile mills*..... 789
Electricity in twine and rope mills*.... 551
Electricity in war*..... 76
Electricity in wholesale grocery establishment* 503
Electricity, war taxes on (E)..... 960
"Electricity Week" at Portland, Me.... 187
Electrification again advocated at Boston 754
Electrification at Philadelphia, features of* 923
Electrification, Chicago report on (E) 1053
Electrification of Chicago, Milwaukee & St. Paul Railway, progress on* 769
Electrification of fifty-mile Canadian line 138
Electrification of railways at Sydney, Australia 902
Electrification, Philadelphia (E)..... 921
Electrification, railroad, Engineer Goss addresses Western Society on..... 1138
Electrification report, Chicago..... 1080
Electrification, Scandinavian railway.... 480
Electrification work on London suburban railroads..... 852
Electrochemical possibilities of Pacific Coast, by J. W. Beckman..... 627
Electrolysis, effects of, by Albert F. Ganz 617
Electrolysis in Providence, report on.. 679
Electrolysis mitigation in Springfield and New Elyria, Ohio..... 435
Electrolysis mitigation, methods of..... 974
Electrolysis, overhead, and porcelain strain insulators, by S. L. Foster.... 627
Electrolysis survey for Indianapolis..... 788
Electrolyte, gelatinous battery..... 370
Electrolyte, solution stratification in purification of, by F. R. Pyne..... 626
Electrolytic iron..... 339
Electrolytic iron produced commercially in France..... 1166
Electrometallurgical industries as possible consumers of electric power, by D. A. Lyon and R. M. Keeney.... 626
Electroplating bronze..... 1056
El Reno company builds line to serve Indian agency..... 363
Emblem adopted by Texas Power & Light Company*..... 321
Empire State Gas and Electric Association, annual meeting.....356, 723
Employees, electricity, bonus for (E).. 1002
Employees, utility, courtesy by (E)..... 95
Energy, sale of, to municipalities (E) 881
Engineer Goss addresses Western Society of Engineers on railroad electrification 1138
Engineer, junior electrical, civil service examination for..... 680
Engineering improvements and publicity (E)..... 650
Engineers advocate department of engineering and public works for New York..... 314
Engineers, apprentice electrical, examination for..... 54
Engineers present open letter to chairman of New York Constitutional Convention 484
Engineers, recognition of, in public engineering work (E)..... 461
Engineers urge qualification of utility commissioners 238
English electricity works conference.. 295
English guarantee scheme fails..... 800
Enter the psychologist (E)..... 960
Esterline recording instruments, new*.. 1167
Estimates and cost accounting, by J. P. Coghlin..... 610
Estimating for proposals, accurate (E) 879
Examination of electricians in Massachusetts 364
Examinations in Massachusetts..... 756
Excess indicator for fire alarm*..... 1016
Exciters, direct-connected*..... 342
Exide depot in Detroit*..... 84
Experiments on eye with inverted reflectors 624
Expert criticises municipal ownership.. 1100
Export procedure, new regulations governing 1004
Export trade, aid to..... 686
Export trade, electrical, improvement in (E)..... 694
Exports, American electrical, during first year of war (E)..... 394
Exports, electrical (E)..... 178
Exports, electrical, for April..... 4
Exports, electrical, for May..... 180
Exports, electrical, for June and for fiscal year 1914-1915..... 396
Exports, electrical, for July..... 715
Exports, electrical, for August..... 849
Exports, electrical, for September..... 962
Exports, electrical, to Argentine Republic 208
Exports, electrical, to South America.. 372
Exposed work barred in Louisville..... 1149
Extensions, making them pay for themselves (E)..... 786
Extensions, rural (E)..... 825

F

Factories, glass, illumination of, by William A. D. Evans*..... 78
Factory lighting, British Government committee reports on..... 810
Fall electrical trade and lighting number (E) 393
Fall River, lower rates at*..... 1101
Fallacy, common 1015
Fan, fly-chasing*..... 85
Fan keeps flies out of restaurant*..... 102
Fan-window-display contest, Western Electric, winners of*.....816, 863
Fans, exhaust, contractors promote installation of 152
Fans, telephone-booth, solve another problem 685
Faraday Society, general meeting of.... 962
Fargo connecting devices*..... 35
Farm, electric service on (E)..... 178
Farm line, one-wire..... 323
Farms, Dutch, electric motors on..... 53
Features of Pennsylvania electrification at Philadelphia*..... 923
Federal Trade Commission investigates foreign market for American electrical goods, by Waldon Fawcett* 292
Federation of Trade Press Associations, annual convention..... 537
Fees for wiring permits in Boston .. 471
Ferro-alloys, electric furnace melting of, by R. S. Wile..... 626
Field windings, temperature of, by H. M. Phillips 894
Financier says utilities are big money savers 922
Financing with commercial paper (E).. 742
Finland's waterfalls, exploitation of..... 381
Fire alarm, excess indicator for*..... 1016
Fire-alarm installations, standards for 429
Fire-alarm station, new, for San Francisco 1128
Fire-alarm system for New York City, new..... 109
Fire-alarm systems for industrial plants 428
Fire apparatus, electrically propelled, by A. Jackson Marshall*..... 264
Fire-extinguishing materials..... 371
Fire hazards in old buildings, safeguarding. 992
Fire losses in Berlin, low..... 577
Fire-prevention inspector, examination for 763
Fireclay company increases profits by use of central-station service..... 604
First indication of what courts will consider unfair competition under recent laws, by Elton J. Buckley 296
Five thousand volts, direct current, railway equipment for, by Clarence Renshaw* 774
Fittings, Appleton Unilet*..... 343
Fittings, electrical, use of steel in, is voted down 1149
Fittings, latest approved.....128, 170, 213, 254, 345, 386, 493, 735, 817, 864, 912, 995, 1038, 1086, 1170
Fixture hanger's helper*..... 801
Fixture, outdoor incandescent lighting* 167
Fixture stud, fastening*..... 286
Fixture tool 1017
Fixtures, Benjamin, for street lighting with gas-filled tungsten lamps* 814
Fixtures, diffusing-glass, for interior lighting with gas-filled lamps*..... 950
Fixtures, Edwards* 862
Fixtures for Mazda series street lighting* 910
Fixtures, hanging, plumb 286
Fixtures, high-temperature 110

Digitized by Google

Fixtures, street-lighting, for type C Mazda lamps* ... 299
Flame arc in paint and dye testing, by W. R. Mott ... 625
Flameproof wires ... 232
Flashlight, metal tubular* ... 33
Flashlight service, unusual (E) ... 1054
Flashlights, Kwik-Lite* ... 440
Flatirons, buy old ... 1009
Flat rate abandoned by municipal plant ... 59
Flat rates at Burlington, Vt. ... 1011
Float, unique electric-iron* ... 930
Float-switch control from two points for motor-driven pump* ... 606
Float, Westinghouse prize-winning ... 945
Flood lighting (also see Lighting).
Flood lighting (E) ... 694
Flood lighting of building fronts from ornamental cluster posts* ... 724
Flood lighting proves profitable in Louisville ... 663
Flood-prevention activities, utilities affected by ... 318
Flood prevention, water power and navigation ... 163
Flux bottle, non-spilling ... 801
Flux method of obtaining average illumination ... 622
Flywheel, using, to equalize load (E) ... 1137
Ford cars, Westinghouse equipment for* ... 384
Foreign market for American electrical goods investigated by Federal Trade Commission, by Waldon Fawcett* ... 292
Foreign trade promotion through strong organization ... 1018
Forester's report says there is no market for water power ... 1138
Form-factor ... 70
Foundations for transmission line towers and tower erection ... 71
Frantz-Premier spreads out ... 589
Free service to needy ... 15
Freshney, Samuel A.* ... 53
Fuel conservation in England ... 882
Function of utility company in community ... 929
Furnace, electric (E) ... 500
Furnace, electric steel, heat losses from, by W. H. Wills, Jr., and A. H. Schuyler ... 625
Furnace fumes, silver, treatment of, by Cottrell process, by C. H. Aldrich ... 626
Furnace installations, noteworthy electric ... 993
Furnace load, electric, as central-station possibility ... 13
Furnace operation in Alaska mine, electric ... 987
Furnace, Snyder, Haynes Stellite Company to install ... 1128
Furnace, Tinfos electric* ... 54
Fuse in grounded generator lead ... 437
Fuses for alternators ... 436
Fuses, renewable, hearing on ... 108
Fuses, testing ... 975
Future of electric vehicle (E) ... 693
Future of electrical advertising, by W. A. Wadsworth ... 1010
Future of water-power development in Alabama, by Thomas W. Martin ... 850

G

Galena plant makes new record ... 838
Galena power plant increases capacity ... 280
Galva (Ill.) company extends lines* ... 509
Garage, electric, functions of ... 766
Garage, electric, versus stable (E) ... 1136
Garage for employees, electrical manufacturer builds* ... 878
Garage in Chicago, electric commercial car* ... 713
Garage topics discussed by electric vehicle men ... 876
Garages, Chicago electric, introduce a parking system for waiting cars ... 264
Garaging plan of Boston Edison Company recommended for city ... 1070
Garbage wagon, electric* ... 1033
Gas from peat ... 489
Gases, electrical phenomena in ... 928
Gases, inflammable, ignition of ... 961
General Electric Company veterans celebrate ... 405
General Electric makes gain ... 166
General Vehicle Company, battery-service system of ... 454
Generating apparatus, recent developments in, by P. M. Lincoln ... 521
Generating station for Manchester, England, by S. L. Pearce ... 672
Generating system for train lighting, improved head-end axle* ... 490
Generator, high-voltage direct-current ... 1082
Generator lead, grounded, fuse in ... 437
Generator set for country-house lighting* ... 82, 122
Generators, three-wire direct-current, protection of* ... 518
Generator, two-wire direct-current, protection of* ... 517
Georgia commission news (see Public Service Commissions).
Getting most from electric vehicle (E) ... 221
Gigantic bridge built by aid of telephones* ... 1158
Give public electrical literature ... 931
Glass factories, illumination of, by William A. D. Evans* ... 78
Glassware, illuminating, simple means for cleaning ... 441
Gloucester (Mass.) Electric Company expands ... 554
Good will of public, obtaining, by E. B. Fenton ... 146
Government electric power and telephone system in Uruguay ... 31
Government ownership of the telephone—economic, social and political conditions in Europe which influence it, by James P. Duncan ... 1153
Grand Rapids, change at ... 279
Graphite ... 380
Great Western Power Company sales force, electric luncheon held by ... 187
Greatest utilization of hydroelectric power (E) ... 743
Grinder, Stow* ... 1083
Grip, Maine feeder* ... 489
Grocery establishment, wholesale, electricity in* ... 503
Ground connection, Fargo* ... 385
Ground plates, test of* ... 431, 669
Ground points, Fargo* ... 250
Grounding, independent ... 718
Grounding insulator circuits ... 431
Grounds and insulation resistance, testing for, by L. H. Henderson* ... 1020
Group drives, improving (E) ... 1094
Growth of electric-vehicle business (E) ... 826
Guards, lamp* ... 440
Guide post at Biddeford, Me., electric. ... 149
Gun shuts off current in Hoosac Tunnel ... 902
Gyroscopic stabilizer for steamships ... 290

H

Hamilton electric incline railway* ... 1160
Hammer, electric, economical and efficient* ... 210
Hammer, Western Electric, operation of* ... 858
Handling out-of-town work, by A. W. Lindgren ... 64
Handling stores according to the cash-control idea, by Wilfred G. Astle* ... 1012
Harmonics in transformer magnetizing current, by F. J. Peters ... 573
Harrison Street station, Chicago, to be dismantled ... 396
Harvesting machine works, electricity in* ... 883
Harvesting machinery works, electricity in* ... 745
Haverhill Electric Company, new quarters of* ... 752
Haynes Stellite Company to install Snyder furnace ... 1128
Hearing before Railroad and Industrial Commissions of Wisconsin, report of ... 796
Hearing on renewable fuses ... 108
Heater, electric, to prevent gasoline automobiles from freezing in cold garages* ... 989
Heater, Radiant* ... 632
Heating and cooking, electric, rates for (E) ... 95
Heating development, central-station steam, by J. Grant DeRemer ... 525
Heating devices, electric, by W. M. Stearns* ... 1062
Heating, district (E) ... 499
Heating, electric, and heat storage ... 430
Heating, electric, for light manufacturing plants a profitable load* ... 605
Heating, industrial electric, by H. O. Loebell ... 200
Heating, industrial electric (E) ... 2
Heating, industrial electric, importance of ... 1063
Heating of iron when magnetized at high frequencies, by N. W. McLachlan ... 673
Heating of metals, application of electricity to, by F. L. Bishop ... 615
Heating-pad campaign at Augusta, Me. ... 967
Heating pad, flexible metal* ... 538
Heating steel shrunk tires by electricity ... 773
Hebgen, Max, by H. M. Byllesby ... 356
Hickey for conduit installations* ... 247
High school, city, electric service for, by C. L. Vestal* ... 1024
Hoist for Montana mine, large ... 943
Hoist, large electric, by Wilfred Sykes ... 572
Holtzer-Cabot Electric Company, new factory of* ... 1037
Home Economies Department of New York Edison Company ... 603
"Home Electrical" awarded two gold medals ... 444
Honoring John J. Carty* ... 1023
Hood River rate case (E) ... 219
Horns for factories, electric signal* ... 993
Hospital installation, Scottish ... 337
Hospital signal lighting, new system for* ... 934
Hot weather sales record at Toledo ... 276
Hotel installation in London, big ... 102
"House Electric" at no cost ... 102
House-wiring window display elicits 900 inquiries in six days* ... 1103
Houses wired with concentric system in Boston ... 666
How can combination gas and electric company render best service to customer? by A. B. Spaulding and N. H. Potter ... 619
How is business? ... 413
Hull, Mass., proposed sale of municipal plant of ... 971
Hydroelectric companies, Massachusetts* ... 160
Hydroelectric companies of Massachusetts under state supervision ... 744
Hydroelectric development at Niagara Falls, further Canadian ... 222
Hydroelectric development on public domain ... 1096
Hydroelectric plant, important Swedish ... 412
Hydroelectric plant in Tennessee, construction started on new ... 1149
Hydroelectric power, economic and social value of, by Frank G. Baum ... 615
Hydroelectric power, greatest utilization of (E) ... 743
Hydroelectric project for Ireland ... 808
Hydroelectric project, Philippine ... 155
Hydroelectric systems, supplemental power for, by John F. Vaughan ... 763
Hysteresis, law of (E) ... 787
Hysteresis loop, effect of displaced magnetic pulsations on, by L. W. Chubb and T. Spooner ... 808
Hysteresis loop, unsymmetrical, by J. D. Ball ... 808

I

Ice-cream manufacturing, electricity in* ... 55
Ice harvesting, electricity in* ... 1005
Idaho commission in favor of differential (E) ... 1
Idaho commission news (see Public Service Commissions).
Ignition of inflammable gases (E) ... 961
Illuminants, electrical, by S. H. Blake. ... 617
Illuminants, simulating old, by M. Luckiesh* ... 161
ILLUMINATING ENGINEERING SOCIETY:
Annual meeting ... 810
Chicago Section ... 882, 1114
Convention of* ... 574, 619
Convention papers ... 138
Council meeting of ... 744, 922, 1096
Meeting of ... 72
New York Section ... 788, 810, 928, 1113
Illuminating Engineering Society, London ... 372
Illumination and accident prevention (E) ... 596
Illumination and one year's accidents, by R. E. Simpson ... 623
Illumination calculations, simplification of, by A. S. McAllister ... 574
Illumination, desirable intensity of (E) ... 959
Illumination discussed by manufacturers ... 1138
Illumination in Navy ... 810
Illumination efficiencies as obtained in experimental room ... 575
Illumination for "Made in Baltimore" exposition ... 462
Illumination, modern ... 532
Illumination of glass factories, by William A. D. Evans* ... 78
Illumination of interiors as related to architecture and decoration, by David Crownfield ... 623
Illumination of streets, effective, by Preston S. Millar ... 72
Illumination, outdoor, by large units ... 363
Implement manufacturing, electricity in, by W. J. Kyle* ... 97
Importance of measuring demand (E) ... 500
Improvement in electrical-export trade (E) ... 694
Improving drawbridge lighting (E) ... 1136
Improving group drives (E) ... 1094
Incline railway, the Hamilton electric* ... 1160
Increasing usefulness of electric passenger vehicles (E) ... 461
Independent Telephone Association of American and the National Independent Telephone Association merge to form United States Independent Telephone Association ... 1120
Independent Telephone Association of America, convention of ... 696, 1004, 1126
India, electrical devices for ... 159
India Hand Book ... 379
Indiana commission news (see Public Service Commissions).
Indiana Electric Light Association, convention of ... 534
Indianapolis bank adopts flood lighting* ... 1104
Indicators, electrostatic potential and synchronism* ... 251

Digitized by Google

Inductive interference (E) 549
Industries, other, outlook in 417
Injunction in Springfield rate case (E) 136
Inspecting goods after they are received; buyer's rights and liabilities, by Elton J. Buckley 416
Inspection department, electrical, system of keeping records of current work in, by Washington Devereux* 1122, 1156
Inspection, electrical, at Panama-Pacific International Exposition, by G. A. Cleary 22
Inspection ordinance for Jersey City 189
Inspection work, system in (E) 1135
Installation and working of lead storage batteries, by R. Rankin 1107
Installation rules for gas-filled incandescent lamps 896
Institute of Radio Engineers, meeting of 628
Institution of Electrical Engineers 902
Instrument for testing 975
Insulating cover for Dossert cable taps* 444
Insulation, hard paper for 1168
Insulation, mica (E) 919
Insulation, mica, temperature of 942
Insulation of underground piping 194
Insulation resistance and grounds, testing for, by L. H. Henderson* 1020
Insulator circuits, grounding 431
Insulator, porcelain strain* 856
Insulator, Rogers tree* 907
Insulator, trolley-sectionalizing* 212
Insulators, replacing, upon live lines* 339
Insulators, testing (E) 313
Insurance Congress, World's 598
Insurance, liability, cost of 1066
Intangible values (E) 920
Intensive business cultivation at Kansas City 838
Intensive cultivation of central-station business (E) 881
Interesting facts about automobile business, by G. Brewer Griffin 338
Intermountain Electric, of Salt Lake, branches out 114
International Association of Municipal Electricians, convention of 222, 428
International Engineering Congress* 614
International Engineering Congress (E) 596
International Trade Conference in New York 598
Interstate Commerce Commission 328, 369
Inventor, putting, to work (E) 94
Inventories and appraisals of properties, by C. L. Cory, W. G. Vincent and William J. Norton 568
Inventories, value to operating companies of, by Hermann Spoehrer 569
Iron alloys melted in vacuo, magnetic properties of, by T. D. Yensen 808
Iron and steel industry and electric furnace, progress in, by Karl G. Frank 522
Iron campaign at Malden, Mass* 753
Iron campaign at Portsmouth, N. H. 145
Iron, electric, as premium 280
Iron, electrolytic 339
Iron, heating of, when magnetized at high frequencies, by N. W. Mc Lachlan 673
Iron, jumbo electric, as feature of parade 148
Iron-ore smelting in Norway, electric* 54
Iron sale, attractive show window aids in 61
Irons, advertisements that sold many* 469
Irons, electric, boosted by laundries 889
Irrigation, electric, proposed for Cape Cod district 470
Isolated plant versus central-station power 577

J

Janesville Wis.) company participates in trade celebration* 969
Japan, electric utility companies in 985
Jobbers of Chicago stage big golf party at Belmont 720
Johns-Manville lighting show-rooms in New York 301
Jointer, electric bench* 816
Jones, T. I.* 149
Jovian convention at Chicago 222, 652, 696, 761
Jovian Electrical League of Southern California 836
Jovian League and Electric Club of Kansas City 604, 811, 882, 962
Jovian League, Denver 721
Jovian League, Philadelphia 744, 922
Jovian rejuvenation at Dayton 648, 902
Jovian rejuvenation at Los Angeles, special 356
Jovians, Chattanooga, enlist merchants in prosperity propaganda 681
Jovians, Columbus 828
Jovians, Columbus, win honors* 630
Jovians, Dayton, celebrate opening of new hotel 836
Jovians, Louisville, 238, 681, 744
Jovians, Memphis 297
Jovians of Columbus, Ohio, have big day 4
Jovians of Nashville plan big celebration 982
Jovians of St. Louis hold prosperity meeting 680

K

Kansas City company sells many appliances during ten-day show* 839
Kansas City Electric Club (see Electric Club of Kansas City).
Kansas City, intensive business cultivation at 838
Kansas City to boost Electrical Prosperity Week 811
Kansas commission news (see Public Service Commissions).
Kansas Electrical Contractors' Association, convention of 109
Kansas Gas, Water, Electric Light and Street Railway Association, convention of 809
Kelly, Thomas F.* 362
Kennedy, S. M.* 510
Kilowatt Club, outing of 180
Knobs, assembled porcelain* 728

L

Lamp, audion, further development of music from light 908
Lamp, de Forest, as oscillating audion* 908
Lamp, electric incandescent, Edison and invention of* 676
Lamp, foolproof electric hand* 773
Lamp grips on Bryant sockets* 728
Lamp guards, Security* 440
Lamp, incandescent, for 1915 536
Lamp industry, romance of, by Evan J. Edwards 28
Lamp, luminous arc, by R. B. Hussey and S. C. Rogers* 899
Lamp, Mazda Olivette* 815
Lamp, M-shaped photographic enlarging* 492
Lamp, new gas-filled arc 1166
Lamp, portable* 125
Lamp, portable floor* 1147
Lamp renewals in Boston, free, problem of 469
Lamps, arc, for street illumination 576
Lamps, cadmium-vapor arc 674
Lamps for automobiles, glare-free* 910
Lamps, forty-watt gas-filled 772
Lamps, gas-filled, at Waltham, Mass. 752
Lamps, gas-filled incandescent, installation rules for 896
Lamps, gas-filled tungsten, from central-station standpoint 603
Lamps, high-efficiency 583
Lamps, high-efficiency, effective window display of* 212
Lamps, hooded, applications of (E) 459
Lamps, Mazda C, and illumination progress, by H. H. Magdsick 397
Lamps, Mazda "C" street, operation of, by Carroll H. Shaw* 297
Lamps, mercury vapor, industrial lighting with 621
Lamps, modern arc, by C. E. Stephens* 409
Lamps, new form of Moore color-matching* 949
Lamps, new magnetite arc, for street lighting at Charleston, W. Va.* 126
Lamps, small incandescent, and special illumination problems 620
Lamps, street, center suspension of 1070
Lamps, tungsten filament, competitive economy test of—a correction 4
Lamps, vacuum tungsten, direct-reading device for computing characteristics of 302
Lantern, Delta* 125
Lantern, Delta two-cell* 538
Latest approved fittings (see Fittings).
Laundries boost electric irons 889
Laundry fittings, special* 123
Law about buying goods, some interesting and important 486
Law of hysteresis (E) 787
Law regarding contracts 946
Leclanche primary batteries, investigation in 462
Leeds, electrical progress at 52
Leeson-Universal electrical coil-winding machine* 1127
Letter presented by engineers to chairman of New York Constitutional Convention 484
Letter that eliminated much misunderstanding 105
Lexington, Mass., lighting effects at night pageant of* 332
License law for New York City 109
License laws for electrical contractors (E) 743
Licensing electricians, rules of New York City board for 606
Life testing of incandescent lamps at Bureau of Standards, by G. W. Middlekauf, B. Mulligan and J. T. Skogland 620
Lifting capacities of Cutler-Hammer lifting magnets, big increase in* 1127
Light and illumination, by Charles P. Steinmetz 810
Light and power industry, stability in 534
Light plant for construction of dam in wilderness 275
Light sources, relative photographic and visual efficiencies of 621, 624
Light, yellow 1128
Lighting and power plant, rural* 271
Lighting and power, rates for (E) 271
Lighting and power service, cost of (E) 15
Lighting at Maine fair, special 469
Lighting chart, street, city map used for 620
Lighting, commercial, selection of standard unit for, by W. R. Moulton 793
Lighting contract secured by Shirley (Mass.) company 122, 595
Lighting, country house, unique generator set for* 82, 332
Lighting customers, service to (E) 568
Lighting effects at night pageant at Lexington, Mass.* 889
Lighting, electric, of railroad cars, by R. C. Lanphier 754
Lighting, electric, to popularize, by Edison Day prize contest 363
Lighting equipment for high-efficiency lams, Burr* 1083
Lighting, factory, British Government committee reports on 810
Lighting fixtures, Edwards* 862
Lighting flood (E) 694
Lighting, flood, Indianapolis bank adopts* 1104
Lighting, flood, of building fronts from ornamental cluster posts* 724
Lighting, flood, proves profitable in Louisville 663
Lighting, hospital signal* 934
Lighting in downtown office buildings, by A. O. Dicker and J. J. Kirk 622
Lighting, improving drawbridge (E) 1136
Lighting installation in Waltham, Mass., employs gas-filled lamps 752
Lighting installation for Paducah 361
Lighting installation for public tennis court* 320
Lighting installation guards factory from intruders 379
Lighting installation to aid real-estate sales 59
Lighting monster birthday cake by electricity* 889
Lighting, new street, in Jeffersonville, Ind. 754
Lighting, new street, in South Boston 363
Lighting of armories and gymnasiums with incandescent lamps, by A. L. Powell and A. B. Oday 621
Lighting of armory for tennis 788
Lighting of office buildings 882
Lighting of passenger steamer 576
Lighting of rifle ranges* 372
Lighting of ships 576
Lighting of tennis court with Bryan-Marsh lamps 444
Lighting of typical offices in State, War and Navy Department Building, by M. P. Chapman 622
Lighting of Widener Memorial Library* 330
Lighting-plant bond issue of Ellensburg, Wash., declared invalid 462
Lighting plants, Massachusettts municipal 905
Lighting posts, California types of* 1018
Lighting, projector, for protection of bathing beaches* 485
Lighting, semi-direct, in Chicago Edison Building 575
Lighting, school, discussed by Chicago illuminating engineers 1114
Lighting, special, for State House, Boston 1004
Lighting, street 72
Lighting, street, addresses on 6
Lighting, street, at Charleston, W. Va.* 126
Lighting, street, at Manchester, N. H. 148
Lighting, street, for Salt Lake business district* 1009
Lighting, street, in Chicago* 481
Lighting, street, in Hartford 60
Lighting, street, in Niagara Falls, Ont. 398
Lighting, street, Novalux units for* 910
Lighting, street, overall efficiency in (E) 178
Lighting, style versus dogma in 246
Lighting system for Youngstown, new 321
Lighting system, street, dedicated by Youngstown 483
Lighting, train, improved head-end axle generating system for* 490
Lighting, tungsten, rush construction at night facilitated by* 684
Lighting unit, outdoor incandescent* 167
Lighting, window, Wichita show-window contest stimulates 1143
Lighting with gas 1113
Lightning arrester for brick plant* 974
Lightning-arrester installation, by Terrell Croft* 512
Lightning arrester, Universal* 82
Lightning grounds, protecting 979
Lightning rod protects property, report shows 937
Lime manufacture, electricity in, by Arthur C. Hewitt* 181

Digitized by Google

Lincoln Highway Association holds annual meeting 922
Lincoln Highway, Florida motorist suggests road rules for 458
Line material, effective display of* 720
Linemen and their hazards, by C. B. Scott 804
Lines, high-tension, hazard of 805
List of new radio stations announced 396
List prices of manufacturer, maintaining (E) 137
Load dispatching at Boston, by Pierce Kent* 767
Loads, off-peak 535
Local associations for contractors (E) 354
Locating faults by drop-of-potential method, by H. S. Percival* 983
Locknut, emergency 286
Locomotive, electric mine, by Graham Bright 572
Locomotives, electric, exports of 728
Locomotives, new gas-electric, for "Dan Patch" electric lines* 860
London suburban railroads, electrification work on 852
Louisville Board of Trade favors price maintenance 234
Louisville city limits, extension of 1056
Louisville, efficiency meeting in 61
Louisville Electrical Clearing House 152, 325
Louisville electrical interests operate "House Electric" 930
Louisville electrical interests working for Electrical Prosperity Week 369, 396
Louisville, exposed work barred in 1149
Louisville, furnishing electric service in, for $2.99* 319
Louisville, new business at 15, 101, 186
Louisville, plans for Electrical Prosperity Week in 369, 681, 744, 835, 902
Loyalty to accepted standards versus the utilization of cheap substitutes, by W. F. Aberly 610
Luminous arc lamp, by R. B. Hussey and S. C. Rogers* 399
Lynn Gas & Electric house-wiring campaign* 839
Lynn station remodeled 24

M

Machine shops and foundries, electrical construction in, by Norman G. Meade* 16
Machinery, American, in foreign schools (E) 270
Machinery, electromagnetic, classification of, by Frederick Creedy 72
Machines, two, simple direct motor drive for* 1066
"Made in Baltimore" exposition, illumination for 462
"Made in Little Rock" display 58
"Made in Lockport" windows 318
Magnetic fields, chemical reaction in (E) 220
Magnetic gear shift for gasoline automobiles* 857
Magnetic material, some remarkable (E) 787
Magnetic properties of iron alloys melted in vacuo, by T. D. Yensen 808
Magnetism and electricity, mechanical analogies in, by Prof. W. S. Franklin 522
Magnetism, recent progress in (E) 394
Maine commission news, see Public Service Commissions).
Maine State Exposition, special lighting at 15
Maintaining list prices of manufacturer (E) 137
Making extensions pay for themselves (E) 786
Manchester, England, new municipal electric plant for 208
Manchester generating station, proposed, by S. L. Pearce 672
Manufacturers, with electrical 40, 90, 131, 174, 216, 258, 308, 350, 390, 448, 497, 544, 593, 638, 690, 739, 783, 822, 868, 916, 956, 998, 1042, 1090, 1132, 1174
Marble quarrying, electricity in* 963
Marconi international progress 96
Mardi Gras, Philadelphia 435
Marine electrical installations, by H. A. Hornor 568
Market for electrical goods in Portugal 19
Marketing of new electrical toy 980
Marlow, E. S.* 557
Martin, A. C.* 470
Maryland commission news (see Public Service Commissions).
Massachusetts Board of Electrical Examiners 107
Massachusetts commission news (see Public Service Commissions).
Massachusetts contractors investigate licensees' qualifications 933
Massachusetts Electric and Gas Association, annual dinner 1004
Massachusetts electric companies show decided gains 604
Massachusetts hydroelectric companies* 160
Massachusetts hydroelectric companies under state supervision 744
Massachusetts Institute of Technology, power-plant equipment for 854
Massachusetts Institute of Technology to receive big fund 297
Massachusetts Institute, summary of electric vehicle study by 874
Massachusetts municipal electric plants 905
Maximum demand, determination of 532, 535
Maximum demand, measuring (E) 695
Maximum-demand meter, new 722
Mazda C lamps and illumination progress, by H. H. Magdsick 397
McCall raps chronic agitators 744
McConnell, H. N.* 61
Measure earth resistance to electric current 416
Measurements, electrical 73
Measuring earth resistivity, method for 980
Measuring maximum demand (E) 694
Meat chopper, motor-driven* 685
Meeting competitor's bid 934
Metals, application of electricity to heating of, by F. L. Bishop 616
Meter board* 1017
Meter for demonstrating lamp economy* 248
Meter housing for rural installations* 277
Meter, how to read, booklet on 105
Meter, induction, watt-hour, by V. L. Hollister 74
Meter, production, to check building operations 520
Meter, two services to one 233
Meters, British standardization of 863
Meters, prepayment, Brooklyn Edison discontinues 61
Meters, water-current 684
Method of making service connections 275
Methods of disposing of refuse from woodworking plants, by F. O. Alton 556
Mica insulation (E) 919
Mica insulation, temperature of 942
Mica mining 946
Mica, 1914 production of 78
Michigan Electrical Contractors' Association elects officers 107
Milford (Mass.) utility property, valuation of 751
Milk, electric sterilization of 994
Millar, Preston S., addresses Kansas City Electric Club 4
Mills, large, application of station power to 578
Milwaukee electrical show 904
Mine, Alaska, results of electric-furnace operation in 987
Mineral production in United States 1052
Mines, Kentucky, to operate electrically 200
Minneapolis company employees form glee club 228
Minneapolis General Electric increase in sales 14, 103, 228, 837
Minneapolis General Electric presents fountain to public 61
Minot (N. D.) company builds to Burlington 363
Missouri commission news (see Public Service Commissions).
Missouri Electrical Contractors' Association, convention of 109
Missouri Telephone Association, convention of 962
Mixing 278
Modern arc lamps, by C. E. Stephens* 409
Montgomery, Robert* 229
Motion-picture machines, motor-driven 1151
Motion-picture problem solved* 341
Motion-picture projector, motor-driven* 952
Motion-picture projectors, compensarc for, by C. Walford* 230
Motion-picture work, rectifying apparatus for 124
Motor and appliance load, small, development of 531
Motor application, fields of 71
Motor as economic industrial factor, by D. B. Rushmore 616
Motor control, electric, principles and systems of, by C. D. Knight 1111
Motor, direct-current, test of, by H. C. Lightfoot* 240, 372
Motor drive for two machines* 1066
Motor-driven motion-picture machines 1151
Motor, factory sewing-machine* 856
Motor-generator set for charging automobile batteries* 383
Motor generators versus rotary converters, by E. Friedlaender 521
Motor, Hamilton-Beach sewing-machine* 773
Motor, induction, special type of 670
Motor, influence of, on machine tools, by A. L. De Leeuw 617
Motor, light-weight street-railway* 990
Motor on portable wood saw* 751
Motor prevents water famine in Brownwood, Tex. 968
Motor, repairing 896
Motor, repulsion-start induction, by J. L. Hamilton 806
Motor, rewinding, for lower frequency 565
Motor searchlights with British-French forces* 239
Motor, sewing-machine* 633
Motor speeds, standard, advantages of, by Harry N. Gilbert 586
Motor starter, new automatic* 343
Motors, "Advance" single-phase induction* 539
Motors, alternating-current, classification of, by Val A. Fynn 72
Motors, central-station practice in renting 605
Motors, direct-current, some characteristics of, by Harry N. Gilbert 325
Motors, electric, on Dutch farms 53
Motors for organ bellows 325
Motors, inclosing 111
Motors, new Diehl polyphase squirrel-cage* 491
Motors, notes on installation of, by M. F. Arloe* 558
Motors, small direct-current, new self-starter for* 1128
Motors, small, on central-station circuits 527
Motors supplant steam for water pumping at Wellesley, Mass. 147
Motors, testing* 286
Municipal co-operation in public-utility management, by Philip J. Kealy 806
Municipal electric plant for Manchester, England 208
Municipal electric plants, Massachusetts 905
Municipal electric power system of Sydney, Australia 727
Municipal electrical supply proposed for Baltimore 480
Municipal lighting-plant bond issue declared invalid 462
Municipal ownership, expert criticises 1100
Municipal plant inadequate to power needs of Merrimac, Mass. 968
Municipal plant of Hull, Mass., proposed sale of 971
Municipal service, electric vehicles in, by A. J. Slade and R. D. Dumont 1045
Municipalities, sale of energy to (E) 881
Music from light—further developments of audion lamp 908

N

National Association of Electrical Inspectors 21, 110, 232, 436, 517, 718, 845, 935
National Code final authority in Massachusetts 1067
NATIONAL ELECTRIC LIGHT ASSOCIATION:
- Commercial Section 971
- Commercial Section Wiring Committee 550, 972, 1001
- Iowa Section 138
- Lehigh Valley Light & Power Company Section 756
- Michigan Section convention 27
- Milwaukee Company Section 6
- New England Section convention 96, 396, 577
- New England Section, report of Electric Vehicle Committee 641
- 1916 convention to be held in Chicago 962
- Philadelphia Electric Company Section 922, 1096
- Southeastern Section 380
- Technical and Hydroelectric Section 882

National Electrical Code for 1915 1067
National Electrical Contractors' Association, convention of* 202
National Electrical Contractors' Association, convention program 96
National Electrical Contractors' Association, 1916 convention 1066
National Electrical Safety Code, proposed conference on 678, 696
National Independent Telephone Association and the Independent Telephone Association of America merge to form United States Independent Telephone Association 1120
National Independent Telephone Association, convention of, 712, 1004, 1120
National Safety Council, convention of 804
Naumkeag Steam Cotton Company to use central-station power 511
Naval Advisory Board 502
Need for greater publicity (E) 136
Need for reducing number of standard wheel and tire sizes for electric vehicles, by Paul W. Kerr 712
Netherlands, supply of, with electric energy 30
New Bedford central station, electrical features of new office building of* 507
New-business circular brings results* 753
New England contractors' convention 607
New England Electric Vehicle Committee report 641
New Hampshire commission news (see Public Service Commissions).
New Jersey commission news (see Public Service Commissions).

Digitized by Google

New Orleans company, new rate schedule adopted by 1102
New Orleans, large power contracts secured at 276
New York City board for examining and licensing electricians 563
New York commission news (see Public Service Commissions).
New York Edison Company adopts new school course in electric appliances* 1102
New York Edison Company, Home Economies Department of 603
New York Edison Company, timely window display of* 15
New York electrical exposition 272, 381, 679, 725
New York, Electrical Prosperity dinner in 1027
New York Electrical Society 946
New York Electrical Society elects officers 4
New York municipal telephone service to be investigated 381
New York, new electrical code for 756
Newton toggle switch* 1126
New Zealand telephones 1147
Niagara Falls, Canadian Government power plant at 937
Niagara Falls, further Canadian hydroelectric development at 222
Nobel award, Edison and Tesla named for 903
Nobel prizes 1056
Nobel prizes awarded to America (E) 921
Nobel prize for Edison, Tesla and Richards 922
Nodon-valve voltages* 565, 669, 759
North Carolina college bequeathed valuable laboratory 933
Northern States Power Company, commercial growth of 280
Northern White Cedar Association, summer outing of 119
Northwest Electric Light and Power Association, convention of (E) 501
Northwest Electric Light and Power Association, convention of* 528
Norton, W. J.* 5
Notes on installation of motors, by M. F. Arloe* 558
Notes on interior wiring, by Terrell Croft* 1105, 1146
Notes on telephone plant organization, by F. Day 1028

O

OBITUARY:
Ayer, James I 1042
Baker, Malcolm Harlow 1090
Beckert, Louis F 174
Berliner, T. 1090
Bouney, John P 1090
Brown, Richard S.* 39
Bruger, Theodor 1090
Cates, Benjamin L 307
Childers, Basel D 130
Conner, William Andrew 1132, 1174
Daily, Bryant Jarvis 868
Deacon, William G 174
Field, A. W 915
Field, Cornelius J 638
Fisher, H. A 1090
Gerrish, William H 174
Graham, John R 448
Guthe, Karl E 544
Hammond, Isaac B 690
Hartmann, Eugene 998
Hebgen, Max 356
Hoyt, Edward H 307
Huber, P. E 1089
Huebner, Albert C 915
Jackson, W. T 1042
Johnson, Frank Edward 592
Mace, Romaine 822
Marlow, E. S 822
McQuaide, James P 216
Miller, Ira 1174
Moore, Edward B 496
Mott, Jordan Lawrence 258
Norton, Orin H 543
Prime, Professor Frederick 174
Radel, Andrew 782
Rasehorn, Dr. Paul 868
Rathenau, Emil 131
Silva, Albert 307
Stetson, George Ripley 258
Stillwell, Prof. Thomas Bliss 349
Turbett, Charles 543
Wagner, Robert 738
Wheeler, Herbert Merrill 956
Widener, P. A. B 915
Obtaining good will of public, by E. B. Fenton 146
Office system and forms for electrical contractor, by Clovis M. Converse* 150
Offices that invite public confidence* 967
Ohio Commission news (see Public Service Commissions).
OHIO ELECTRIC LIGHT ASSOCIATION:
Committee meetings of 1165
Committee on New Business Co-operation 555, 792, 967
Convention of 120, 196
Convention of (E) 177
Report of Committee on Standardization of Voltages 196
Report of Committee on Transmission and Distribution 197
Report of Meter Committee 198
Ohio power companies perfect organization 378
Oil-can spouts 286
Oil production, Indiana, increase in 334
Oil switch, framework-mounted* 1084
Oil switch, improved industrial-type* 34
Oil, transformer, novel plan for changing 380
Oil, transformer, sludge in (E) 313
Oklahoma City record in electrical construction 896
Old and new in household 840
One-wire farm line at Clarinda, Iowa 323
Ontario Hydro-Electric Power Commission, plans for development by 680
Operating rules, electrical construction and (E) 785
Operation of Mazda "C" street lamps, by Carroll H. Shaw* 297
Opportunity for sale of electrics 703
Ore company to employ electricity 1037
Oregon commission news (see Public Service Commissions).
Oregon Power Company's exhibit of rural applications 837
Organ bellows, motors for 325
Organization (E) 961
Organizing for co-operation (E) 826
Organization of Ohio power companies perfected 378
Outlet-box fittings and fixtures, Benjamin* 588
Outlet plate and connector for armored cables, Sterling* 589
Outlook in other industries 417
Out-of-town work, handling, by A. W. Lindgren 64
Oven, shrapnel-testing* 488
Ovens, electric, by Percy W. Gumaer 75
Overall efficiency in street lighting (E) 178
Overhead charges, by Philander Betts 568
Overhead Line Committee, Northwest Electric Light and Power Association 530
Oxy-acetylene blowpipe, cutting sheet-steel piling with 302
Ozark company secures large contract 470

P

Pacific Power & Light Company, generating and distributing statistics of 901
Pacific Power & Light Company, operating statistics of 148
Pan-American delegates, electrical entertainment for 138
Pan-American Scientific Congress, second 5
Pan-American Scientific Congress, program of 1152
Panama Canal, electrical features of, by Edward Schildhauer 616
Panama Canal Zone, appliances in 662
PANAMA-PACIFIC INTERNATIONAL EXPOSITION:
Busch-Sulzer-Diesel engine day 168
Electrical construction at (E) 353
Exposition Engineers' Day* 726
Gold medal for Standard Underground Cable exhibit 83
High honors awarded Western Electric products 33
"Home Electrical" awarded two gold medals 444
Million-volt transformer at* 945
Problems in electrical inspection at 22
Sangamo meter exhibit receives medal of honor* 166
Underground-conduit exhibit of G. M. Gest* 211
Westinghouse exhibit of rectifying apparatus for motion-picture work 124
Wiring and conduit work at, by A. A. Willoughby* 365, 432, 472
Panelboard campaign successful in Louisville 60
Panelboards, Louisville, improvements in 792
Paper for insulation, hard 1168
Paper, wood-pulp, electricity in manufacture of* 223
Parabolic mirror, by F. A. Benford 624
Parcel checking in appliance display room 656
Parcel-post delivery of lamps successful in Boston 276
Patent Office, proposed revision of rules of practice of 977
Patent on Wallace lamp shade held valid 991
Patents, accelerating delayed 159
Patents, electrical, record of* 40, 91, 132, 175, 217, 259, 308, 351, 391, 449, 497, 545, 593, 639, 691, 739, 823, 869, 917, 957, 999, 1043, 1091, 1134, 1175
Patents of General Bakelite Company declared valid and infringed 246
Patents on Wallace lamp sustained 814
Paying commissions on cancelled orders, by Elton J. Buckley 234
Peat-distillation process, new 994
Peat, gas from 489
Pennsylvania commission news (see Public Service Commissions).
Pennsylvania Electric Association, convention of 524
Pennsylvania electrification at Philadelphia, features of* 923
Pennsylvania Water & Power Company system, combined operation of steam and hydraulic power in, by John Abbet Wells 763
Peoria Electric Club wins prize* 727
Phase angle of current transformers, by Chester L. Dawes 73
Phase-failure relay* 122
Philadelphia Electric Company, new combination substation of* 67
Philadelphia electrification (E) 921
Philadelphia hydroelectric project 155
Philippine Islands commission news (see Public Service Commissions).
Photographic enlarging outfit, mercury-vapor M-shaped* 492
Photometers, portable, practical hints on use of 575
Piano-player, electric, possibilities of shown 1142
Pittsburgh electrical interests and Electrical Prosperity Week 681
Plan for interesting children in electricity* 1010
Platinum production larger 296
Plug, attachment, new interchangeable* 122
Plug, attachment, with soldered connections* 1032
Plug cap for armored cord* 487
Plug, swiveling attachment* 989
Plugs and receptacles, Ralco* 124
Plugs, nonbreakable fuse* 906
Pohe, Stephen C.* 527
Polarized attachment plug and receptacle* 1126
Pole guy anchors, test on 492
Pole jack, Simplex* 683
Porcelain, electrical, production of 121
Porch lights in campaign at Springfield, Mass. 187
Portable floor lamp* 1147
Portable tuner for wireless devised by Boston experimenters 1126
Portland, Me., has "Electricity Week" 187
Portland (Ore.) electrical code 757
PORTRAITS:
Ayton, Frank 42
Ballard, Russell H 39
Beardslee, Frank D 104
Brown, Richard S 39
Coleman, Henry I 663
Condon, Edward J 535
Conner, William Andrew 1174
Doherty, William J 543
Edwards, H. M 698
Flandreau, W. H 496
Freshney, Samuel A 53
George, Clarence R 496
Gibbs, L. D 699
Gray, Prof. Alexander 349
Harrison, H. W 701
Hutchison, Miller Reese 1131
Jackson, E. M 702
Johnson, H. W 698
Johnson, Walter H 766
Jones, Jesse L 781
Jones, T. I 149
Kelly, William E 592
Kelly, Thomas F 362
Kennedy, S. M 510
Lloyd, R. L 699
Marlow, E. S 557, 700
Marshall, A. J 698
Martin, A. C 470
McAllister, A. S 258
McConnell, H. N 61
McDowell, J. W 699
Miles, P. L 390
Montgomery, Robert 229
Norton, W. J 5
Pieper, J. H 701
Pohe, Stephen C 527
Robinson, Harvey 700
Rose, W. J 199
Schrantz, J. W 701
Smith, Bertram 448
Spaulding, Will 702
Stannard, Clare N 14
Wallis, L. R 323
Wheeler, C. D 215
Wolls, W. A 931
Wynne, Thomas A 761
Yonts, Charles B 279
Young, A. K 187
Young, H. E 795
Portugal, market for electrical goods in 19
Possibilities of electric piano-player shown 1142
Post card, effective central-station 792
Posts, lighting, California types of* 1018
Potential indicators, electrostatic* 251
Power, electric, in Canada, by Charles H. Mitchell 615
Power, electric, in South Wales collieries 754

Digitized by Google

Power from central-station sources.... 580
Power, industrial electric protection and control of, by C. P. Steinmetz 521
Power needs of Youngstown (Ohio) district 754
Power-plant equipment for Massachusetts Institute of Technology.... 854
Power plant of Alaska mine, steam-electric* 1097
Power sales problems 967
Power-station design, by H. H. Barnes 614
Power system of Sydney, Australia, municipal electric 727
Powers of state utility commissions (E) 94
Premiums stimulate house-wiring orders 837
Prepayment-meter funds, consumer liable for 322
Present status of arc-lamp carbons, by V. A. Clarke* 406
Preservative treatment of poles, by F. L. Rhodes and R. F. Hosford.... 807
Press Congress of the World 398
Press room, static in 115
Presto automobile specialties* 951
Prestolite Company, new storage-battery plant of* 644
Price-fixing cases now before public—the Ford, Victor and Kellogg cases, by Elton J. Buckley 201
Primary mercurial resistance standards 771
Principles and systems of electric motor control, by C. D. Knight.... 1111
Prize contest stimulates utility salesmen 321
Problems we are facing and how they may be met, by George H. Kelly 765
Production meter to check building operations 520
Progress, electrical, reasons for, by C. P. Sparks 1110
Progress on electrification of Chicago, Milwaukee & St. Paul Railway*.... 769
Projector lighting for protection of bathing beaches* 485
Prominent electrical men on Naval Advisory Board 502
Proposals, accurate estimating for (E) 879
Prosperity activities in Dayton 1162
Protection against high-frequency surges (E) 355
Protection of three-wire direct-current generators* 518
Protection of two-wire direct-current generators* 517
Providence house-wiring campaign*.... 1064
Psychologist, enter the (E) 960
Public-policy advertising (E) 880
Public policy in regard to bare concentric system (E) 651
PUBLIC SERVICE COMMISSIONS:
Arizona 65, 758, 1109
California 112, 190, 328, 519, 667, 758, 1018, 1109
Colorado 1150
District of Columbia 112, 328, 476, 1018, 1109
Georgia 328, 476
Idaho 25, 112 368 438, 667, 758, 897, 976, 1150
Indiana 25, 235, 287, 328,477, 564, 613, 721, 802, 898, 938, 977, 1109, 1150
Interstate Commerce Commission 328, 369
Kansas 112, 153, 1109
Maine 368, 438, 938
Maryland 26
Massachusetts 26, 153, 190, 237, 519
Missouri 153, 369, 439
New Hampshire 65, 112, 938, 1109
New Jersey 112, 154, 237, 328, 369, 721, 1068
New York, First District 65, 154, 288, 667, 758, 802, 1109
New York, Second District, 26, 112, 154, 190, 288, 328, 369, 439, 519, 564, 613, 667, 721, 804, 848, 938, 977, 1109
Ohio 114, 439
Oregon 114, 191, 237, 564, 667, 721
Pennsylvania 155, 667, 1018
Philippine Islands 977
Washington 439, 1110, 1150
West Virginia 155, 192
Wisconsin 26, 66, 519, 564, 613, 668, 758, 848, 1068, 1110, 1150
Public utilities, by Alexander C. Humphreys 617
Pubic utilities, by Edward Willis 617
Public-utility management, municipal co-operation in, by Philip J. Kealy 806
Publicity as means of increasing residence business (E) 460
Publicity, engineering improvements and (E) 650
Publicity, need for greater (E) 136
Pump, centrifugal, from standpoint of central station, by T. D. Rose* 7
Pump, Columbiana electrically operated* 947
Pump, electrically driven high-vacuum* 1035
Pump, house* 635, 813
Pump manufacture, electricity in* 1057
Pump, motor-driven, float-switch control from two points for* 606
Pump, new vacuum* 777
Pump, tire* 1036
Pump wagons, electric, for central station 322
Pump, water, electrical signal for* 189
Pumping at Wellesley, Mass., electric motors for 147
Pumping, electric, by Millbury (Mass.) Water Company 753
Pumping head, motor-driven deep-well* 248
Pumping, municipal, electricity for* 653
Pumping outfit, electrically operated* 684
Pumps, dry-dock 778
Purchase and care of initial truck, by G. Drake Smith 261
Putting inventor to work (E) 94

Q

Quarter Century Club of General Electric Schenectady works, outing of 405
Questions and answers* 115, 193, 289, 370, 478, 565, 669, 759, 899, 978, 1069, 1151

R

Racine, new form of street-lighting contract proposed for 1144
Radiator, combination electric 116, 193, 289
Radiator, electric, hot-water* 588
Radiators, Lee electric* 990
Radio Club of Boston 788
Radio equipment on steamer, auxiliary, test of 979
Radio League of America 1056
Radio signals, strength of 335
Radio station for Society Islands near completion 986
Radio stations, list of 758
Radio stations, new 396
Radio tower falls at Tufts College 676
Radiotelegraphic investigations of British Association Special Committee 675
Radiotelephony, transcontinental, apparatus for 828
Radiotelephony, transcontinental (E).. 650
Rail, unprotected top-contact, by Charles H. Jones 73
Railway, electric, for Maracaibo, Venezuela 439
Railway equipment for 5,000 volts direct current, by Clarence Renshaw* 774
Railway, new London electric 481
Railway service in Boston, improving 180
Railway Signal Association's new officers 550
Railways, California electric, future of, by Paul Shoup 836
Railways, municipal and government, in Ontario 381
Rand, electrical progress on 462
Range advertisement that sold twenty-two ranges* 971
Range campaign at Scranton* 1009
Range campaign that paid 751
Range, electric, in college dormitory.. 1008
Ranges and stoves, Globe electric* 907
Ranges, electric, report on 533
Ranges, electric, Southern California Edison Company opens campaign on 1104
Ranges, electric, wiring for* 1069
Ranges, Globe electric* 340
Rate-advance case, western 328
Rate case, Hood River (E) 219
Rate case, Springfield, Mo. (E) 136
Rate reduction at Easthampton 656
Rate schedule at Sioux City, new 323
Rate schedule, new, adopted by New Orleans company 1102
Rate schedule of Springfield (Mass.) company* 753
Rate system, simple 900, 978
Rates and rate-making, by Paul M. Lincoln 722
Rates, class, for light and power, by Frank G. Baum 75
Rates, electric (E) 50
Rates, flat, at Burlington, Vt. 1011
Rates for electric heating and cooking (E) 95
Rates for lighting and power (E) 271
Rates in St. Louis reduced—company's customer's reach 65,000 mark 1145
Rates, lower, at Fall River* 1101
Rates, lower bulk and cooking, in Boston 795
Rates reduced by Union Electric Company, St. Louis 322
Rates reduced in Pepperell, Mass. 469
Razor blades, safety, method of sharpening* 633
Reactance of large capacity, laboratory-built* 944
Reasons for electrical progress, by C. P. Sparks 1110
Recent decisions influencing public utilities, by James V. Oxtoby 28
Recent progress in magnetism (E) 394
Receptacle and switch, combined* 209
Receptacle, duplex wall* 165
Receptacle, outlet-box* 167
Receptacle, polarized, and attachment plug* 1126
Receptacle, screw-plug flush* 383
Receptacles and plugs, Ralco* 124
Receptacles for semi-indirect and similar fixtures* 384
Receptacles, new Hubbell porcelain* 540
Recognition of engineers in public engineering work (E) 461
Record of electrical patents (see Patents).
Records of current work in electrical inspection department, system of keeping, by Washington Devereux* 1122, 1156
Rectifier, new mercury-arc, for charging small batteries* 84
Rectifying apparatus for motion-picture work, Westinghouse 124
Rectifying equipment, demand for 474
Reflector, asbestos* 440
Reflector, flaring porcelain-enameled steel* 247
Reflector for industrial lighting with gas-filled tungsten lamps* 947
Reflector installation, noteworthy* 442
Reflector, prismatic-glass window* 440
Reflectors, bowl-type metal* 634
Reflectors for high-efficiency window lighting* 303
Refrigeration, new method of 908
Refunding bond issues (E) 94
Regent Palace Hotel, London, electrical installation in 102
Regulation of public utilities, by Leonard A. Busby 986
Regulations governing export procedure, new 1004
Relative photographic and visual efficiencies of light sources 621
Relay, new compensator type* 734
Relay, phase-failure* 122
Relays for protection of single alternating-current tie lines* 382
Reluctance of magnetic fields, by John F. H. Douglas 70
Reminiscences of early days of electrical industry, by Samuel Freshney 28
Reppell Electric Company sells out 896
Research fellowships in the University of Illinois 1138
Residence business, publicity as means of increasing (E) 460
Resistance of radiotelegraphic antennas 427, 905
Resistance standards, primary mercurial 771
Restaurant, underground electric 911
Retinal sensibilities related to illuminating engineering 622
Rewinding motor for lower frequency 565
Rheostats, square-type field* 1085
Rifle ranges, lighting of* 372
Road building, Utah uses electric power in* 1008
Roads, good, to reduce cost of living.. 195
Robbins & Myers sales conference* 859
Rockford vocational school co-operates with central station in training employees* 31
Roebling's new factory nearing completion 344
Romance of lamp industry, by Evan J. Edwards 28
Rope and twine mills, electricity in* 551
Rotary Clubs hold electrical meetings 681
Rotary converters, application of, to coal-mining service* 84
Rubbing and polishing machine, electrically operated* 906
Rules for collecting, computing and compiling data in connection with appraisals, by C. W. Wilder 568
Rules of New York City board for licensing electricians 606
Rupture of dielectrics by transient voltages (E) 549
Rural communities, supplying of from adjacent central stations 528
Rural districts, competition in (E) 395
Rural extension at Madison 751
Rural extensions (E) 825
Rural lighting and power plant* 1128
Russia, opportunity for electrical trade with 1036

S

Safety and Welfare Committee, Pennsylvania Electric Association 525
Safety, by Dudley R. Kennedy 28
Safety Code, National Electric, proposed conference on 678, 696
Safety-razor edger* 633
Safety record, notable electric (E) 961
Safety work at Columbus, results of 557
Sale of current to municipally owned distributing systems by central stations, by W. Rawson Collier* 890
Sale of energy to municipalities (E) 881
Salem central station celebrates thirty-fifth anniversary 795
Sales help, useful 1011

Digitized by Google

Sales methods, tendencies in (E) 312
Salesmen or solicitors, avoiding being at mercy of, by Elton J. Buckley 485
Salt Lake City, battery service for 849
San Francisco Electrical Development and Jovian League 624
Sand and gravel plants, electricity in* 599
Sandusky company employees hold picnic 462
Sandusky makes elaborate preparations for Electrical Prosperity Week 680, 836
Sangamo meter exhibit receives medal of honor* 166
Saw, portable motor-driven* 751
Scandinavian railway electrification 480
School course in electric appliances, New York Edison Company adopts new* 1102
School lighting (see Lighting).
Schools, co-operation with (E) 742
Scientific Congress, Pan-American, program of 1152
Scientific Congress, second Pan-American 5
Scientific organization, British government and (E) 270
Screw-driver, insulated* 487
Searchlight, dirigible, for automobiles* 127
Searchlight for use with dry cells* 209
Searchlight with focusing adjustment for any style of lamp* 540
Searchlights, motor, with British-French forces* 239
Seattle sign makes big impression* 1101
Selecting a vocation (E) 827
Self-starter, new, for small direct-current motors* 1128
Separator outfit, portable magnetic* 441
Service, applications for (E) 649
Service at any cost* 121
Service connections, method of making 275
Service, convenience of electrical (E) 1094
Service, courteous, by Edward H. Mulligan 227
Service (E) 355
Service to lighting customers (E) 595
Sewing machine, Wilcox & Gibbs, electric drive for* 992
Shade-holder, Hubbell* 587
Shades, silk illuminating* 538
Shall central station sell appliances? by J. H. Moseley* 466
Shocks, low-tension, danger of, by H. S. Warren 805
Shopping, novel method of 114
Shortage of central-station assistants in England (E) 1055
Short-circuit phenomena of alternators, by N. S. Diamant 573
Should the business of electrical contractor and dealer be combined? 612
Shovel, electric, to be used in coal mining 101
Show-window contest stimulates window lighting in Wichita 1143
Sign attracts attention in Cincinnati 1011
Sign, electric, diverts trade 149
Sign, electric, for Butte church 405
Sign for Boston store, attractive Christmas 1103
Sign for newspaper* 509
Sign in Johnstown, Pa., large 148
Sign in Seattle makes big impression* 1101
Sign legislation in Clarksville, Tenn 508
Sign, Louisville electric, combines weather forecast with advertising message 888
Sign, new sketching* 994
Sign of Louisville company, combined gas and electric* 969
Sign of St. Louis central station* 909
Sign on furniture store 753
Sign, painted display, in Janesville, Wis.* 603
Sign, San Francisco has largest 280
Sign sold by central station to competing gas company* 321
Signal for water pump* 189
Signs, Chase changeable* 991
Signs, dead, demonstrating on 60
Signs, electric, at Atlantic City, will fight to retain 557
Signs, electrically operated motion, on horse-drawn trucks* 992
Signs for Chattanooga, mayor advocates more electric 1104
Signs, talking 978
Simplex Electric Heating Company salesmen take high honors 85
Simplification of illumination calculations, by A. S. McAllister 574
Simulating old illuminants, by M. Luckiesh* 161
Single potentials in silver-cyanide plating bath, by F. C. Frary and R. E. Porter 625
Skin effect (E) 597
Skin effect in conductors, by A. E. Kennelly, F. A. Laws and T. H. Pierce 570
Slotted commutators, what the operator should know about 1147
Sludge in transformer oil (E) 313
Small-customer question* 657
Snake end* 1017
Soap manufacture, electricity in* 1139
Sociability runs, educational value of, by A. Jackson Marshall 458
Socket base* 123
Socket, Mogul porcelain* 813
Socket, ornamental porcelain* 82
Socket, porcelain keyless, for use in husks* 122
Sockets, Bryant, lamp grips on* 728
Sockets, new C-H wall, interchangeable brass shells of* 813
Soil exposition 719
Solder, aluminum 670
Solder, melting* 4, 1017
Solder, molten, to clear dirt from 976
Soldering iron, new type of 635
Soldering paste, holder for 1017
Some characteristics of direct-current motors, by Harry N. Gilbert 325
Some interesting and important law about buying goods, by Elton J. Buckley 335
South African electrical supplies, great increase in cost of 666
South America, electrical trade in 155
Southern California Edison Company opens campaign on electric ranges 1104
Southwestern Electrical and Gas Association, 1916 convention of 720
Special sales in Boston 754
Speed regulator and starter* 166
Splices in galvanized iron wire, tests of, by Terrell Croft* 716
Springfield (Ill.) company inaugurates rural service 103
Springfield (Mo.) company, valuation of 462
Springfield (Mo.) rate case, injunction in (E) 136
Stabilizer, electric, for ships 290
Standard Underground Cable exhibit, gold medal for 83
Standard unit for commercial lighting, selection of, by W. R. Moulton 620
Standardization, British electrical 238
Standardization in electrical industry (E) 547
Standardization of portable cords (E) 1001
Standardizing motor voltages 579
Standards of electrical construction and operation 796
Standards of practice for business papers 537
Stannard, Clare N* 14
Starter and speed regulator, large* 166
Starters, automatic, for alternating-current motors* 685
Starting motor and lighting generator for gasoline automobiles* 125
Static electricity in textile mill* 231
Static in press room 115
Static shocks from belts 975
Steam-electric power plant of Alaska mine* 1097
Steam-tables for lunch counters and restaurants, electric 487
Steel costs, electric, by F. T. Snyder 625
Steel, electric, in Germany 982
Steel electrically produced direct from ore 904
Steel-mill practice, some electrical applications in, by D. M. Petty 523
Steel mills, electrification of, by Brent Wiley and Wilfred Sykes 522
Steel mills, purchased power for, by C. S. Lankton 523
Steel production, electric 303
Steel warehouses, electricity in* 463
Sterilization of milk, electric 994
Stimulating friendly relations by sale of baby bonds 510
St. Louis company's customers reach 65,000 mark—rates are reduced* 1145
St. Louis company reduces rates 322
Stock-selling plan, Baltimore 1008
Stock sold by utility on partial-payment plan 275
Stone crusher, portable, on central-station service* 363
Stone quarries and asphalt plants, electricity in* 315
Stores, handling, according to cash-control idea, by Wilfred G. Astle* 1012
Stove demonstration, electric, at Portland, Me 238
Stream measurements in North Atlantic coast drainage basin* 1023
Street flushing, electric vehicles for* 1046
Street-lighting contract, new form of, proposed for Racine 1144
Street lighting (see Lighting).
Street-railway company enters jitney bus field 1143
Street-railway system, waterpower auxiliary for* 1159
Street signs in San Francisco, electrically illuminated 727
Strength of electric currents, calculation of, when measured by Rayleigh current balance 404
Strength of radio signals 335
Submarine batteries discussed at court martial 898
Submarines, protection from 989
Substation, combination, of Philadelphia Electric Company* 67
Substation, large-capacity outdoor, for industrial service* 253
Substation, low-capacity 66,000-volt* 683
Substation, low-cost 33,000-volt* 385
Substation, unusual accidents in* 63
Substations, automatically controlled, by E. W. Allen and Edward Taylor 567
Substations, outdoor development and operation of, by F. L. Hunt 845, 936
Subway excavation, noise and smoke nuisance in Philadelphia to be avoided by use of electricity in 408
Successful commercial managers (see Commercial Managers).
Suggestions for central-station advertising managers 889
Sunspots, magnetic storms and weather 195, 289
Supreme Court opinion in Des Moines Gas Company case 329
Surges, high-frequency, protection against (E) 355
Sweden, water power of, by Sven Lübeck 615
Swedish hydroelectric plant, important 412
Swedish water powers 380
Switch and cutout cabinets* 814
Switch and cutout suggestions, by Terrell Croft* 1105
Switch and receptacle combination, flush wall* 209
Switch, automatic, for lighting plants* 253
Switch, automatic pole-line oil* 1032
Switch, balanced disconnecting* 632
Switch, combined snap, and separable attachment plug* 32
Switch, Cutler-Hammer, for preventing automobile thefts* 538
Switch for center light of fixture* 801
Switch houses, outdoor* 33
Switch, oil, improved industrial-type* 34
Switch, pushbutton wall* 32
Switch, service, arranged for disconnection of fuses before handling* 444
Switch, the Newton toggle* 1126
Switchbox, setting, in plasterboard* 286
Switchboxes, Wurdack spacing* 252
Switches and busbar supports for large generating plants* 729
Switches and receptacles, installing flush* 975
Switches, improved flush push-button* 82
Switches, six-ampere pull* 947
Switches, Westinghouse oil knife* 168
Sydney, Australia, railway electrification at 902
Synchronism indicator, electrostatic* 251
System in inspection work (E) 1135
System of keeping records of current work in electrical inspection department, by Washington Devereux* 1122, 1156

T

Talking signs 978
Tallulah Falls development, construction elements of, by Charles G. Adsit and W. P. Hammond 763
Tank lifters for small-sized oil switches* 210
Taping hook* 801
Taps, Dossert cable, insulating cover for* 444
Tasmanian Hydroelectric Department, demonstration of electrical appliance by 204
Taxicab, electric 764, 994
Taxicabs, electric, in Detroit* 871
Taylor and Waco, Tex., now connected by electric power line 1008
Telautograph, new Swedish 728
Telephone development in Chicago, extraordinary 901
Telephone dispatching facilities, railroads increase 487
Telephone display adds to attractiveness of department store show window* 929
Telephone employees hold picnic 462
Telephone equipment for churches* 488
Telephone exchange building for Chicago 430
Telephone for use on aeroplanes* 211
Telephones, gigantic bridge built by aid of* 1158
Telephone in restaurants 300
Telephone outfit, cordless vestibule* 252
Telephone Pioneers of America, convention of 52, 537, 598
Telephone plant organization, notes on, by F. Day 1028
Telephone service to municipality of New York to be investigated 381
Telephone service, transcontinental, Chicago Telephone Company gives demonstration of 159
Telephone Society of New York 606
Telephone system, automatic, of Los Angeles, by W. Lee Campbell 570
Telephone train dispatching on Baltimore & Ohio Railroad 816
Telephone window demonstrations, loud-speaking* 1036
Telephone window display, instructive* 35
Telephones aid grain loading 302
Telephones along Lincoln Highway, long-distance 898

Digitized by Google

Telephones in China ... 685
Telephony, automatic, for Norway ... 949
Telephony on aeroplanes ... 1070
Temperature of field windings, by H. M. Phillips ... 894
Temperature of mica insulation, by F. D. Newbury ... 942
Tendencies in electric sales methods (E) ... 312
Tennis court, lighting installation for* ... 320
Tennis-court lighting with Bryan-Marsh lamps ... 444
Terminal box for aerial telephone cable* ... 686
Tesla sues Marconi on wireless patent ... 297
Test of direct-current motor, by H. C. Lightfoot* ... 240
Test of ground plates* ... 566, 669
Test-plate for illumination photometers ... 576
Tester, vest-pocket ... 801
Testing for grounds and insulation resistance, by L. H. Henderson* ... 1020
Testing, instrument for ... 975
Testing insulators (E) ... 313
Tests of splices in galvanized iron wire, by Terrell Croft* ... 716
Texas central station conducts prosperity campaign ... 681
Texas company encourages dealers to form Christmas clubs to stimulate appliance business ... 893
Textile mill, static electricity in* ... 231
Textile mills, electricity in* ... 789
Theft of current, handling cases involving ... 527
Third rail, protecting* ... 370
Thomson Quarter Century Club meeting ... 272
Three most important price-fixing cases now before public—the Ford, Victor and Kellogg cases, by Elton J. Buckley ... 201
Three-volt dry battery, patented* ... 1126
Throw-over arrangement for operating two motion-picture machines* ... 341
Timeliness in electric-vehicle sales (E) ... 1093
Tire factory, electric drive effects economy in ... 104
Tire pump* ... 1036
Tires, heating steel shrunk, by electricity ... 773
Toaster that turns toast* ... 731
Toggle hook* ... 801
Topeka electric show ... 1056
Torpedo control, Hammond system of ... 295
Towns, small, electrical improvements in (E) ... 135
Toy display, electrical, shows wide range of suitable gifts* ... 1143
Toy, new electrical, marketing of ... 980
Tractor, Mercury industrial* ... 48
Trade, electrical, in South America ... 155
Trade, foreign, to be promoted through strong organization ... 1018
Trade papers adopt standards of practice ... 537
Train lighting, improved head-end axle generating system for* ... 490
Transcontinental radiotelephony (E) ... 650
Transcontinental wireless telephony ... 678
Transformer, bell-ringing, connection of ... 760, 900
Transformer connections, star, phenomena accompanying transmission with, by L. N. Robinson ... 573
Transformer cooling coils, cleaning ... 566
Transformer core loss as affected by triple harmonics, by H. M. Lacey and C. H. Stubbings ... 674
Transformer magnetizing currents, harmonics in, by F. J. Peters ... 573
Transformer, million-volt, to be demonstrated at Panama-Pacific Exposition, by Neill Willson* ... 945
Transformer oil, novel plan for changing ... 380
Transformer outfit, emergency* ... 1085
Transformer, toy ... 1033
Transformer winding* ... 478
Transformers, abnormal voltages in, by J. Murray Weed ... 573
Transformers, air-blast, alarm for* ... 195, 289
Transformers, bell-ringing, and lighting ... 195
Transformers, bell-ringing, toy and sign-lighting* ... 948
Transformers, current, phase angle of, by Chester L. Dawes ... 73
Transformers, delta-cross connections of, by G. P. Roux ... 572
Transformers, distributing, protection against lightning for, by R. T. Wagner ... 526
Transformers, Wayne toy* ... 858
Transmission, electrical, on New Zealand gas-electric motor car* ... 1034
Transmission-line construction ... 536
Transmission line in Connecticut nearing completion ... 294
Transmission line in Connecticut, new ... 795
Transmission line towers and tower erection, foundations for ... 71
Trolley-sectionalizing insulators, automatic* ... 212
Truck, electric, for advertising cigars ... 508
Truck, initial, purchase and care of, by G. Drake Smith ... 261
Trucking, motor, economics of ... 874
Trucks, Chicago grocer buys 11 electrics and sells 300 tons of coffee as result ... 1143
Trucks, electric, capitalizing the advertising value of (E) ... 1137
Trucks, electric, for Panama Railroad terminal piers ... 167
Trucks, electric, used as freight car shifters ... 302
Trucks, horse-drawn, electrically operated motion signs on* ... 992
Trucks, industrial electric, operating costs of ... 872
Trucks, industrial, in service of Pennsylvania Railroad Company ... 764
Turbine operates 32 months without stop ... 728
Twine and rope mills, electricity in* ... 551
Twisting wires ... 1017
Two phases, separate conduits for ... 719
Two services to one meter ... 233

U

Underground-conduit exhibit of G. M. Gest* ... 211
Underground entrances, by Terrell Croft* ... 1146
Underground piping, insulation of ... 194
Union Electric Light & Power Company, St. Louis, spectacular sign of* ... 909
Union Gas & Electric Company, Cincinnati, appliance campaign of ... 360
United Electric Light & Power Company holds annual booster sales meeting ... 839
United Electric Light Company, Springfield, Mass., simplified rate schedule of* ... 753
United States Independent Telephone Association, first convention of ... 1120
United States Light and Heating Company in good shape ... 386
United States Light and Heating Company sold ... 52
University of Illinois, research fellowships in ... 1138
Uruguay, government electric power and telephone system in ... 31
Use of steel in electrical fittings is voted down ... 1149
Using a flywheel to equalize the load (E) ... 1137
U-S-L car-lighting system not affected by prior litigation ... 952
Utah Light & Power Company, new offices of ... 60
Utah uses electric power in road building* ... 1008
Utilities affected by flood-prevention activities ... 318
Utilities Bureau conference on valuation ... 828, 939
Utilities suffer from storm in Cincinnati ... 111
Utility commission created in Alberta, Canada ... 977
Utility merger for Idaho completed ... 854
Utilization of water power (E) ... 827

V

Vacuum and air-pressure outfit, tankless* ... 32
Vacuum-cleaner campaign in St. Louis ... 60
Vacuum cleaner helps students to work their way ... 169
Vacuum cleaner, Hotpoint* ... 488
Vacuum cleaner, Palm stationary* ... 587
Vacuum cleaners in Canada, American ... 949
Vail celebrates seventieth birthday ... 207
Valuation, conference on ... 828, 939
Valuation, conference on (E) ... 920
Valuation of Milford, Mass., utility property ... 751
Valuation of public utilities ... 568
Value of advertising ... 186
Value of domestic-appliance load to central station* ... 1062
Values, intangible (E) ... 920
Vancouver Island Power Company, auxiliary steam plant of, by H. W. Beecher* ... 373
Vehicle business, electric, growth of (E) ... 826
Vehicle business in Boston, expansion of* ... 277
Vehicle committee, English electric ... 54
Vehicle development, battery rental systems as aid to ... 793
Vehicle, electric, again the (E) ... 597
Vehicle, electric, and central station, by John F. Gilchrist and A. Jackson Marshall ... 44
Vehicle, electric, and central station (E) ... 3
Vehicle, electric, as business builder* ... 710
Vehicle, electric, future of (E) ... 693
Vehicle, electric, getting most from (E) ... 221
Vehicle, electric, makes fifteen hundred miles in fourteen days ... 456
Vehicle, electric, makes long cross-country run ... 712
Vehicle, first electric, in Edinburgh ... 96
Vehicle, five-ton electric, operating cost of ... 470
Vehicle loads, comparative development of commercial-power and electric* ... 876
Vehicle parade at British municipal electricians' meeting ... 60
Vehicle performance, exaggerating ordinary ... 81
Vehicle, road, electric, comparative development of commercial power and ... 765
Vehicle sales, electric, timeliness in (E) ... 1093
Vehicle section, electric* ... 41, 261, 451, 641, 871, 1045
Vehicle, small electric delivery, field for ... 765
Vehicle study, electric, by Massachusetts Institute ... 874
Vehicles, electric, as tramways adjunct ... 644
Vehicles, electric, at Birmingham, England, report on ... 52
Vehicles, electric, need for reducing number of standard wheel and tire sizes for, by Paul W. Kerr ... 712
Vehicles, electric, for street flushing* ... 1046
Vehicles, electric, in Concord, Mass ... 876
Vehicles, electric, in municipal service, by A. J. Slade and R. D. Dumont ... 1045
Vehicles, electric, opportunity for sale of ... 703
Vehicles, electric passenger, increasing usefulness of (E) ... 461
Vehicles, electric, prove good hill climbers in department-store delivery service, by A. Jackson Marshall ... 1048
Vehicles, electric, specific advantages of, for various industries ... 703
Vehicles, electric, use of, in municipal service, by F. Ayton ... 41
Vehicles, gas and electric, comparative operation of, in same service ... 766
Ventilation, electric, for Harrisburg schools ... 280
Vermont Electrical Association, convention of ... 485
Vessel, coasting, electrically propelled ... 847
Vision and brightness of surroundings ... 622
Vocation, selecting (E) ... 827
Voltage diagrams of autotransformers ... 435
Voltage, supply ... 370
Voltages, motor, standardization of ... 579
Voltages with electrolytic rectifier* ... 565, 669, 759
Voltmeter, cheap 110-volt alternating-current* ... 973

W

Wall-box mounting* ... 801
Wallace lamp patents sustained ... 814
Wallace lamp-shade patent held valid ... 991
Wallis, L. R.* ... 323
War, electricity in* ... 76
War taxes on electricity (E) ... 960
Ward electric cross-county trip* ... 1052
Ward Special campaign ... 970
Warehouse, Seattle, electrical installation in ... 895
Warehouses, large steel, electricity in* ... 463
Washer, Champion* ... 489
Washer, electric, for use in stationary tubs* ... 250
Washer, Frantz-Premier* ... 682
Washer, Horton* ... 587
Washer, small electric* ... 540
Washing-machine campaign of Philadelphia Electric Company ... 1010
Washing machine, new electric* ... 1166
Washing machine, the "Klean Kwick" electric* ... 1166
Washing machine, White* ... 442
Washington commission news (see Public Service Commissions).
Water company to discard steam in favor of electric pumping ... 753
Water-heater campaign in Boston ... 363
Water-heater, electric, new automatically regulated* ... 1169
Water-power auxiliary for street railway system* ... 1159
Water-power conference at Portland, Ore. ... 439
Water-power development in Alabama, future of, by Thomas W. Martin ... 850
Water power, flood prevention and navigation ... 163
Water power, forester's report says there is no market for ... 1138
Water power in Spain ... 1026
Water power in Vermont ... 977
Water power of Sweden, by Sven Lübeck ... 615
Water-power utilization in West considered by governors ... 482
Water power, utilization of (E) ... 827
Water powers, control of (E) ... 93
Water powers of the Cascades ... 768
Water powers, Swedish ... 380
Water resources of Rio Grande Basin ... 24

Digitized by Google

Water softener effects economy in central-station plant 207
Waterfalls of Finland to be exploited.. 381
Wave forms, irregular, by Frederick Bedell 70
Welding apparatus, demonstration of.. 165
Welding defective cores in paper mill 386
Welding, electric, by C. B. Auel..... 616
Welding, electric, by Gordon Fox*..... ..... 117, 156, 204
West Jersey and Seashore Railroad, system of, by J. V. B. Duer..... 73
West Virginia commission news (see Public Service Commissions).
Western Association of Electrical Inspectors, program for meeting of 1056
Western Electric Boston plant abandons outing 235
Western Electric Company, new Portland quarters for 492
Western Electric employees meet disaster 180
Western Electric fan-window-display contest, winners of*..... 816, 863
Western Electric products awarded high honors at exposition..... 33
Western Society of Engineers, Electrical Section..... 810, 986
Westinghouse Company establishes savings fund for employees..... 671
Westinghouse electric equipment for Ford cars* 384
Westinghouse Electric Export Company, officers of..... 555
Westinghouse Electric takes over sale of Westinghouse Machine product 816
Westinghouse electrical equipment for gasoline automobiles*..... 125
Westinghouse hot plates*..... 1168
Westinghouse lamp works opened in Milwaukee 813
What dealers and contractors can do to cash in on Electrical Prosperity Week 797
White Companies, J. G., urge men to join militia..... 246
White Way for Lexington, Ky..... 323
White Way inaugurated at Malone, N. Y..... 180
White Way, Lowell, extension of..... 60
Wichita prosperity week plans..... 982
Wichita show-window contest stimulates window lighting..... 1143
Widener Memorial Library, lighting of* 330
Winding, transformer*..... 478
Window-display competition, salesman's 278
Window-display, house wiring, elicits 900 inquiries in six days*..... 1103
Window display of New York Edison Company, prize*..... 754
Window display of New York Edison Company, timely*..... 15
Window display, original..... 754
Window displays..... 974
Window displays to boost electricity* 968
Window dressing, contractors' co-operative 666
Wire Department, Boston, report of.... 800
Wire hold for metal molding, Edwards* 32
Wire, iron and bimetallic, effective resistance and inductance of..... 200
Wireless, Australian Navy Department to supervise..... 905
Wireless companies use Bakelite 734
Wireless concession, Argentina-United States 901
Wireless in Australasia..... 208
Wireless in saving lives..... 788
Wireless patent, Tesla sues Marconi on 297
Wireless portable tuner devised by Boston experimenters..... 1126
Wireless receiving devices patented by Greenleaf W. Pickard..... 81
Wireless relay invented..... 1070
Wireless station for Carnegie Institute 343
Wireless stations, naval..... 314
Wireless stations, trouble near..... 900
Wireless, students' camp in touch with world by..... 486
Wireless telephony from Washington to Hawaii, de Forest audion lamp in* 908
Wireless telephony, transatlantic..... 788
Wireless telephony, transcontinental.... 678
Wires, flameproof..... 232
Wiring and conduit work at Panama-Pacific Exposition, by A. A. Willoughby* 365, 432, 472
Wiring, bare concentric, public policy in regard to (E)..... 651
Wiring campaign at Providence*..... 1064
Wiring campaign, house, at Portland, Me. 656
Wiring campaign, house, in Lynn, Mass.* 839
Wiring campaign of Rutland (Vt.) company 792
Wiring, concentric, advisability of using, in this country..... 428
Wiring, concentric, by S. E. Doane.... 429
Wiring contracts in Columbus, O..... 280
Wiring equipment, concentric, for Louisville 612
Wiring for electric ranges*..... 1069
Wiring, house, Concord (N. H.) advertises advantages of..... 59
Wiring, house, in Boston, with concentric system 666
Wiring, house, window display elicits 900 inquiries in six days*..... 1103
Wiring inspection ordinance for Jersey City..... 189
Wiring installation in Boston, initial concentric 280
Wiring, interior, notes on, by Terrell Croft* 1105, 1146
Wiring kinks, dollar*..... 286, 801, 975, 1017
Wiring permits in Boston, fees for..... 471
Wisconsin commission news (see Public Service Commissions).
Wisconsin Electrical Association to meet in March 1160
Wisconsin electrical code..... 719
Wisconsin Electrical Contractors' Association, 1916 convention of..... 1015
Wisconsin Railroad and Industrial Commissions, report of hearing before 796
With the electrical manufacturers (see Manufacturers).
Wolls, W. A.*..... 931
Women as electrical workers (E)..... 1003
Woodworking plants, disposition of refuse from (E)..... 548
Woodworking plants, methods of disposing of refuse from, by F. O. Alton 556
Working capital, by Henry Floy..... 569
World's Insurance Congress..... 598

X

X-ray operators, protection of..... 901

Y

Yacht, transcontinental motor, electrical equipment of..... 648
Yonts, Charles B.*..... 279
Young, A. K.*..... 187
Young, H. E.*..... 795
Youngstown dedicates street-lighting system 483

Z

Zahm, A. W., organizes new supply company 234

Digitized by Google

INDEX TO AUTHORS IN VOL. LXVII OF THE ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Aberly, W. F., Loyalty to Accepted Standards Versus the Utilization of Cheap Substitutes 610
Adsit, Charles G., and W. P. Hammond, Construction Elements of the Tallulah Falls Development 763
Aldrich, C. H., Treatment of Silver-Furnace Fumes by the Cottrell Process 626
Allen, E. W., and Edward Taylor, Automatically Controlled Substations 567
Alton, F. O., Methods of Disposing of Refuse from Woodworking Plants 556
Amberg, E. J., and Ferdinand Zogbaum, Construction and Maintenance Costs of Overhead Contact Systems 73
Arloe, M. F., Notes on the Installation of Motors* 558
Astle, Wilfred G., Handling Stores According to the Cash-Control Idea* 1012
Auel, C. B., Electric Welding 616
Ayton, F., The Use of Electric Vehicles in Municipal Service 41
Ball, J. D., The Unsymmetrical Hysteresis Loop 808
Barnes, H. H., Economics of Electric Power-Station Design 614
Baum, Frank G., Class Rates for Electric Light and Power Systems or Territories 75
Baum, Frank G., The Effect of Hydro-electric Power Transmission Upon Economic and Social Conditions 615
Beckman, J. W., Electrochemical Possibilities in California and on the Pacific Coast 627
Bedell, Frederick, Irregular Wave Forms 70
Beecher, H. W., Auxuliary Steam Plant of the Vancouver Island Power Company* 373
Benford, F. A., The Parabolic Mirror .. 624
Betts, Philander, Overhead Charges 568
Bishop, F. L., The Application of Electricity to the Heating of Metals 616
Blake, S. H., Electrical Illuminants 617
Bright, Graham, The Modern Electric Mine Locomotive 572
Buckley, Elton J., Avoiding Being at Salesmen's or Solicitors' Mercy 485
Buckley, Elton J., Inspecting Goods After They Are Received; the Buyer's Rights and Liabilities 416
Buckley, Elton J., Paying Commissions on Cancelled Orders 234
Buckley, Elton J., Some Interesting and Important Law About Buying Goods 335
Buckley, Elton J., The First Indication of What the Courts Will Consider Unfair Competition Under Recent Laws 296
Buckley, Elton J., The Three Most Important Price-Fixing Cases Now Before the Public—The Ford, Victor and Kellogg Cases 201
Busby, Leonard A., Regulation of Public Utilities 986
Campbell, W. Lee, Automatic Telephone Switchboard System of Los Angeles 570
Chapman, M. P., Artificial Lighting of Typical Offices in the State, War and Navy Department Building 622
Chubb, L. W., and T. Spooner, The Effect of Displaced Magnetic Pulsations on the Hysteresis Loss of Sheet Steel 808
Clark, J. L., Depreciation Reserve 535
Clarke, V. A., The Present Status of Arc-Lamp Carbons* 406
Cleary, G. A., Problems in Electrical Inspection at the Panama-Pacific International Exposition 22
Coglin, J. P., Estimates and Cost Accounting 610
Collier, W. Rawson, The Sale of Current to Municipally Owned Distributing Systems by Central Stations* 890
Collis, A. G., Arc Phenomena 569
Converse, Clovis M., Office System and Forms for the Electrical Contractor* 150
Cory, C. L., W. G. Vincent and William J. Norton, Inventories and Appraisals of Properties 568
Cox, J. B., Contact System of the Butte, Anaconda and Pacific Railway 73
Crain, G. D., Jr., Business Hints for Dealer and Contractor 188, 324, 475, 664, 755, 932, 1065, 1148
Creedy, Frederick, The Classification of Electromagnetic Machinery 72
Croft, Terrell, Lightning-Arrester Installation* 512
Croft, Terrell, Notes on Interior Wiring* 1105, 1146
Croft, Terrell, Tests of Splices in Galvanized Iron Wires* 716
Crownfield, David, The Illumination of Interiors as Related to Architecture and Decoration 623
Dawes, Chester L., The Phase Angle of Current Transformers 73
Day, F., Notes on Telephone Plant Organization 1028
De Leeuw, A. L., The Influence of the Electric Motor on Machine Tools 617
DeRemer, J. Grant, Opportunities for Central-Station Steam Heating Development 525
Devereux, Washington, System of Keeping Records of Current Work in Electrical Inspection Department* 1122, 1156
Diamant, N. S., Calculation of Short-Circuit Phenomena of Alternators 573
Dicker, A. O., and J. J. Kirk, Lighting in Downtown Office Buildings 622
Douglas, John F. H., The Reluctance of Some Irregular Magnetic Fields 70
Dreyfus, E. D., Co-Ordination of the Accounting and Engineering Departments 525
Duer, J. V. B., Third-Rail and Trolley System of the West Jersey and Seashore Railroad 73
Dumont, R. D., and A. J. Slade, Electric Vehicles in Municipal Service 1045
Duncan, James P., Economic, Social and Political Conditions in Europe Which Influence Government Ownership of the Telephone 1153
Edwards, Evan J., Romance of the Lamp Industry 28
Evans, William A. D., The Illumination of Glass Factories* 78
Fawcett, Waldon, The Federal Trade Commission Investigates the Foreign Market for American Electrical Goods* 292
Fenton, E. B., Obtaining the Good Will of the Public 146
Floy, Henry, Working Capital 569
Fortescue, Charles L., The Calibration of Current Transformers by Means of Mutual Inductances 74
Foster, S. L., Overhead Electrolysis and Porcelain Strain Insulators 627
Fox, Gordon, Electric Welding* 117, 156, 204
Frank, Karl G., Progress in the Iron and Steel Industry and the Electric Furnace 522
Franklin, W. S., Mechanical Analogies in Electricity and Magnetism 522
Frary, F. C., and R. E. Porter, Single Potentials and the Silver-Cyanide Plating Bath, as Affected by Its Composition and Concentration 625
Freshney, Samuel, Reminiscences of the Early Days of the Electrical Industry 28
Friedlaender, E., Motor-Generators Versus Rotary Converters 521
Fynn, Val A., Classification of Alternating-Current Motors 72
Ganz, Albert F., Effects of Electrolysis on Engineering Structures 617
Gati, Bela, Submarine Cable Rapid Telegraphy; Ocean and Intercontinental Telephony 570
Gilbert, Harry N., Advantages of Standard Motor Speeds 586
Gilbert, Harry N., Some Characteristics of Direct-Current Motors 325
Gilchrist, John F., and A. Jackson Marshall, The Electric Vehicle and the Central Station 44
Goodwin, W. L., Co-Operation Between Electrical Contractors and Jobbers 282
Griffin, G. Brewer, Some Interesting Facts About the Automobile Business 338
Gumaer, Percy W., Economic Operation of Electric Ovens 75
Hamilton, J. L., The Repulsion-Start Induction Motor 806
Henderson, L. H., Testing for Grounds and Insulation Resistance* 1020
Hewitt, Arthur C., Electricity in Lime Manufacture* 181
Hixson, C. J., Contact Conductors and Collectors for Electric Railways 73
Holding, H. H., and Stephen G. Thompson, Comparative Development of the Commercial-Power and Electric-Vehicle Loads* 876
Hollister, V. L., The Induction Watt-Hour Meter 74
Hornor, H. A., Standard Marine Electrical Installation 568
Hosford, R. F., and F. L. Rhodes, Recent Results Obtained from Preservative Treatment of Telephone Poles 807
Humphreys, Alexander C., Public Utilities 617
Hunt, F. L., The Development and Operation of Outdoor Substations 845, 936
Hussey, R. B., and S. C. Rogers, The Luminous Arc Lamp* 399
Ives, H. E., The Application of Crova's Method of Colored Light Photometry to Modern Incandescent Illuminants 621
Jones, Charles H., Unprotected Top-Contact Rail for 600-Volt Traction System 73
Kealy, Philip J., Municipal Co-Operation in Public-Utility Management 806
Kelly, George H., Problems We Are Facing and How They May Be Met 765
Kennedy, Dudley R., Safety 28
Kennelly, A. E., F. A. Laws and T. H. Pierce, Experimental Researches on Skin Effect in Conductors 570
Kent, Pierce, Load Dispatching Method of Edison Electric Illuminating Company of Boston* 767
Kerr, Paul W., The Need for Reducing the Number of Standard Wheel and Tire Sizes for Electric Vehicles 712
Knight, C. D., The Principles and Systems of Electric Motor Control 1111
Kyle, W. J., Electricity in Implement Manufacturing* 97
Lacey, H. M., and C. H. Stubbings, Transformer Core Loss as Affected by Triple Harmonics 674
Lagrand, Charles, Diesel Engines for Generator Drive 572
Lamme, B. G., Physical Limitations in Direct-Current Commutating Machinery 567
Lankton, C. S., Purchased Power for Steel Mills 523
Lanphier, R. C., Recent Improvements in Electric Lighting of Steam Railroad Cars 568
Lavalle, M. J., Contractors' Office Forms and Systems 62
Lebenbaum, Paul, Contact System of the Southern Pacific Company—Portland Division 73
Lightfoot, H. C., Test of a Direct-Current Motor* 240, 372
Lincoln, Paul M., Rates and Rate-Making 722
Lincoln, Paul M., Recent Developments in Power Generating Apparatus 521
Lindgren, A. W., Handling Out-of-Town Works 64
Loeb, A. E., Co-operation Between the Electrical Contractor and the Central Station 555
Loebell, H. O., Industrial Electric Heating 200
Lübeck, Sven, The Water Power of Sweden 615
Luckiesh, M., Simulating Old Illuminants* 161
Lyon, D. A., and R. M. Keeney, Metallurgical Industries as Possible Consumers of Electric Power 626
Magdsick, H. H., Mazda C Lamps and Illumination Progress 397
Marshall, A. Jackson, Educational Value of Sociability Runs 458
Marshall, A. Jackson, Electrical Vehicles Prove Good Hill Climbers in Department-Store Delivery Service 1048
Marshall, A. Jackson, Electrically Propelled Fire Apparatus* 264
Marshall, A. Jackson, and John F. Gilchrist, The Electric Vehicle and the Central Station 44
Martin, Thomas W., The Future of Water-Power Development in Alabama 850
McAllister, A. S., Simplification of Illumination Calculations 574
McDonald, Donald, What It Means to Be a Public Servant 929
McLachlan, N. W., Heating of Iron When Magnetized at High Frequencies 673
Meade, Norman G., Electrical Construction in Machine Shops and Foundries* 16
Meade, Norman G., Electricity in Cement Manufacture* 273
Middlekauf, G. W., B. Mulligan and J. T. Skogland, Life Testing of Incandescent Lamps at the Bureau of Standards 620
Millar, Preston S., The Effective Illumination of Streets 72
Mills, E. C., Gas-Fired Boilers 675
Minton, John P., Dielectric Losses with Cathode-Ray Tube 74
Mitchell, Charles H., Electric Power in Canadian Industry 615
Moseley, J. H., Electricity in Cotton Gins* 139
Moseley, J. H., Shall the Central Station Sell Appliances?* 466
Mott, W. R., Use of the Flame Arc in Paint and Dye Testing 625
Moulton, W. R., A Selection of a Standard Unit for Commercial Lighting 620
Mulligan, Edward H., Courteous Service 227
Newbury, F. D., Experimental Data Concerning the Safe Operating Temperature for Mica Armature-Coil Insulation 942
Oday, A. B., and A. L. Powell, Present Practice in the Lighting of Armories and Gymnasiums with Incandescent Lamps 621

Digitized by Google

Oxtoby, James V., Recent Decisions Influencing Public Utilities 28
Parsons, G. F., Central-Station Practice in Renting Motors 605
Pauly, K. A., Some of the Latent Developments in Electrical Equipment 522
Pearce, S. L., Proposed Generating Station for Manchester, England 672
Peek, F. W., Jr., The Effects of Transient Voltages on Dielectrics 569
Percival, H. S., Locating Faults by the Drop-of-Potential Method* 983
Peters, F. J., Harmonics in Transformer Magnetizing Currents 573
Petty, D. M., Some Electrical Applications in Steel-Mill Practice 523
Phillips, H. M., The Temperature of Field Windings 894
Place, C. W., Automatic Control 807
Porter, R. E., and F. C. Frary, Single Potentials and the Silver-Cyanide Plating Bath, as Affected by Its Composition and Concentration 625
Potter, N. H., and A. B. Spaulding, How Can the Combination Gas and Electric Company Render the Best Service to the Customer? 619
Powell, A. L., and A. B. Oday, Present Practice in the Lighting of Armories and Gymnasiums with Incandescent Lamps 621
Pyne, F. R., Solution Stratification as an Aid to the Purification of Electrolytes 626
Rankin, R., The Installation and Working of Lead Storage Batteries 1107
Renshaw, Clarence, Railway Equipment for 5,000 Volts Direct Current* 774
Rhodes, F. L., and R. F. Hosford, Recent Results Obtained from Preservative Treatment of Telephone Poles 807
Robinson, L. N., Phenomena Accompanying Transmission with Some Types of Star Transformer Connections 573
Rogers, S. C., and R. B. Hussey, The Luminous Arc Lamp* 399
Rosa, E. B., E. C. Crittenden and A. H. Taylor, The Effect of the Variation of Atmospheric-Pressure on the Candlepower of Various Flames 620
Rose, T. D., The Centrifugal Pump from Standpoint of Central Station* 7
Roux, G. P., Delta-Cross Connection of Transformers 572
Rushmore, D. B., The Electric Motor as an Economic Factor in Industrial Life 616
Ryan, Harris J., and Roland G. Marx, Sustained Radio-Frequency High-Voltage Discharges 628
Schildhauer, Edward, Electrical and Mechanical Installations of the Panama Canal 616
Schuyler, A. H., and W. H. Wills, Jr., Heat Losses from an Electric Steel Furnace 625
Scott, C. B., Linemen and Their Hazards 804
Shaw, Carroll H., Operation of Mazda "C" Street Lamps* 297
Shoup, Paul, The Future of California Electric Railways 836
Simpson, R. E., Illumination and One Year's Accidents 623
Slade, A. J., and R. D. Dumont, Electric Vehicles in Municipal Service 1045
Smith, G. Drake, The Purchase and Care of the Initial Truck 561
Snyder, F. T., Electric Steel Costs 625
Sparks, C. P., Reasons for Electrical Progress 1110
Spaulding, A. B., and N. H. Potter, How Can the Combination Gas and Electric Company Render the Best Service to the Customer? 619
Spoehrer, Hermann, The Value to Operating Companies of Well Planned and Executed Inventories 569
Spooner, T., and L. W. Chubb, The Effect of Displaced Magnetic Pulsations on the Hysteresis Loss of Sheet Steel 808
Stearns, W. M., Electric Heating Devices* 1062
Steinmetz, Charles P., Central-Station Development 788
Steinmetz, Charles P., Light and Illumination 810
Steinmetz, Charles P., Protection and Control of Industrial Electric Power 521
Stephens, C. E., Modern Arc Lamps* 409
Sykes, Wilfred, A Large Electric Hoist 572
Sykes, Wilfred, and Brent Wiley, The Electrification of Steel Mills and the Use of Central-Station Power 522
Taylor, Edward, and E. W. Allen, Automatically Controlled Substations 567
Thomson, Harry F., Comparisons Between Horse, Gasoline and Electric Delivery Costs 874
Vaughan, John F., Supplemental Power for Hydroelectric Systems 763
Vestal, C. L., Electric Service for a City High School* 1024
Vilett, W. H., Credits, Collections and Cash Discounts 106
Wadsworth, W. A., The Future of Electrical Advertising 1010
Wagner, R. T., Protection of Distributing Transformers Against Lightning 526
Walford, C., The Compensarc for Motion-Picture Projectors* 230
Walton, S. V., Co-operation of the Central Stations with the Electrical Contractors and Dealers in Electrical Supplies 281
Warren, H. S., Danger of Low-Tension Shocks 805
Weed, J. Murray, Abnormal Voltages in Transformers 573
Wells, John Abbet, The Combined Operation of Steam and Hydraulic Power in the Pennsylvania Water & Power Company System 763
Whitehead, J. B., The Electric Strength of Air 69
Wilder, C. W., Rules for Collecting, Computing and Compiling Data in Connection with Appraisals 568
Wile, R. S., Melting of Ferro-Alloys in the Electric Furnace 626
Wiley, Brent, and Wilfred Sykes, The Electrification of Steel Mills and the Use of Central-Station Power 522
Willis, Edward, Short Paper on Public Utilities 617
Willoughby, A. A., Wiring and Conduit Work at the Panama-Pacific Exposition* 365, 432, 472
Wills, W. H., Jr., and A. H. Schuyler, Heat Losses from an Electric Steel Furnace 625
Willson, Neill, Million-Volt Transformer to Be Demonstrated at the Panama-Pacific Exposition* 945
Yensen, T. D., The Magnetic Properties of Some Iron Alloys Melted in Vacuo 808
Zogbaum, Ferdinand, and E. J. Amberg, Construction and Maintenance Costs of Overhead Contact Systems 73

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 1. CHICAGO, SATURDAY, JULY 3, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer.

A. A. Gray, General Manager. H. S. Tuthill, Business Manager.

C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
- Idaho Commission Rules in Favor of the Differential..... 1
- Industrial Electric Heating..... 2
- The General Business Outlook..... 2
- The Electric Vehicle and the Central Station..... 3

DEPARTMENTS:
- Commercial Practice..... 13
- Electrical Construction..... 15
- National Association of Electrical Inspectors..... 21
- Public Service Commissions..... 25
- New Electrical and Mechanical Appliances..... 32
- Current Electrical News..... 36
- Electric Vehicle Section..... 41

LEADING ARTICLES:
- The Centrifugal Pump from the Standpoint of Central Station.—By T. D. Rose..... 7
- Electrical Construction in Machine Shops and Foundries.—By Norman G. Meade..... 16
- Problems in Electrical Inspection at the Panama-Pacific International Exposition 23
- Michigan Section, National Electric Light Association..... 27

MISCELLANEOUS:
- Electrical Exports for April..... 4
- Preston S. Millar Addresses Kansas City Electric Club..... 4
- Cincinnati Electric Club Entertains..... 4
- Columbus Jovians Have Big Day..... 4
- The Second Pan-American Scientific Congress..... 5
- W. J. Norton..... 5
- Annual Meeting of Milwaukee Company Section..... 6
- The Electric Furnace Load as a Central Station Possibility 13
- Boston Edison Company Employees' Outing..... 14
- Clare N. Stannard..... 14
- Timely Window Display of New York Edison Company..... 15
- Free Service to the Needy..... 15
- Illinois Contractors Meet at Peoria..... 18
- Cutting Out Plaster for Ceiling Outlets..... 19
- Outfit for Making Special Conduit Bends.—By Samuel L. Brenner 20
- Missouri Electrical Contractors Change Meeting Date..... 20
- Lynn Station Remodeled..... 24
- Water Resources of Rio Grande Basin..... 24
- Rockford Vocational School Co-Operates With Central Station in Training Employees..... 31
- The Use of Electric Vehicles in Municipal Service..... 41
- Frank Ayton..... 42
- The Electric Vehicle and the Central Station..... 44
- Electric Ambulance for Durban..... 46
- Mercury Industrial Tractor..... 48

Copyright, 1915, by Electrical Review Publishing Company, Inc.

IDAHO COMMISSION RULES IN FAVOR OF THE DIFFERENTIAL.

A ruling that will be studied with interest by public utility corporations has recently been handed down by the Idaho Public Service Commission in the case of the Pocatello Gas and Power Company versus the Southern Idaho Water Power Company. It was alleged that the latter company has discriminated in its charges in competing with the complainant for business in Pocatello. It is averred that the rate offered by the defendant for water heaters is less than cost, discriminating against consumers using current for other purposes, and that it was instituted for the sole purpose of unfairly competing with the complainant in the water-heating business. The report indulges in some philosophy respecting the measures which must apply in arriving at a conclusion as to what this or any other charge might be. The point of prime interest in this issue is taken that the water-heating service is only one of many classes of service and uses to which electricity is now put. It is assumed that the use of electricity for illuminating purposes is at the present time the highest use to which it can be put. Its use involves the employment of plant and equipment from three to four hours a day, and takes precedence over all other uses. Energy must be furnished for this use at all hazards. The rate for other services, therefore, must necessarily be interdependent upon and revolve around the lighting rate. The evidence shows that even after considerable advertising and soliciting only a few customers for this particular service have been secured even at the low rate. No great progress in securing this class of business has been made. It is reasonable to assume then that were it not for the low rate considerably less of such service could be secured, and it then follows that if this service could not be secured the revenue therefrom would be withheld from the company and it would then be necessary to charge a higher rate for the other services in order to maintain the organization as a profitable business.

Another interesting point of view relates to the disposition the Commission makes of the contention of the complainant that it could afford to furnish gas for this service at a certain rate and compete with the electrical company if the latter were compelled to raise its rates. The Commission says that it would hardly be justified in compelling the defendant company to raise its rates for electrical energy for this class of service so as to enable the complainant company to compete with it in that service.

Digitized by Google

INDUSTRIAL ELECTRIC HEATING.

There is a great field for the acquisition of future business on the part of central stations in industrial electric heating. In fact, those who have given the greatest amount of study to this question are emphatic in proclaiming that the possibilities in this field are without parallel in the annals of the central-station industry.

While possibly there is no immediate prospect of an industrial heating load comparable with industrial power, save in a few isolated cases, there is every reason to believe that the heating business will in the near future comprise an appreciable percentage of the entire business of the central station and certainly no more desirable load could be had.

In Toledo, Ohio, for instance, the local utility recently closed a contract with the Willys-Overland Company calling for a 6,000-kilowatt heating installation in enameling ovens, this equipment replacing steam and gas heating. In this case an increase in production of 40 per cent is conservatively estimated because of the shorter time required for electric baking. When this item alone is considered the low unit cost of gas or steam heat in comparison with the kilowatt-hour cost for electrical energy becomes almost a negligible item.

Enameling is just one of many possible applications of electric heat, and the automobile industry one of many that could profitably enjoy electrical energy for this purpose as well as for power and lighting.

An indication of the importance of this subject to the central-station industry is the action of the National Electric Light Association in devoting an entire session at the recent San Francisco convention to industrial electric heating. Several papers of especial interest were presented and much profitable discussion ensued. Of patricular interest was a paper by Mr. F. T. Snyder of Chicago dealing with electric-furnace power loads. He aptly summarizes the entire situation in the statement that "among those who are in contact with the more recent installations of electric furnaces in the lines naturally tributary to purchased electric power it is quite evident that there now exists the possibility of a prompt development to large proportions. How rapidly this development will arrive and what proportion of it will become purchased power will be largely determined by the attitude and policies of the power companies." It is, perhaps, not realized by central stations that there are about 1,000,000 horsepower of electric furnaces in regular operation throughout the world, an amount of power quite sufficient to justify serious consideration from power producers and to disprove the somewhat common belief that the electric furnace has not yet been commercially perfected.

The United States at present has electric steel-making capacity under 100,000 tons per year. The total production of steel from all kinds of fuel furnaces is some 30,000,000 tons. A number of years ago it became evident that steel, when required in small quantities, could be made at less cost in electric furnaces than in fuel furnaces. Later developments have proved that electric steel furnaces can produce steel at any tonnage rate at a cost lower than in fuel furnaces and it is uniformly true that the quality of the product is much superior.

From the standpoint of the central station the electric furnace load is extremely desirable. While only a few installations may operate 24 hours a day, 12-hour operation is quite general, even where the working hours are nine or 10 a day. In actual experience electric furnaces show an annual load-factor on 12-hour service of about 40 per cent and about 70 per cent with 24-hour service. Also the intermittent character of the service permits of shutting down during peak hours of the central station without serious loss of temperature.

Industrial electric heating is rapidly coming into its own and a central station can well afford to give serious consideration to the technical and commercial problems involved, all of which are possible of easy solution.

THE GENERAL BUSINESS OUTLOOK.

This country is blessed by length and breadth; by a variety of climatic conditions; with every degree of temperament, an illimitable range of courage, and with a complexity of racial instincts and tendencies which effect a balance and produce what we are wont to call our Americanism.

We have strong feelings here, but they hardly approach embitterments. We are, unconsciously, even more than the old gentleman of France, "one for all and all for one." Consequently, it may be predicated that our mutual interests and interdependence will force us to maintain amicable relations and solve our problems peacefully.

A transcontinental train, making the trip from coast to coast, is ample evidence of the variety of nationalities, of the differences of point of view and of the solidarity of love of the adopted country. Getting away from the big industrial cities and sweeping out into the reaches of Wyoming, Nebraska and the Dakotas, the immensity of the productive factor becomes apparent, and in every mind is the idea that we hardly know the greatness of the land in which we live. Anyone traveling across the country today, whether by the northern or southern route, may see unparalleled evidences of the agricultural wealth of the land. Prosperity is apparent on every hand, and despite the continued struggle abroad, with its depressing effect here, there reigns predominant a cheerful note and an expectation of better things to come.

In the very interesting publication called "Copper Gossip," issued by the National Conduit and Cable Company, the statement is made that in many lines of industry there is extraordinary activity at present, and it is hoped that the general business situation will soon feel the stimulus of improved conditions. It is true that we are being deprived of an immense buying power for materials of construction and fabrications of peaceful arts. On the other hand, there are immense

Digitized by Google

war orders coming to this country from foreign nations and these have created a condition of great activity at many leading centers of manufacture. Underlying conditions in the country appear to be sound, and it may be expected that as the temerity which naturally and reasonably accompanies an unexpected and hardly understood condition such as we have been experiencing for the last six months is passed, business in every direction will move steadily forward to a period of great material prosperity.

In the electrical industry there have been many ups and downs recently. The genuine misapprehension which existed at the beginning of the year, however, is beginning to give way to a more settled policy of conservative expansion, and in many parts of the country inquiries are looking up. The electrical supply jobbers are securing a little more business, but while there are many orders, the aggregate volume is small and the cost of handling is considerable. The impulse of a better buying mood is apparent, and the promise is that this tendency will be maintained if not accelerated. Many of the articles entering into electrical construction are made of the stuff from which war material is devised. This has already had an unsettling effect upon the metal market, and the probability is that for some time at least an increasing cost for raw and finished material will be the order of the day. In this emergency the electrical industry must take its courage in its hand, and rather than make extraordinary sacrifices in effort and profit in order to hold down the price, put its selling organization with all the vigor and intelligence at its disposal behind the determination that the things are necessary and worth the cost.

THE ELECTRIC VEHICLE AND THE CENTRAL STATION.

One of the most interesting reports presented to the recent San Francisco convention of the National Electric Light Association, was that relating to the central station and the electric vehicle. The joint authors were Mr. John F. Gilchrist, president, and Mr. A. Jackson Marshall, secretary, of the Electric Vehicle Association of America. A brief abstract of this report is published on other pages of this issue. Central-station managers wherever the electric vehicle may be used, either for company purposes or its use advocated for both passenger and commercial service, should make a careful study of the complete report which is available through the agency of either of the above named organizations.

The managers of electric light and power companies have been scolded a good deal by the electric vehicle manufacturers and by those electric vehicle enthusiasts in the central-station field who have put their organizations behind the movement of increasing the use of the electric vehicle and have found themselves greatly the gainers thereby. We cannot all of us attend all of our affairs with the same enthusiasm in the same directions. The report calls attention to the fact that comparatiely few central-station organizations appreciate the opportunities that a vigorous prosecution of electric vehicle propaganda offers. The advancing of testimony and the establishment of concrete fact with respect to the preliminary methods to be employed and the results to be obtained, such as are included in the report under discussion, will continue to bolster up the faltering faith of those who are making the attempt and make converts to the cause.

No one doubts now the conclusion that the horse as a draft animal is rapidly passing from the scene of social and commercial activities. Within a short time transportation of every description will be motorized, and prompt and vigorous action upon the part of central-station managers and electric vehicle interests is necessary if the electric is to benefit.

The work being done in establishing a better understanding of the possibilities of the electric vehicle by the Electric Vehicle Association is splendid, and the sympathies of the central-station managers of the country are with the latter organization. As the utilization of the electric vehicle increases many heretofore apparently complex problems will solve themselves. This is the history of the development of every great movement. Because these problems will ultimately solve themselves is no reason why those most interested should view the situation with complaisance.

Abroad we find our British brothers enthusiastic over the possibilities of the electric vehicle, and we direct attention to the stirring words of Mr. Frank Ayton, honorary secretary to the Electric Vehicle Committee of the Incorporated Municipal Electrical Association, published in the Electric Vehicle Section in this issue. We believe that over here we take the lead in imaginative faculty and in our forward attempts to have electrical energy perform a multitude of services. An examination of the report presented by Mr. Ayton will indicate that he and his associates are not at all backward in finding for the electric many uses to which, up to the present time, we have given scant attention. The suggestions outlined for the adaptation of the electric for various municipal services are easier to accomplish in Great Britain where there are so many electrical supply undertakings in control of municipal departmental work. It is a fact that practically every city worth while in this country is a good customer of the privately owned central station, and we are in a position here to increase the use of electrical energy by advocating the adaptation of the electric to municipal service.

The more we study the agency and the opportunity, the more inclined we are to get strongly behind the work of the Electric Vehicle Association and bespeak for it the hearty co-operation of not only the central-station interests, but of every active organization interested in the electrical industry.

Digitized by Google

Electrical Exports for April.

The following data on the electrical exports of the United States for April are from the official government report on the foreign commerce of that month issued by the Bureau of Foreign and Domestic Commerce.

A decided general improvement is shown by the electrical-export figures for April, the total value of these shipments being higher than for any month since March, 1914. An increase of over 15 per cent is shown in the electrical total compared to that of April, 1914. For the four classes for which the number of articles shipped is reported, there were sent out in April the following: Electric fans, 4,523; arc lamps, 35; carbon-filament lamps, 248,338; metal-filament lamps, 196,725.

The following table gives the detailed figures for the various electrical classes reported, together with the comparative figures for the corresponding month of last year.

Articles	April, 1915	April, 1914
Batteries	$ 88,372	$ 65,001
Dynamos or generators	127,071	176,469
Fans	61,926	38,525
Insulated wire and cable	354,344	86,993
Interior wiring supplies, etc. (including fixtures)	67,605	60,891
Lamps—		
Arc	554	1,063
Carbon-filament	27,665	4,621
Metal-filament	36,936	20,820
Meters and other measuring instruments	69,835	.....
Motors	193,802	341,369
Static transformers	47,763	93,247
Telegraph instruments (including wireless apparatus)	14,377	8,654
Telephones	89,730	73,061
All other	875,395	770,837
Total	$2,055,375	$1,741,551

Preston S. Millar Addresses Kansas City Electric Club.

The Electric Club of Kansas City, Mo., which suspends its semi-monthly luncheons during the summer months, held a special meeting June 25 to hear from Preston S. Millar, secretary of the Electrical Testing Laboratories, New York, on his way east from the Pacific Coast. Mr. Millar urged the club to have at least one program in the year devoted to illumination, and suggested co-operation with the Illuminating Engineering Society to this end. His advice was the conclusion of his talk on the illuminating features of the San Francisco Exposition, and on the modern ideals in home and other illumination. He said that whereas a few years ago the aim was increased lighting efficiency and reduction of use of current for the customer, the present aim is increased attractiveness and harmony of effects, with a result of largely increased use of current, as well as larger sales of equipment. "A visitor in a home equipped with the modern numerous fixtures is charmed and attracted, and wishes similar effects for his own home," said Mr. Millar. "So satisfactory is the newer illuminating ideal, that it behooves all electrical interests to exploit it." Mr. Millar upon request told of many of the novel duties of the Laboratories, indicating the latest requirements put upon electricity. One of the most interesting was his relation of the devising of a means of creating color effects for a "color symphony," the device having been successfully employed, and to be put on tour this fall.

Cincinnati Electric Club Entertains.

The Cincinnati Electric Club, composed of a larger number of electrical men than any similar organization which has ever existed in the city, held its first regular meeting following its perfected organization last week, the affair taking the shape of a dinner at the Zoo under very pleasant auspices. More than one hundred members attended, showing convincingly the enthusiasm which is felt over the new organization. Several addresses were heard, in which the desirability of close co-operation between the various branches of the trade urged. Meetings will be held during the summer.

Convention of Colorado Association.

Announcement is made that the thirteenth annual convention of the Colorado Electric Light, Power and Railway Association will be held at Glenwood Springs, Col., on September 23, 24 and 25, 1915. Plans are being worked out that will insure one of the most successful conventions in the history of the organization.

T. F. Kennedy, of the Denver Gas and Electric Light Company, is secretary.

New York Electrical Society Elects Officers.

At the annual meeting of the New York Electrical Society, held June 15, the following officers were elected:

President, Elmer A. Sperry.

First vice-president, George W. Elliott.

Second vice-president, S. N. Castle.

Third vice-president, Bernhard Hoffman.

Secretary, George H. Guy.

Treasurer, Thomas F Honahan.

Competitive Economy Test of Tungsten Filament Lamps—A Correction.

In the article entitled "Co-Operative Economy Test of Tungsten Filament Lamps," in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of June 26, an error occurs in the seventeenth line of the third column, page 1201. The word "voltage" should read "wattage."

Columbus Jovians Have Big Day.

A lamb barbecue was the chief feature of the annual picnic participated in by 200 Columbus, O., Jovians and 100 guests at Buckeye on June 23. Incident to the affair, local electrical stores were closed and employees given a holiday. The proprietors and officers all held invitations to the picnic. Buckeye Lake, which is the most popular resort of central Ohio, lies about 30 miles east of Columbus. A special car was run by the New York Central lines. Many of the picnickers went by trolley and a still greater number by automobile. Thus the crowd kept gathering from 6 o'clock in the morning until nearly noon. The private grounds of the Sunset Fishing Club, of which some of the Jovians are members, was the scene of the picnic.

On the programme of sports was a base ball game between the manufacturers and jobbers. This resulted in a draw, as dinner was announced before the game was over. The fishing contest was won by C. H. Temple, of the Central Union Telephone Company, Columbus. He caught 15 fine cat-fish, which were secretly appropriated from their place of display and eaten by some of his friends who remained at the lake until the next day. Harry B. Kirkland, vice-president of the American Conduit Company, Pittsburgh, was the winner of the men's quoit-pitching match. An exhibition of fancy swimming was given by Percy Worth, of Cincinnati, the aquatic Jovian jumping from and regaining the deck of a sail-boat moving at the speed of seven miles an hour Practically all the motor-boats on the lake, as well as a number of other boats had been chartered by the Jovians. Bathing, with incidental water sports, was one of the enjoyable pastimes.

The barbeque had a novel setting. Eight lambs were roasted whole. The pit where they were being thus prepared was kept covered by a canvas while the picnickers were seating themselves for the feast, and then this covering was withdrawn to give all a view of the carcasses before removal from the spits. The dinner was bountiful in other delicacies besides roast lamb. The picnic broke up at six o'clock. It was the largest outing ever held by Columbus electrical men, and so taxed the resources of the grounds as to make a new location advisable next year. Among guests from a distance were Oscar Carman, of Indianapolis; Percy Worth, of Cincinnati; S. W. Scofield, of Cleveland; Charles Crofoot, of Cincinnati; H. B. Kirkland, of Pittsburgh, and Leo Mockenhaupt, of Chicago.

The local committee of arrangements, to whom the fine success of the affair was due, was William Hopkins, Erner-Hopkins Company; Arthur Loeb, Avery-Loeb Electric Company; Lawrence Sackett, Sackett Mine Supply Company, with Tribune Carl Metz acting as ex-officio member.

Digitized by Google

The Second Pan-American Scientific Congress.

During the present year two great Pan-American gatherings convene in Washington under the auspices of the Government of the United States. The first of these, the Pan-American Financial Conference, occurred the week of May 24. Of greater interest to the electrical world, however, is the Scientific Congress that will convene in Washington beginning December 27, 1915, and concluding its sessions on January 8, 1916. The first congress of this name was held in Santiago, Chile, in 1908. It had its origin in earlier Latin-American scientific congresses; and at the time of the Santiago congress was enlarged through the generous initiative of the Latin-American countries to include the United States. This Congress was well attended by visiting delegates from the United States. On its adjournment, entirely unsolicited on the part of the latter, Washington was designated as the place of meeting of the Second Congress.

The Scientific Congress will concern itself with constructive discussion and contributions in the domain of pure science, wherein great advance has been made since the last Congress in Santiago, Chile. Science is comprehensively defined by the Congress and includes, under nine heads, these subjects: anthropology; astronomy, meteorology and seismology; conservation of natural resources, agriculture, irrigation, and forestry; education; engineering; international law, public law, and jurisprudence; mining and metallurgy; economic geology, and applied chemistry; public health and medical science; transportation, commerce, finance and taxation.

The Governing Board of the Pan-American Union, composed of the diplomatic representatives of the participating Latin-American countries with the secretary of state of the United States as ex-officio chairman, has honored the Second Pan-American Scientific Congress by authorizing the use of its beautiful building for the office and sessions of the Congress. The Board also authorized the director general of the Pan-American Union, John Barrett, to act as secretary-general of the Scientific Congress. As the program is developed, further announcements will be made.

W. J. Norton.

From time to time during recent years much has been said with regard to the desirability, not to say necessity, of having the engineering fraternity represented upon boards of public control and commissions having to do with the regulation of public utility corporations. The adaptability of the engineer, due first to his course of study, and second to his habit of scientific observation, for work involving intimate analysis of complex problems, is recognized. It is highly satisfactory, therefore, that the all-around ability of the engineer and the later training of the statistician and student of regulatory measures, are recognized in the election of William J. Norton as chairman of the Chicago Section of the American Institute of Electrical Engineers. Mr. Norton has had a unique experience in engineering. He was born on July 17, 1878, at Baltimore, Md. He attended Cornell University from 1898 to 1902, receiving the degree of Mechanical Engineer in the latter year. From 1903 to 1907, he was engaged in engineering work with the Chicago Edison Company, the New York Ship Building Company, and in 1905 was made vice-president and general manager of the Federal Sign System (Electric). From 1907 to 1911 he was assistant secretary of the Public Service Commission for the First District of New York. His work was of an administrative and executive character in connection with rapid transit problems, valuations of street railway properties, and with the regulation of electric light and power companies. From 1911 to 1913 he was engaged on special rate engineering work for the Commonwealth Edison Company of Chicago in connection with the investigation of rates by the Chicago City Council. This work concluded with the passage of an ordinance by the City Council, almost unanimously, and acceptable to the company. In December, 1913, he organized the consulting engineering firm of Norton & Bird, with Paul P. Bird, who had formerly been smoke inspector of the City of Chicago and later special power engineer for the Commonwealth Edison Company. During 1914 and 1915 this firm has been engaged in special rate work for many of the electric lighting and power companies throughout the United States, and has made complete valuations of the electric properties of the Union Gas and Electric Company, Cincinnati, O., and for the eight gas and electric properties of the Public Service Company of Oklahoma. The firm is now engaged in making a complete gas valuation for the Union Gas and Electric Company. It has made special investigations of several municipal electric plants, was retained by the Merchants' Association of New York City in the complaint against the New York Edison Company, and is now under retainer by the Maryland Public Service Commission in the complaint against the Chesapeake & Potomac Telephone Company, of Baltimore. In addition to this great activity, Mr. Norton has taken a conspicuous part in the work of the National Electric Light Association and in other engineering and scientific organizations. In 1911 he was secretary of the Rate Research Committee of the National Electric Light Association, and has been a member of this committee since 1914. He is editor and publisher of "Rate Research," author of the Annotated Edition of the Illinois Public Utilities Commission and Municipal Ownership Law, and editor of the "Public Service Commission Department" of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

W. J. Norton,
Chairman, Chicago Section, American Institute of Electrical Engineers.

Digitized by Google

Annual Banquet of Milwaukee Company Section.

The third annual banquet of the Milwaukee Company Section, National Electric Light Association, was held at the Hotel Pfister, Milwaukee, Wis., Tuesday evening, June 29. Several papers and addresses were delivered relating particularly to street lighting, this subject being especially pertinent at this time because of the completion of the survey on Milwaukee street lighting conducted by the firm of Vaughn, Meyer & Sweet. Gerhard A. Bading, mayor of Milwaukee, acted as toastmaster, and included among the guests present were several aldermen and city officials directly interested in street lighting.

F. A. Coffin of The Milwaukee Electric Railway & Light Company, was the first speaker, choosing for his subject, "Historical Development of Street Lighting." Mr. Coffin reviewed the progress of lighting from the earliest forms to the present highly efficient nitrogen-filled incandescent lamp. He stated that the first public lighting was purely a police and safety measure and, while in later years the esthetic element has entered largely into exterior lighting, still the principal function of any system of street illumination is to provide against accidents and crime.

The subject of street lighting as an aid to public safety was dealt with briefly by Milton C. Potter, superintendent of schools, Milwaukee. Mr. Potter contended that the cost of lighting streets is but a small premium on insurance against accidents, crime, etc. As a concrete example he referred to an installation at Carson City, Nev., costing $125 per lamp and quoted statistics showing the extent of the reduction in crime and number of accidents which indicates that the cost, although high, is a profitable investment to the city.

Edwin S. Mack of Miller, Mack & Fairchild, local attorneys, spoke briefly on essentials of a street-lighting contract. He emphasized the fact that a street-lighting contract between a municipality and a public utility must primarily be definite and all conditions clearly stated. The duration of a contract is also vital to both city and company as this item largely determines the price for which a company can furnish service. He also thought that contracts should specifically provide for any future advances or improvements in lighting equipment or methods, allowing, of course, for proper compensation to the company for installing such improved equipment. The question of outages should also be dealt with definitely.

Edwin Gruhl, assistant to the president of the North American Company, controlling The Milwaukee Electric Railway & Light Company, presented statistics on the cost of street lighting in municipally owned and operated plants. He referred particularly to conditions in Chicago, Detroit, Winnipeg and Seattle, pointing out that in municipally lighted cities such as these, there are no standards, as each successive engineer installs what in his estimation is the best system. He quoted from a survey made by the Railroad Commission of Wisconsin dealing with street lighting in Milwaukee furnished by the utility and as proposed by the municipality. These figures show that it would cost $46,846 more to light the streets if undertaken by the city than if supplied by the utility, principally because of the duplication of equipment at present available for this service. The investment per lamp under municipal operation would be $422 as compared with $328 with company service. Summarizing the comparisons Mr. Gruhl stated that electric company service would be 28 per cent less expensive than municipal ownership. Figures were also presented showing the higher cost of street lighting in the cities having a municipally operated street lighting system.

F. A. Vaughn, of Vaughn, Meyer & Sweet, spoke on the subject of "Technical Designs of Street Lighting Systems," quoting largely from his report recently completed and abstracted in our issue of June 26, 1915. He showed lantern slides of various types of equipment for street lighting, distribution and efficiency curves of various types of units and diagrams of the proposed Milwaukee installation.

Edgar Switzer of the Westinghouse Electric & Manufacturing Company, dealt with the subject of "Modern Types of Street-Lighting Equipment." He reviewed the development of street-lighting units from the open arc to the present gas-filled incandescent lamp. He thought that the magnitite arc represents the greatest development in street lighting units and the early objections to this lamp have been entirely removed. Maximum illumination is given at an angle of 10 degrees from the horizontal, which is particularly desirable for street lighting and a rectifying system has been developed which is entirely satisfactory. He urged that these lamps be given serious consideration where a street lighting equipment is being considered.

Details of the design and use of refracting glassware for street-lighting service were given in a talk by W. A. Dorey of the General Electric Company. Lantern slides showing the distribution of light by means of these refractors were shown and descriptions given of equipment which will meet the specifications of the proposed Milwaukee system.

The program was closed with a brief address by Eltinge Elmore, president of the Milwaukee Retail Merchants' Association on the commercial advantages of street lighting. He spoke first of the advertising value of well lighted streets and of the influence of good light in accident and crime prevention.

Electric Club-Jovain League of Chicago.

Prof. F. R. Moulton, of the University of Chicago, delivered a very interesting illustrated address before the Electric Club-Jovian League of Chicago on June 24, the subject being "The Wonderful Heavens." Lantern slides of actual photographs of the sun, moon, stars, etc., taken with the aid of powerful telescopes were shown and explained.

President Pinckard reported that progress is being made by the Picnic Committee and all indications point to the most successful outing in the history of the club. Thursday, August 5, has been selected as the date for the affair, which will again be held at Ravinia Park.

H. A. Mott, chairman of the general committee, has appointed Perry Boole chairman of the Prize Committee, and it is believed that the record of last year, when prizes aggregating over $1,000 in value were secured, will be exceeded.

H. E. Niesz has been made chairman of the Publicity Committee.

Classifications of Technical Literature Wanted.

The Joint Committee on Classification of Technical Literature is making a collection of classifications of applied science which have been developed independently in the offices of manufacturing plants or engineering firms. Classifications which exist in manuscript form and have been used for filing or indexing data are particularly desired. The committee is also collecting copies of any extensions of present systems to cover special activities or branches of engineering not now fully covered by published classifications. Contributions should be sent to W. P. Cutter, secretary, 29 West Thirty-ninth Street, New York, N. Y.

Chicago Section, Electric Vehicle Association.

The last of the regular weekly meetings of the Chicago Section, Electric Vehicle Association of America until September, was held on June 29 at the Metropole Hotel. H. W. Howard, of the B. F. Goodrich Company, delivered an address on "Latest Developments in the Automobile Tire Industry."

The Board of Public Utilities Commissioners of the Philippine Islands, in a recent ruling, fined a transportation company operating an automobile line in Leyte $100 for cutting the scheduled price for carrying passengers.

Digitized by Google

The Centrifugal Pump from Standpoint of Central Station.

By T. D. Rose.

This article discusses in a comprehensive manner the characteristics and performances of centrifugal pumps with comparisons with other types. Data are given on the types of pumps suitable for specified services and recommendations made as to the method of drive. The entire subject is treated from the standpoint of the central-station power engineer.

The commercial adoption of many pieces of power apparatus depends now, to a large extent, upon the central-station power engineer. In his work in direct contact with the industrial establishments, where he has become, in many cases, the "consulting engineer" for the owner of the plant, the installation of power equipment is governed to a large extent by his experience and judgment. In this work it has become necessary that he familiarize himself with all kinds of machines. He wants to know their construction, their application, their characteristics, their advantages and their disadvantages. In following out this line of work he can hardly find a more interesting and a more important machine, at the present time, than the centrifugal pump. The field is a fertile one and one that is becoming more important every day as the central station spreads its wings over the industrial world.

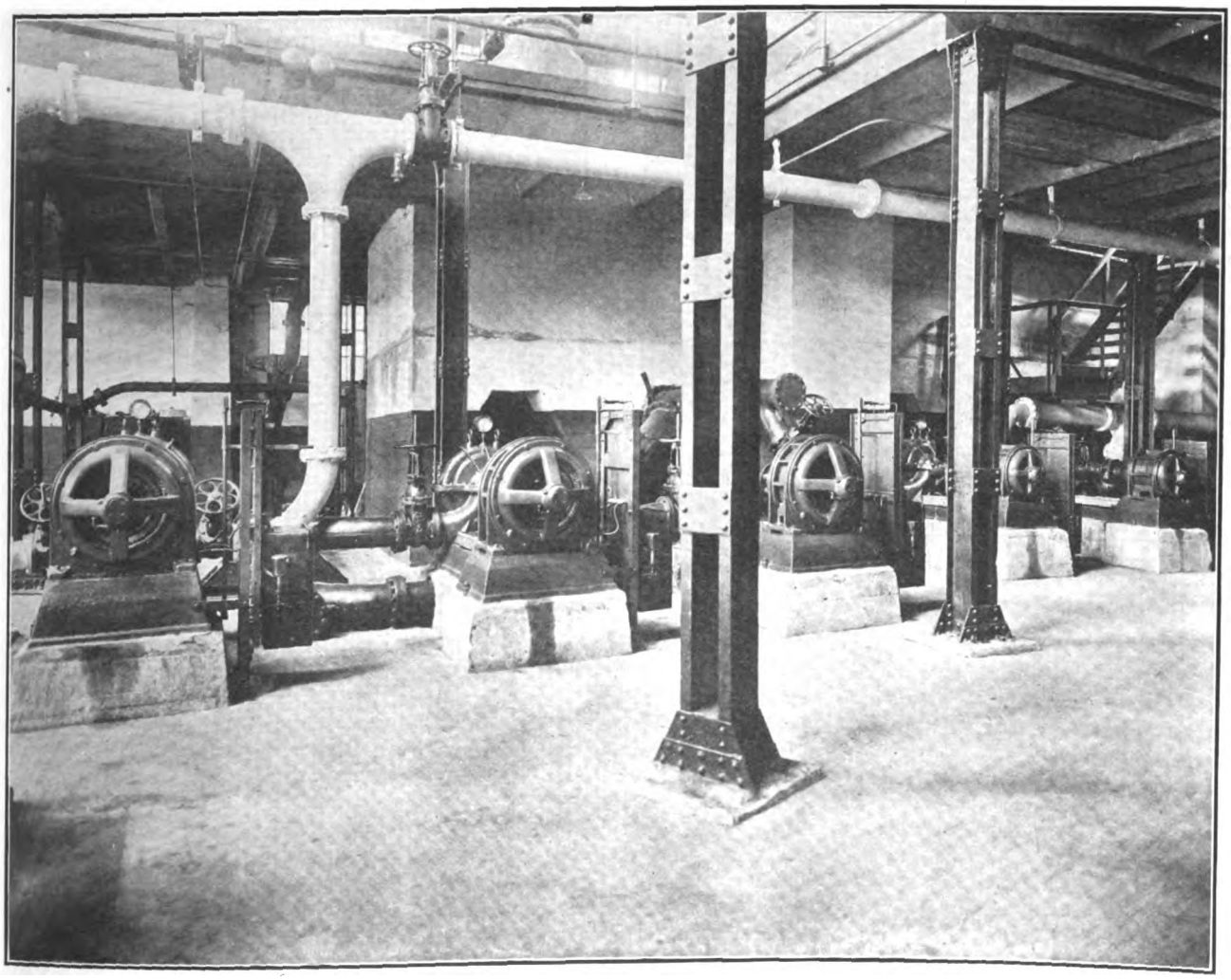


Fig. 1. Three Eight-Inch and Two Six-Inch Centrifugal Pumps Driven by 35 and 25-Horsepower Motors Respectively.

The centrifugal pump has long been considered to be a more or less mysterious piece of apparatus and only those actively engaged in its manufacture have given the subject sufficient study to remove its veil of mystery. The commercial adoption of this pump has probably been held back for two reasons: The insufficiency of published information on its characteristics, and the lack of a satisfactory method of drive. The first reason hinges upon the second, in that without a satisfactory method of drive there was no necessity for published information. With the successful operation of steam turbines and electric motors, the question of drive was solved and it is probable that then the use of the centrifugal pump took its impetus. It was not, however, until the central station took seriously to the extension of its power business and began the scientific application of electric motor drive that the centrifugal pump really left the laboratory and power house, and entered the industrial field. This development has gone so far now that it is safe to say that the future adoption of central-station service to pumping business depends almost entirely upon the centrifugal pump. In view of that fact, it behooves the industrial power engineers of the central-station companies to thoroughly familiarize themselves with the characteristics of the pump.

It is, therefore, the object here to discuss the general construction and operation of the pumps; to show their application to various classes of pumping, to bring up the important points to be considered by central-station power engineers

Digitized by Google

before making an installation and at the same time to show its advantages and disadvantages. During the discussion of the various types of pumps and their characteristic features, it will not be the writer's object to advocate the adoption of any particular design, but to give, as far as possible, an unbiased résumé of the study of several text books and manufacturer's publications on the subject. The sources of information on centrifugal pumps are few, and in most cases the subject is presented by some manufacturer whose experience has been along certain lines, and who conscientiously presents his own side of the question. We shall, therefore, strive to look at all sides of questions where a difference of opinion is found and endeavor for ourselves to decide upon the best solution.

The term "centrifugal," when applied to pumps, would seem to indicate all pumps whose action depends upon centrifugal force, or as the dictionary puts it, upon "the force tending to recede from the center of rotation." But certain manufacturers seem to have restricted the use of the term to pumps having certain peculiar features in the design, and to have applied the word "turbine" to pumps having other peculiar features, while in either case the word "centrifugal" would apply equally as well.

In just the same manner in which action of an electric motor is the converse of that of an electric generator, so the action of a water turbine is the converse of that of a centrifugal pump. The reaction water turbine evolved from the early observed fact that when water issues from a vessel there is a reaction on the vessel tending to cause motion in a direction opposite to the jet. Therefore, in the centrifugal pump, when the vessel or impeller, which is filled with water, is revolved there is a reaction on the water tending to cause motion in a direction opposite to that of the impeller. In case of either the turbine or the pump the wheel passages must be completely filled with water.

The centrifugal pump consists of a revolving part, called the impeller, or rotor, revolving in a casing so designed as to direct the path of the water. The impeller consists of a hub on which are fastened blades or vanes curved from the hub in the form of a spiral. The object of the shape is to give the water such a path through the impeller, that its flow will not be marked by eddies or sharp changes in direction of flow. The entire success of every centrifugal pump depends upon the shape of this path of water through the pump and the pump that has the smoothest path of flow, both through the impeller and through the casing, will be the pump with the highest efficiency.

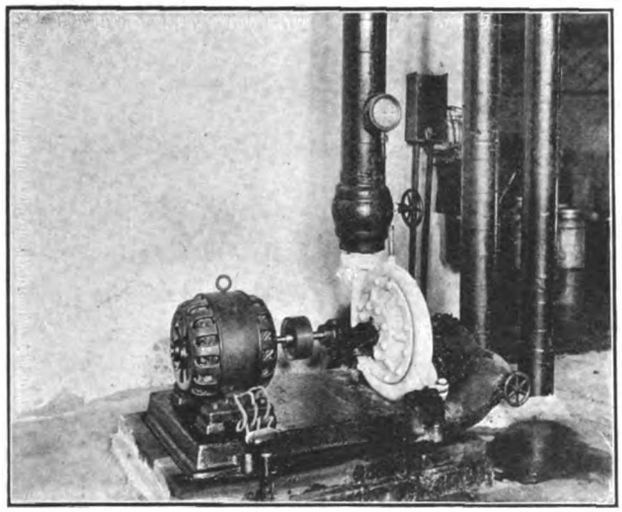


Fig. 2. Small Volute Brine-Circulating Pump in Ice-Cream Factory.

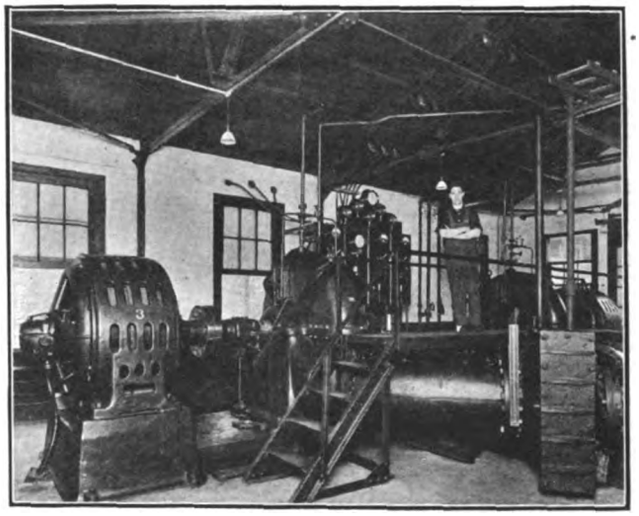


Fig. 3. Two 18-Inch Single-Stage Pumps Driven by 450-Horsepower Motors.

The description just given is applicable to impellers used on all types of centrifugal pumps, so we might say that the determining factor in the different styles of pumps is found in the different shapes of casing used. As stated, the path of the water through the entire pump must be free from shocks. Therefore, the general shape of the suction and discharge openings and the casing itself must conform to the theory of the design. In order that no head may be lost due to shocks and abrupt changes in velocity, use is made of two different designs. In the one a whirlpool chamber or volute casing is used and in the other stationary or movable diffusion vanes. In either case the object is the same; to divert the water smoothly from the impeller into the discharge openings. These whirlpool chambers or vanes are usually in the form of an archimedian spiral.

The pumping conditions applicable to centrifugal pumps may be divided into two general classes, low-lifting duty and high-lifting duty. Until recently the centrifugal pump has not been very satisfactory for high-lift work, on account of poor design. Prior to 1901 the pump was considered to be limited to low-head work, but, at that time, the experiments of certain manufacturers proved that it was applicable to very high heads and, at the same time, capable of operating at as equally high efficiencies as at low heads.

The style of pump used for low-lift pumping is of the single-stage volute type. This type of pump is not adapted to very high speeds on account of difficulties in the design of the impellers. The head at which a pump will operate is dependent upon the peripheral speed of the impeller. Therefore, if the pump is to operate against a low head, it must have either a low speed, or a small impeller at high speed. In using a small impeller the designers have found difficulties in the construction of the impeller vanes. Special high-speed pumps to handle this class of work have been designed and are called screw or propeller pumps. The design and general construction of these pumps will be described later.

For high-lift pumping two different designs have been worked out both employing the use of multi-stage pumps. These two pumps are spoken of as high-lift centrifugal pumps and high-lift turbine pumps. In the latter the volute casing has been done away with and a system of vanes employed making the pump resemble a turbine, and hence its name. By a multi-stage pump is meant a pump having a succession of rotors connected in series, each rotor raising the pressure of the water by a certain amount. The same work can be done by using several separate pumps in series and many successful installations have been worked out this way. The parallel of this in the electrical industry is the employment of two or more direct-current generators in series to raise the voltage or pressure on the system.

As stated above, the single-stage, volute

Digitized by Google

pump is applicable to low heads only. There seems to be some difference of opinion in regard to the maximum head on which these pumps should be used, but as a general rule they can be applied to heads from 0 to 150 feet. Since these pumps are particularly well adapted to low heads and large volumes of water, they find their best application in irrigation, drainage, reclamation, water-works where lift is not high, pumping for filter beds, sewerage and dock work and general water service under low heads. The amount of water that can be handled is almost unlimited.

Several installations have been made which handle 130,000 gallons per minute. These pumps have discharge pipes as large as 72 inches in diameter. In one large installation there are two 66-inch pumps of the following capacities: 100,000 gallons per minute, head 8.5 feet, 100 revolutions per minute, efficiency 75 per cent; 175,000 gallons per minute, head 20 feet, 150 revolutions per minute, efficiency 85 per cent. For the drainage of the Ferrarese marshes pumps have been installed moving 2,000 tons or almost 500,000 gallons per minute. For the drainage of marshes in Barbados pumps have been installed with impellers 15 feet in diameter and with whirlpool chambers 32 feet in diameter. In the Lake Superior Paper Company's new plant there are two volute pumps, each handling 6,000,000 gallons of pulp per day. These are the largest pulp pumps in existence.

High-lift pumps are, as stated above, divided into two classes: high-lift centrifugal pumps and high-lift turbine pumps. The only difference between these two types is that the former has no diffusion vanes, while the latter has. Both of these types employ the use of multi-stages. The high-lift centrifugal pump is merely a succession of volute pumps in series, with the volute casing only on the last stage, while in the turbine pump, the diffusion vanes are used in each stage. There is a difference of opinion among manufacturers in regard to the use of diffusion vanes on multi-stage pumps. Until recently practically all high-lift pumps were equipped with stationary diffusion vanes, but now there seems to be a tendency to build pumps without them. The whole question resolves itself into one of efficiency. In regard to the question, one writer, in the preface to his book, states that pumps without diffusion vanes will not be considered, since their effiicency is below what can be obtained with vanes. The basis of this argument was that with the continued use of centrifugal pumps there would follow a demand for higher efficiency, and that this demand can only be met by using diffusion vanes. It must be remembered that diffusion vanes are stationary guides, similar to the vanes in the impeller, placed in the casing to direct the path of the water as it leaves the tips of the impeller. The shape or curvature given these vanes is, of course, dependent upon the velocity of the water leaving the impeller. It would naturally follow that where the velocity of the water is changed the effect produced by the vanes would be entirely different. For this reason certain pump manufacturers have discarded the use of vanes and have turned their attention to the volute-shaped casing, claiming that the results obtained tend to improve efficiency. There is no doubt about the fact that a pump fitted with vanes is more difficult to construct and is therefore more expensive, but for a certain specified head and velocity they should give the higher efficiency. However, with the increasing use of centrifugal pumps a more wide use of variable speed will result and the pump with the flatter efficiency curve over wide ranges in speed will be desirable. We might say, then, that for absolutely constant speed the turbine pump will be the more efficient, but for variable speed the pump without fixed guide vanes will be desirable.

In standard high-lift pumps the head per stage varies, depending upon the amount of liquid handled. Good practice seems to place the head per stage between 100 and 150 feet. The limiting factors in head per stage are friction losses due to high velocity with a small number of stages and the deterioration of the vanes and the impeller and diffusion tips due to contact with water.

Among the many applications of multi-stage pumps are found, lifting water out deep mines, water for hydraulic elevators, fire-pump service, hydraulic mining, water works having high heads and large power-station work.

As stated under the head of low-lift pumps, the volute pump is essentially a slow-speed pump. To handle large quantities of water against low heads with high speeds, two types of pumps have been designed; screw, or propeller pumps, and multi-rotor pumps.

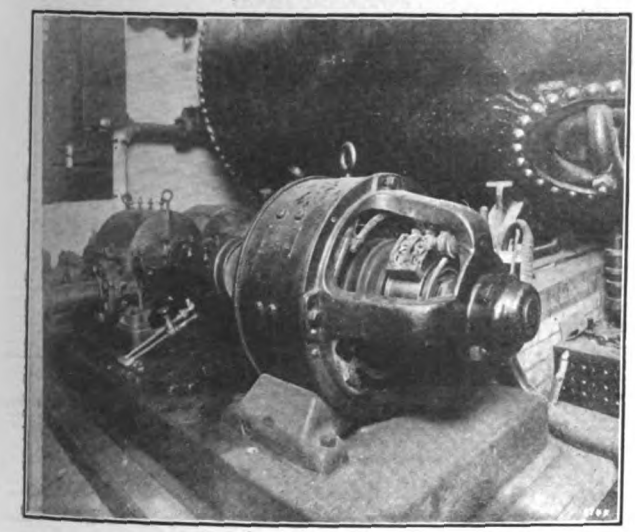


Fig. 4. Small Turbine Pump Used on Hydraulic Elevator System.

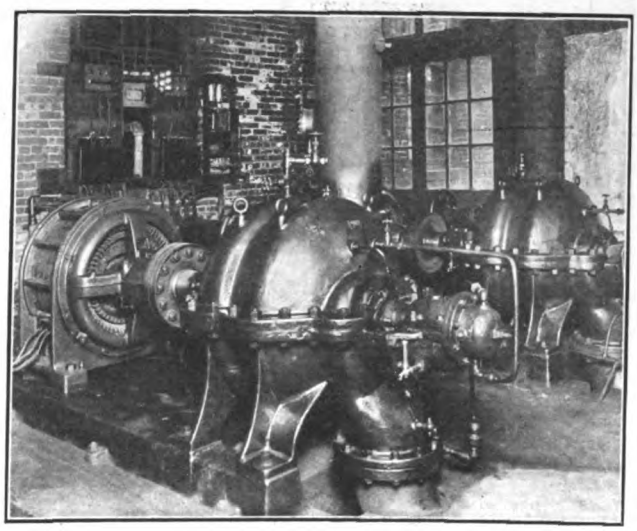


Fig. 5. Two 12-Inch Volute Pumps Driven by 150-Horsepower Motors.

The screw, or propeller pump is really not a centrifugal pump, so little discussion will be given to it. In a few words, it consists of a screw or propeller similar to the disk fan. "The water flows axially into the propeller, is given a radial motion and is discharged axially into a vortex or volute chamber. In the centrifugal pump the liquid flows in a radial direction through the impeller and obtains its energy through the difference in circumferential speed at the inlet and outlet of the impeller." In a screw propeller pump the liquid flows axially, with no increase in circumferential speed, and obtains its energy through impulses from the propeller. After leaving the propeller the water can be guided to the discharge pipes by vanes or by a volute casing.

The multi-rotor pump merely consists of a pump made up of more than one impeller, of the standard centrifugal pump, operating in multiple in one casing. On entering the casing the water divides, part going through each impeller and coming together again at the discharge

Digitized by Google

end. This pump does the work of two or more single-stage pumps, operating in multiple.

The most common condition under which a centrifugal pump operates is, in all probability, constant speed. In all probability, practically 90 per cent of the pumps installed are designed to operate at a constant speed, with very little variation in head worked against and volume delivered. In considering the pump under these conditions, reference will be made to Figs. 6 and 7. Here we have the general operating characteristics of centrifugal pumps, all factors being expressed in per cent of normal. We are more or less familiar with the general shape of these curves, but there are several points of interest to be noted. Both sets of curves show the general laws of centrifugal pumps; that the capacity or volume delivered is in inverse proportion to the head worked aaginst; that as the head increases, the capacity and horsepower required decreases (in this condition consider the contrast with the reciprocating pump), and that unless the driving power is sufficiently large there is a possibility of overloading the motor when the head gets below normal. In this connection it should be noted that recent designs in pumps have almost made this condition impossible when the pump is driven by a driver of liberal design. In Fig. 6 the maximum rise in brake horsepower is only five per cent above normal, and this occurs with a 35 per cent increase in capacity, with a 50 per cent drop in head. This design is very desirable where there is a probability of the pump "losing its head." In Fig. 7 the maximum rise in brake horsepower is 27 per cent above normal, with a 50 per cent increase in capacity and a 50 per cent decrease in head.

These two sets of curves show two different designs of pumps, one with the drooping characteristic head-capacity curve, Fig. 6, and one with the rising characteristic head-capacity curve, Fig. 7. For varying head work the pump should naturally have the drooping characteristic so as to give a high efficiency over as large a range of head as possible. For service where a variation in capacity is desirable the pump with the rising characteristic would have an advantage of obtaining this variation with very little change in head and efficiency.

We have seen that with a certain speed and a fixed head the pump can deliver only a fixed amount of water. Now, suppose, having assumed a condition of constant speed, we should desire to decrease the amount of water delivered. To accomplish this we must increase the head worked against, by throttling the discharge. This operation, however, is not conducive to economy, since throttling causes shocks and eddies in the pump casing, which results in decreased efficiency.

In this connection the likeness of the centrifugal pump to the water turbine has suggested a possible way of varying the volume delivered at constant speed; that is, by the use of adjustable guide vanes around the impeller. The vanes would vary the cross section of the guide channels, thus throttling the water, and change the direction of flow, thus keeping up a relatively high efficiency. This has not been practical on high-pressure pumps because the cross sections are small and the movable vanes would be difficult to install. One writer says the following: "The only reason why they have not been adopted on low-head pumps (where the channels are sufficiently large) is on account of the greater cost of construction. Commercially it is difficult to have a costly pump competing with cheaper types, even if the former possesses some advantages, and especially when guaranteed efficiencies at normal load are the same. But with the constantly increasing use of centrifugal pumps there will be many demands for a high efficiency. Should such high efficiency be demanded with varying quantities of water, adjustable guide vanes must come into use in spite of the higher costs. This applies more especially to low-pressure pumps."

The most economical way to vary the amount of discharge from a centrifugal pump is to vary its speed. This method is used in all installations of good design where such variation is possible. In Fig. 8 is seen the effect of this change in speed. This illustration shows how the efficiency curve is flattened out. Fig. 9 shows the head-capacity curves for five different speeds of a volute pump with interposed efficiency curves. The efficiency curves are drawn by connecting together the points of equal efficiency at different speeds and show what a large range in capacity can be obtained with good efficiency. It, therefore, follows that where variable capacity is desirable, it can only be accomplished efficiently by varying the speed. However, care should be exercised in the selection of the size of motor to be used on the pump since there is a great danger of overloading the motor as the speed is increased. In Fig. 8 it should be noted that the dotted brake-horsepower curve rises very rapidly.

Some one has made the following statements about centrifugal pumps and it would be well to remember them:

"With constant head the capacity will vary as the square of the speed.

"With constant speed the capacity will vary inversely as the square of the head.

"The head is proportional to the square of the speed, the volume being proportional to the speed."

These statements are theoretically true, but if they are remembered a large amount of trouble can be eliminated in

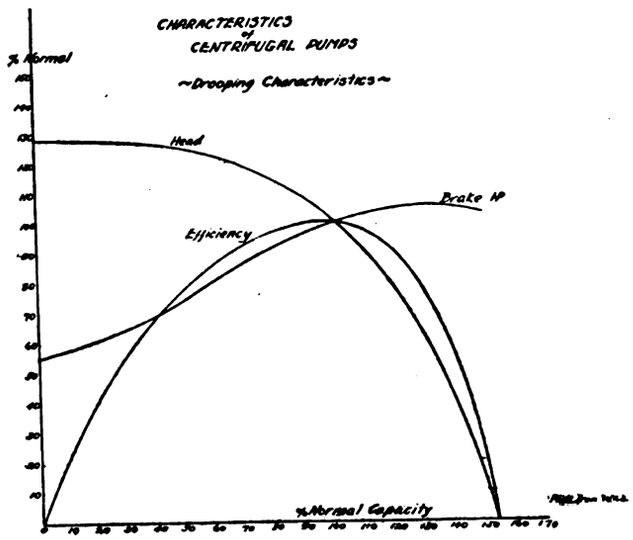


Fig. 6. Drooping Characteristics of Centrifugal Pumps.

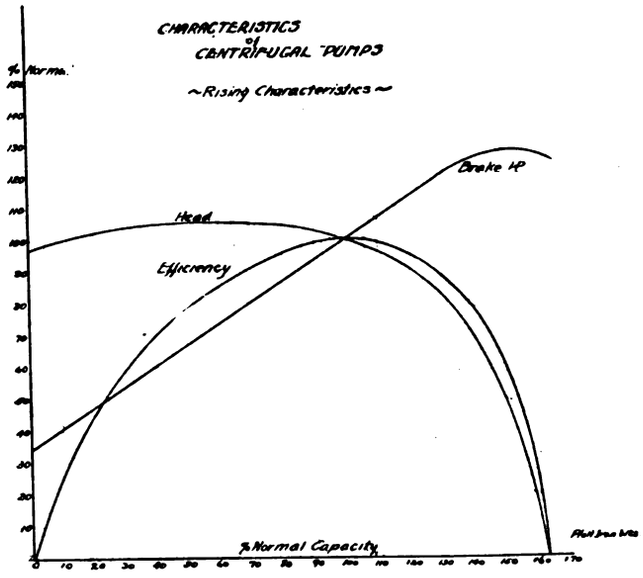


Fig. 7. Rising Characteristics of Centrifugal Pumps.

Digitized by Google

connection with the working out of centrifugal-pump problems.

In studying centrifugal pumps from the standpoint of the central station the following points should be considered:

First, the careful determination of the head to be worked against; second, the priming conditions; third, the design and efficiency of the pump; fourth, the selection of the driving motor.

The head on centrifugal pumps is made up as follows: Suction lift, discharge head, friction head and the velocity head. The suction lift is the vertical distance from level of water to be pumped to the center line of the pump, as illustrated in Fig. 10. The discharge head is the vertical distance from the center line of the pump to the level to which the water is to be elevated. To determine this very accurately where the pumping is now being done by another type of pump, it is best to place a pressure gauge on the discharge from the pump and convert the pressure reading to feet elevation. The friction head can be determined from tables giving losses in pipe lines, and elbows for different sizes and capacities. The velocity head is dependent upon the velocity of the water and can be accurately calculated. It is very important that all of these factors be calculated as accurately as possible or the pump will not be suitable for the operating conditions and will operate at a low efficiency.

One of the primary considerations in a centrifugal pump is that its water passage must be completely filled before it will operate. Therefore, before starting up the pump it must be primed. This is therefore a prerequisite to its operation. The simplest and safest way to insure priming is to place the pump in such a position that it will be primed at all times, by placing it a few feet below the level of the water to be pumped. Although the pumps will operate under a suction lift, yet it is always best to have the water flow to the pump. This condition is almost essential where the liquid to be pumped has a vapor, such as drains in boiler rooms to be handled by a sump pump. In this case a vertical submerged pump would be the most satisfactory.

In some cases the pump cannot be placed below the level of the water and must therefore have a suction lift. This lift should be made as small as possible and the lower end of the suction pipe should be submerged almost to the bottom of the tank, and a foot valve placed on it. This valve will prevent a backward flow of water into the tank when the pump is shut down, and if it is kept in good condition, the pump will always remain primed.

Where neither of the above conditions can be met there are several other methods that can be used, which we might call artificial methods. A small hand pump can be used to get sufficient water to fill the passages of the centrifugal pump, an injector can be used, or a small tank can be placed above the pump with capacity enough to fill the pump passages. Of course, any method that requires the least amount of labor will give the best results and every installation should be studied carefully under the first condition of priming.

The design and efficiency of the pump and the selection of the driving motor can best be discussed under one head, since the latter is in a way dependent upon the former. As we have seen, the highest efficiency is attained at high speed. This is also true of electric motors. Therefore, the combination of the two by direct connection would result in the most economical drive. Care should be taken in the question of speed. In many cases the variation in speed of the alternating-current motor due to a change in frequency should be considered. Where an accurate determination of the capacity to be delivered and the head to be worked against is essential, the slip of the motor and the change in speed due to frequency must be noted. A 10 per cent variation in speed one way or the other from that at which the pump is designed to operate will make a large variation in the work the pump will do. The speed regulation of the direct-current motor is also of importance, but not as essential as in the alternating-current motor. If a slight error in the calculation has been made the speed of the standard direct-current motor can be very easily changed to suit the conditions by the use of resistance, but with the squirrel-cage alternating-current motor this is not possible. Fig. 9 illustrates the effect a 10 per cent speed range can have on the pump. Suppose the pump to be designed for operation at 1,000 revolutions per minute against a head of 95 feet, delivering 1,100 gallons per minute. At a 10 per cent drop in speed the pump would stop delivering, since the maximum head at 900 revolutions per minute is only 86 feet, and then delivering only 500 gallons per minute. A 10 per cent increase in speed would cause the pump to deliver about 1,570 gallons per minute. The brake-horsepower curve of the pump should be noted and a motor chosen of sufficient size to be able to take care of the load in case of a break in the discharge line. The present design of pumps practically eliminates the possibility of any trouble from this source, but it would be well to ascertain the power required by the pump at zero head.

Besides the points discussed above there are several others that will come up during the consideration of a particular problem. These points are confined solely to the construction of the pump and will

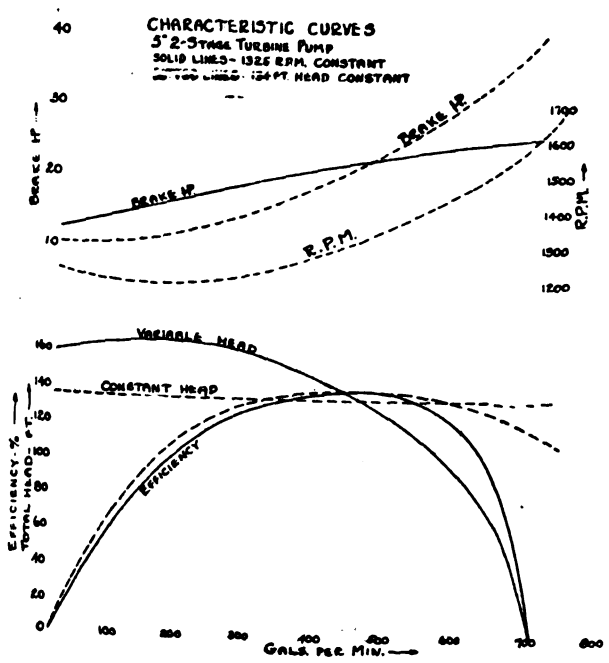


Fig. 8. Characteristic Curves of Five-Inch Pump.

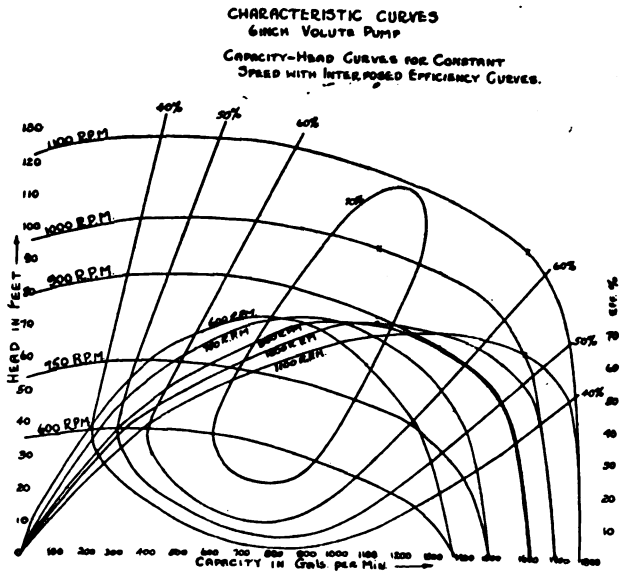

CHARACTERISTIC CURVES
6 INCH VOLUTE PUMP
CAPACITY-HEAD CURVES FOR CONSTANT SPEED WITH INTERPOSED EFFICIENCY CURVES.
HEAD IN FEET
CAPACITY IN Gals. PER MIN.

Fig. 9. Characteristic Curves of Six-Inch Pump.

Digitized by Google

make themselves known under actual operation. They cover such facts as open and inclosed impellers, solid or horizontally split casings, materials used in parts in contact with water and the method of drive.

In regard to open or inclosed impellers, where a high efficiency is desired there is no need for hesitation, for the inclosed impeller must necessarily be used. With the open impeller there is a considerable loss through leakage from the side of the vanes which greatly reduces the efficiency of the pump. The pump equipped with the open impeller is, of course, the cheaper proposition, but it is a question as to whether this type of impeller should be used under any circumstances.

The decision in regard to solid or horizontally split casings is of somewhat the same character as the one just mentioned, concerning the impellers. Where the pump has a solid casing, it can be easily seen that in order to do any repair work on the impeller the whole pump must be taken apart and the suction and discharge pipes removed. In the other pump the casing is split horizontally and all moving parts, together with the suction and discharge openings are in the lower half. In order to repair the pump the upper casing only is removed and the impeller can be lifted out without disturbing any of the permanent connections.

For ordinary water service the impeller should be made of bronze, and the interior of the casing and the shaft where it comes in contact with the water should be bronze covered. This does away with all trouble due to corrosion. For handling brine in refrigerating plants, some pump manufacturers furnish iron parts and some furnish bronze parts.

In regard to the type of drive the pump may be belted or direct-connected to its source of power. Of course, direct-connection is the more satisfactory and where this is adopted, some form of flexible coupling should be used.

Since the centrifugal pump is best adapted to electric motor drive, there would be cases where its advantages could be named among the advantages of motor drive. If a large pumping plant was under consideration the possibility of the central station getting the business would depend, besides upon the advantages of saving that could be shown by the use of motors, upon the points that could be brought up in favor of the centrifugal pump, since were the reciprocating pump decided upon, steam would be the source of power. We might say then, that in many cases advantages in favor of the centrifugal pump would be advantages in favor of motor drive.

The more important advantages of the centrifugal pump when compared to the reciprocating type are simple in construction, absence of valves, large water passages, low first cost, and furnishes water stream without shock.

The first three advantages named will have their greatest effect after several years of service. With the reciprocating pump there is always a falling off in efficiency after a few years of operation. Due to the fact that wear of valves and pistons is always present in reciprocating pumps, there is always a great amount of slippage present. The centrifugal pump will continue to operate at an efficiency practically equal to that found at the time of its installation. Although this initial efficiency may not be as high as that found in reciprocating pumps, yet when slippage and wear of valves is taken into consideration, and the cost of maintenance included the advantage will be on the side of the centrifugal pump.

The great adaptability to motor drive by direct connection renders it possible to place the pump directly where the pumping is needed, without the losses incident to long lines of steam piping in cases where the boiler is at some distant point.

The pump offers another advantage in the ease by which it can be automatically controlled when motor driven. Practically no power is required to start the pump.

The reciprocating pump with its piston motion produces a pulsating pressure in the discharge lines. On account of this fact, air chambers and relief valves are always necessary to relieve the pipe lines from sudden fluctuations in pressure, where this type of pump is used. The centrifugal pump delivers a steady stream of liquid at a constant pressure, free from any tendencies to cause shocks and water hammers. In many instances this fact will be found to result in a great advantage in favor of the pump in question.

In city pumping stations where the available space is small the centrifugal pump would be the only satisfactory solution. Where such installations could be driven from central-station power, the investment for boilers and other auxiliary equipment would be eliminated. The building, under these conditions, could be smaller and the necessary attendance reduced at least one-half.

We can therefore feel that, with its many advantages, with the continued increase in efficiency and with the more widespread knowledge of its characteristics the centrifugal pump will be free from its bondage of mystery, and will float on steadily through the industrial field, driven by electric motors, consuming their share of central-station electric power.

In the preparation of this article reference has been made and credit hereby given to "Centrifugal Pumping Machinery," by Carl De Laval, "Centrifugal Pumps, Their Design and Construction," by Loewenstein and Crissey, and publications of the De Laval Steam Turbine Company, Platt Iron Works and Alberger Pump & Condenser Company.

Dayton Power and Light Company Picnic.

The seventh annual picnic of the employees of the Dayton Power and Light Company was held at Kil Kare Park, about 12 miles from Dayton, on Tuesday, June 22, 1915.

The picnickers went to the park in the traction cars of the Dayton, Springfield & Xenia Southern Traction Company, which is operated with current from the Dayton Power and Light Company.

In the morning a baseball game was played between the different office departments and the outside departments, which resulted in a victory for the outside departments, and they became the possessors, for the first year, of the "F. M. Tait Cup," which was donated by Mr. Tait for annual competition in baseball between these two divisions of the company.

Following the dinner, the annual photograph of the company was taken, in which appeared 768 people, made up of the employees and their families. It is interesting to note here that in 1914 approximately 525 attended the picnic —which goes to show the growth of the company during the past year.

Following the taking of the photograph, John Himes, head of the meter department, on behalf of all of the employees, presented to Mr. Tait, president and general manager of the company, a solid gold watch, on the eve of his leaving Dayton to take up his residence in New York City.

The afternoon was given over to athletic events of all descriptions, such as indoor baseball, volley ball, foot polo, three-legged race, sack race, hand-line throwing, tug-of-war, potato race, quoits, tennis, boating and bathing. All of these events were keenly contested for, not only for individual prizes, but for points to determine the possessors of the "Young Cup," which was donated by the late A. M. Young, for annual competition between the different company departments in athletic events.

The cup this year will be in the possession of the maintenance and construction department, and the Sterling silver medal, given to the best all-around athlete on the grounds, was presented to Richard Pflaum, of the maintenance and construction department.

Following the evening meal the different prizes were presented to the winners and the evening was spent in dancing.

The athletic committee was composed of M. H. Wagner, chairman; Miss Hughes, C. P. Garman, R. R. Herkins, O. E. Howland, O. B. Reemelin, F. B. Steele, R. L. Stewart and H. Thompson.

Digitized by Google

Commercial Practice
Management, Rates, New Business

THE ELECTRIC-FURNACE LOAD AS A CENTRAL-STATION POSSIBILITY.

Details of a California Installation.

Those who have made a careful study of the trend of central-station activities predict that industrial electric heating will ultimately develop into a most important field for new business. Already notable progress has been made as is evidenced by the contract recently secured by the Toledo Railways & Light Company from the Willys-Overland Company, calling for an installation of 6,000 kilowatts in enameling ovens. The success of this installation, from every standpoint, opens up unlimited possibilities in the automobile industry alone, and important research work is being carried on by central stations in the automobile producing centers, with a view to the general introduction of electric heating.

The electric furnace, particularly, offers an interesting study and gives promise of a wide field of usefulness. At the recent convention of the National Electric Light Association at San Francisco, W. M. McKnight presented the following data on an interesting furnace installation in California.

In the advancement of the application of electrical energy to new purposes the electrical furnace offers an interesting study and gives promise of a wide field of usefulness. Late installations show a marked improvement over the somewhat crude devices of earlier periods, demonstrating high efficiency and merit.

The Warman Steel Casting Company of Redondo, Cal., originally used Milwaukee-type crucible furnaces and California crude oil. Crucibles were limited to units of 150-pound capacity and there was uncertainty as to whether large castings could be poured successfully. The total output of the foundry was three tons per day. The high cost of crucibles on the Pacific Coast, their short life and the labor expense in handling them was a serious factor in establishing the success of the undertaking.

In November, 1913, an electric furnace was installed. This was the first Stassano arc furnace used in the United States, and it has been operated continuously from that time, except at intervals necessary for relining. Its capacity is one ton and six heats can be run daily. Deducting for loss of time in relining, there are 24 full operating days per month at 24 hours per day.

The furnace is lined with magnesite brick, which is such a good heat insulator that even an interruption of four hours will not cause the molten metal to chill and crystallize, with the consequent loss of a furnace lining. It requires two days for the relining, three times a month, and the best magnesite bricks are used. The cost of relining is $225, including labor and material, no cement being used between bricks, as they are of such shape as to leave practically no crevices.

Steel castings ranging from the smallest to 1,600 pounds are being founded and sold for from 20 cents per pound to 6 cents per pound, according to size. At present automobile fittings, gears, propellers, rocker arms, water-wheel buckets, and such castings as must be relied upon for the greatest strength are being founded.

The distinguishing feature of this furnace is that fusion is by radiant heat from an electric arc from 2 to 3 inches above the metal and approximately 24 inches from the roof of the furnace, in a closed chamber with neutral atmosphere for the chemical reactions which take place in the process of refining. This permits of closer accuracy and thoroughness in making castings according to specifications. The furnace combines the well-known features of a completely closed melting chamber, the arrangement of a three-phase electric arc above the metal preventing the carbon and other electrode impurities from entering the metal and allows a thorough mixing during any desired length of time. The metal reaches a temperature of approximately 3,600 degrees Fahrenheit, before being poured.

The furnace is suspended on trunnions in a horizontal steel ring, which in turn swings by means of another pair of trunnions, supported in the same plane about 90 degrees around from the first pair, similar to the mounting of a ship's compass.

It is tilted, for the purpose of skimming the slag and pouring the metal, by means of a geared connection on the bottom, controlled by a hand wheel. This unique suspension places the furnace attachments above the plane of the trunnions. The three electrodes dip toward the center of the furnace at an angle of about 15 degrees, converging to a point from 2 to 3 inches above the metal. The average arc is about 10 inches, although at times an 18-inch arc is drawn.

While the original furnace was closed at the top, the Warman Company has altered it so that the roof is removable, and additional furnaces to be installed shortly will embody this improvement.

The carbon electrodes are 3.5 inches in diameter and 6 feet long and burn down to stubs about 18 inches long. The electrodes enter the furnace through a water jacket and are fed individually by hydraulic pressure regulated from control valves at an operator's stand. The consumption of water from the city main is almost nil, amounting to about $3 per month, the water being circulated by a two-horsepower motor-driven pump through a cooling tower to a tank, which supplies the water jackets and the hydraulic control under a head of 20 feet.

The current consumption of the furnace is from 800 to 2,000 amperes per terminal on a three-phase 150-volt circuit. Current is supplied through flexible cables connected to a marble switch panel supporting three single-pole double-throw and one three-pole double-throw knife switches of heavy construction, connecting transformer secondaries in either inter-connected star or delta, at pressure of 150 volts and 100 volts, respectively, with the furnace. Standard indicating instruments are in use. To keep the balance, a ground connection is tapped through an oil switch and overload release, to the middle point of the Y on the main circuit.

Heavy copper busbars lead from the switches to the secondary terminals of three 100-kilovolt-ampere transformers which are specially designed, oil-cooled and wound for 10,000 volts primary and 110 to 150 volts secondary.

The entire consumption for the installation is registered by a primary meter, which together with the transformers is placed in a galvanized-iron substation and controlled by a 10,000-

Digitized by Google

volt Kelman oil switch with overload trip coils. The 10,000-volt service to the plant is protected at the pole by a fused pole-top switch operated from the ground. The plant is served from a double circuit 10,000-volt transmission line one-quarter mile distant. Provision is made, in case of emergency, to connect to either transmission line circuit through a pole-top switch. The double transmission line is fed from two nearby substations, each having an approximate capacity of 2,000 kilowatts. These substations are supplied from the Southern California Edison Company's 10,000-volt and 33,000-volt transmission lines.

Heretofore scrap steel has been a drug on the market in Southern California, the majority of it being shipped East, and this industry has the advantage at present of an unlimited supply of the best scrap steel, at from $7 to $10 per ton.

Aside from steel, ferro-silicon, ferro-manganese and anthracite coal having 90 per cent of fixed carbon, are ingredients necessary to the finished product.

There is very little variation in load from day to day, the average demand being about 225 kilowatts. The fluctuation of the load, which is non-inductive, scarcely affects the regulation of the 10,000-volt line.

Electrical experts, and particularly those engaged in the commercial branches of the business, believe that this installation has established the value and merit of the electric furnace and placed it beyond the experimental stages, and that it must now be regarded as one of the great current-consuming commodities.

Boston Edison Company Employees' Outing.

The annual field day for the employees of the Edison Electric Illuminating Company of Boston was held June 26, at the Riverside Recreation Grounds, 4,500 attending.

The program consisted of 40 sporting events, with prizes for all winners. There was a tennis match between the Boston Y. M. C. A. and Edison tournament winners; a baseball game between the Boston Woven Hose & Rubber Company team and the Edisons; track events and joke sports. Throughout the day two clowns moved about among the crowd, producing great merriment. The Waltham Watch Company band played all day. Luncheon was served to all at the noon hour.

The occasion was in charge of the Welfare Bureau, of which H. W. Moses is the head. Assisting him were W. H. Carrasco, J. J. Buckley, O. B. Landon, C. E. Greenwood, G. H. Atwood, T. Collins, J. W. Emmons, G. M. Guilford and Dr. W. T. Bailey.

SUCCESSFUL COMMERCIAL MANAGERS.

Clare N. Stannard.

Denver, "The City of Lights," is so termed because of its extensive street, sign and decorative lighting and because the number of lamps so used, per capita, is not exceeded in any city in the country. However, the lighting is but one manifestation of the degree of electrical development in Denver, although to the layman the most effective.

Aside from its somewhat remarkable record of business secured during the past 15 years, the Denver Gas & Electric Light Company is known throughout the industry for its progressiveness,

C. N. Stannard.

particularly in regard to its commercial policies and its relations with the public.

It is a tribute to the ability of Clare N. Stannard, secretary and commercial manager of the company, that considerable of this development dates from the time of his assumption of the duties of commercial manager of the company.

Mr. Stannard entered the gas and electric business in 1890 with the Binghamton Gas & Electric Company, of Binghamton, N. Y., taking a cadet course with that company covering a number of years, working in all departments of the gas, electrical and street railway divisions, thus securing information first hand in the operating, manufacturing, distributing and office departments. In 1897 he entered the employ of the Denver City Tramway Company in the auditing department, the following year accepting a position with the Denver Consolidated Electric Company. In the year 1899 a consolidation occurred between the Denver Consolidated Electric and the Denver Consolidated Gas Company and the Denver Gas & Electric Company was formed. Mr. Stannard assumed the position of cashier of the new company and shortly thereafter became superintendent of distribution, later on being made commercial manager and secretary of the Denver Gas & Electric Light Company, which position he now holds.

Many noteworthy campaigns for new business have been conducted under the direction of Mr. Stannard and as a result the company has wonderfully increased its revenue. At the time the new-business department was organized 1,500 ranges had been sold. Up to the present time in the neighborhood of 40,000 have been sold. There were no electric irons or other devices in the city at that time and thus far about 40,000 have been sold.

In the matter of signs and decorative flat-rate lighting, Denver is spoken of as the "City of Lights" and on a per capita basis ranks very high, in fact about as high as any city in the United States similarly located.

Equally impressive has been the growth of the power business which is now many times what it was a few years ago.

The company owns and operates 30 electric trucks, maintains an electric-vehicle department and advises with consumers relative to the purchase and operation of electric machines, both passenger and commercial. There is also a large number of passenger machines in operation in the city and the company has developed a splendid revenue from charging both classes of vehicles.

Recently a spring appliance campaign was completed resulting in a gratifying addition to the company's business.

It is the policy of the Denver Gas & Electric Light Company through its commercial department to co-operate with all classes of consumers, advising with them as to best ways and means of obtaining the desired results with lighting, power, signs, industrial fuel, electric vehicles and other classes of business and this policy originated by Mr. Stannard has had an incalculable influence in furthering friendly relations with the public and substantially increasing the business of the company.

Increase at Minneapolis.

The sales department of the Minneapolis General Electric Company during the week ending June 11, secured contracts for 312 electric customers with 219 kilowatts lighting load and 176 horsepower in motors, and took orders for wiring 39 houses.

Digitized by Google

Timely Window Display of New York Edison Company.

An attractive window display for the week, in which Flag Day occurred, was arranged by the New York Edison Company for its various showrooms in New York City. The display was arranged in two parts, the first being a large painting of Betsy Ross and her assistants making the first American flag. Under this picture was the caption, "One in Many Days." At the opposite side of the window was a motor-driven sewing machine making flags at high speed, and here was displayed the caption "Many in One Day."

Window Display of New York Edison Company.

The Edison Company has adopted a rather unusual method of securing ideas for window displays for special occasions. Announcement is made a few weeks before Decoration Day, Flag Day, the Fourth of July, etc., that a window display contest has been arranged and every one of the 5,000 employees of the company are asked to submit suggestions. For the best suggestion a prize of $10 is awarded, while the suggestions receiving second and third choice are given honorary mention and published in the Company's employees' publication.

Free Service to the Needy.

The Louisville Gas & Electric Company, which last year supplied free fan service to the indigent sick in Louisville at the written request of the attending physician, or any physician, has gone further this summer and is including in the service the use of an electric toaster which is furnished as well as the fan. The conditions are set forth in some 700 letters which have been mailed out to the 700 doctors of Louisville, which contain the following explanation of the toaster proviso:

"Toast well prepared is a necessary article of diet to nearly all invalids. In many cases it is difficult to prepare toast properly and serve it in an appetizing condition with the ordinary cooking facilities. An electric toaster, therefore, will be appreciated in every sickroom, almost as much as an electric fan."

The company makes temporary connections where none exist, though houses which can be served must be located on existing lines of the company.

The element of new-business getting, paradoxical as it might seem, enters into this charitable service, although there is no thought of a profit, other than good will on the part of the company's management. But last summer, having had a taste of electric service, an occasional recipient, when restored to health and earnings again, bought a fan and installed it, and there were several instances of charity cases when the breadwinners got back to work and better times came, becoming subscribers to regular service of the company and having their houses wired.

Special Lighting at Maine Fair.

Noteworthy lighting features for the Maine State Exposition, which opened at Portland June 7, were provided through the Cumberland Power & Light Company of that city.

The exterior of the large exposition building, specially built for the occasion, is illuminated with spectacular floor lighting by means of four projectors of the same type as those used at the Panama-Pacific Exposition and designed by the General Electric Company.

The projectors consist of a polished aluminum parabolic reflector 16 inches in diameter mounted on an iron frame. The front is covered with curved heat-resisting glass clamped to the reflector frame and packed so that the unit can be operated out of doors.

The projectors are each operated with a 500-watt high-efficiency Mazda lamp. The beam may be concentrated to about six degrees divergence, with an apparent candlepower in the center of about 400,000 by locating the filament exactly at the center. By drawing the filament behind the focus, the beam may be spaced to 18 degrees, with an apparent candlepower of 150,000 in the center of beam.

Each projector is mounted about 150 feet from the building and focused at a different angle. The effect is imposing, revealing the simple yet dignified outlines of the building.

Interior lighting is with 750 and 500-watt gas-filled units, in the central area, and 300-watt units of the same type under the galleries.

New Business at Louisville.

The commercial department of the Louisville Gas & Electric Company during the week ending June 11 secured contracts for 131 customers with 82 kilowatts lighting load and 26 horsepower in motors and took orders for wiring 24 already built houses. The city issued 103 electric wiring permits during the week.

Digitized by Google

Electrical Construction

ELECTRICAL CONSTRUCTION IN MACHINE SHOPS AND FOUNDRIES.

By Norman G. Meade.

There are few industrial establishments where the service conditions of the electrical equipment are more severe than in machine shops and foundries, and in the various departments that go to make up a plant of this kind. In the foundry especially, the prevalence of fumes and gases rapidly deteriorates open wiring and accessories. In both machine shops and foundries, traveling cranes, jib cranes and portable machinery are a constant menace to exposed wiring, and conduit work is by far the best investment when depreciation and repairs are considered. In laying out a wiring installation provision should be made for numerous outlets to receive portable-light plugs, connectors for portable motors, etc. As far as practicable, all lighting circuits should be controlled from centers of distribution so that an authorized employee will be responsible for the lighting and extinguishing of all lamps.

Power circuits should, as far as expedient, be run independently of the lighting circuits. For direct-current motor circuits the underwriters require at least 25 per cent greater capacity than the motor calls for, to take care of overloads and starting current. Calculations for wiring are based on the following formula:

$A=P\times746\times22\times1.25L/eE\eta$, in which

A=Area of conductor in circular mils,
P=horsepower,
L=length of one conductor in feet,
E=voltage of circuit,
e=drop in volts,
η=efficiency, which may be taken as 80 per cent.

For alternating-current circuits,

$A=P\times746\times22\times1.5L/eEf\eta$, in which

A=circular mils,
L=length of one conductor in feet,
η=efficiency of motor,
f=power-factor of motor,
E=voltage of circuit,
e=drop in voltage.

This applies to single-phase, to four-wire two-phase and to three-wire three-phase circuits.

The above formula takes into consideration the starting current and overload requirements.

Figs. 1, 2, 3 and 4 give the horsepower requirements for several types of machine tools. These data are based on a large number of tests and excerpts from standard practice and represent fair averages for machines with one cutting tool. Where high-speed tool steel is to be used the power should be increased from 2.5 to 3 times. It will be realized that there

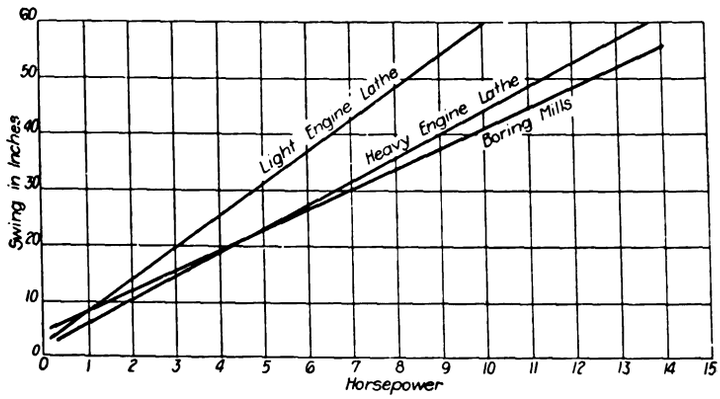


Fig. 1. Horsepower Requirements of Engine Lathes and Boring Mills.

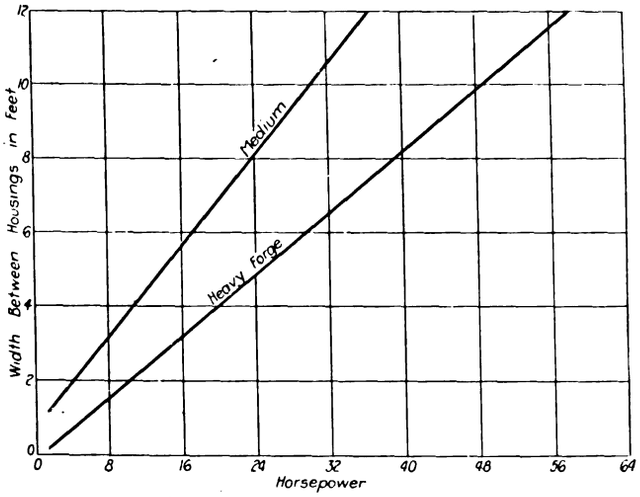


Fig. 2. Horsepower Requirements of Planers.

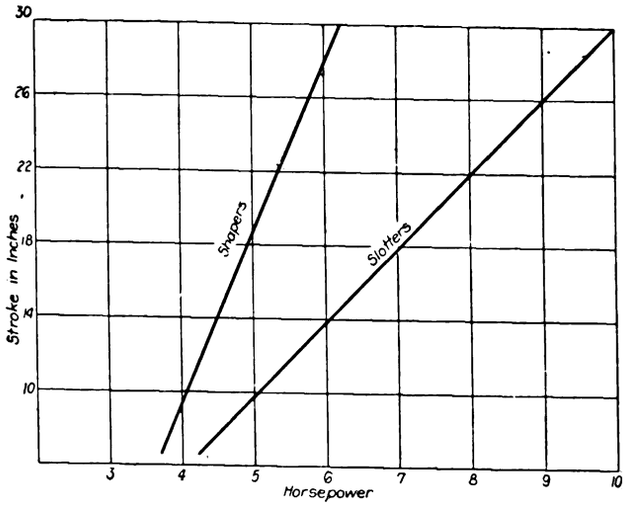


Fig. 3. Horsepower Requirements of Shapers and Slotters.

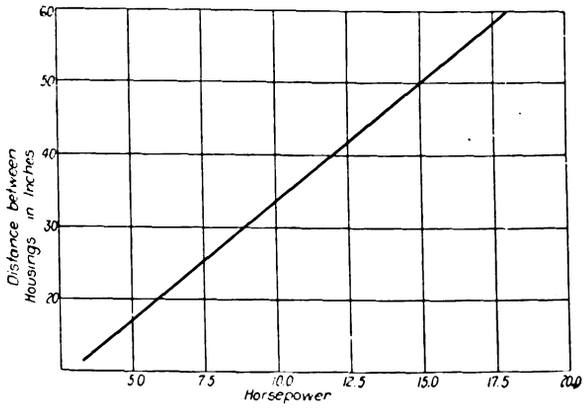


Fig. 4. Horsepower Requirements of Planer-Type Milling Machines.

Digitized by Google

TABLE I.—CUPOLA BLOWERS.

Diameter inside lining, inches.	Capacity per hour, tons.	Pressure per square inch, ounces.	Volume of air, per minute, cubic feet.	Horsepower.
18	0.25-0.5	5-7	150- 300	0.5-1.5
24	1-1.5	7-9	600- 900	2-6
30	2-3.5	8-11	1,200- 2,000	5-15
36	4-5	8-12	2,200- 2,800	10-23
42	5-7	8-13	2,700- 3,700	12-32
48	8-10	8-13	4,000- 5,000	18-45
54	9-12	9-14	4,500- 6,000	22-60
60	12-15	9-14	6,000- 7,500	30-75
66	14-18	9-15	7,000- 9,000	35-90
72	17-21	10-15	8,500-10,500	45-110
78	19-24	10-16	9,500-12,000	52-130
84	21-27	10-16	10,500-13,500	60-150

are so many conditions entering into the operation of machine tools that no exact empirical formulas for the power requirements can be deduced, but the results given in the charts should be close enough for a basis of wiring calculations.

It is beyond the province of this article to enter into a lengthy discussion of the type of equipment to be selected, but in general all machines having a rotary motion and operating at variable speeds should be driven by a direct-current variable-speed motor, preferably an auxiliary-pole type, with variation of speed produced by shunt-field resistance. Reciprocating machines, such as planers, shapers and slotters, should be driven by compound-wound direct-current motors. Types of motors and controllers are now on the market for reversing the motor at each stroke of the machine. Where both direct current and alternating current are available, induction motors are the most satisfactory for group drive and for individual drive of constant-speed machines. There is no doubt that automatic motor starters have a great advantage over manual starters as the human element, other than closing the operating switch, is eliminated.

TABLE II.—ELECTRIC TRAVELING CRANES.

Capacity in Pounds.	Span in Feet.	Hoist Feet per Minute.	Hoist Horsepower.	Bridge Feet per Minute.	Bridge Horsepower.	Trolley Feet per Minute.	Trolley Horsepower.	Total Horsepower.
6,600	26.2	19.7	7	396	7	98	1	15
6,600	39.6	19.7	7	330	7	98	1	15
6,600	53.3	19.7	7	296	7	98	1	15
6,600	66	19.7	7	264	7	98	1	15
6,600	82.5	19.7	7	231	7	98	1	15
11,000	26.2	14.8	7	296	7	98	2	16
11,000	39.6	14.8	7	280	7	98	2	16
11,000	53.3	14.8	7	264	7	98	2	16
11,000	66	14.8	7	248	7	98	2	16
11,000	82.5	14.8	7	231	12	98	2	21
16,500	26.2	14.8	12	280	7	98	2	21
16,500	39.6	14.8	12	264	7	98	2	21
16,500	53.3	14.8	12	264	12	98	2	26
16,500	66	14.8	12	248	12	98	2	26
16,500	82.5	14.8	12	231	12	98	2	26
22,000	26.2	13.2	12	264	7	98	2.5	21.5
22,000	39.6	13.2	12	248	12	98	2.5	26.5
22,000	53.3	13.2	12	248	12	98	2.5	26.5
22,000	66	13.2	12	231	12	98	2.5	26.5
22,000	82.5	13.2	12	214	12	98	2.5	26.5
33,000	26.2	10.7	16	231	12	82.5	3	31
33,000	39.6	10.7	16	231	12	82.5	3	31
33,000	53.3	10.7	16	214	12	82.5	3	31
33,000	66	10.7	16	214	16	82.5	3	35
33,000	82.5	10.7	16	198	16	82.5	3	35
55,000	26.2	9.9	26	214	12	66	5	43
55,000	39.6	9.9	26	214	12	66	5	43
55,000	53.3	9.9	26	198	16	66	5	47
55,000	66	9.9	26	181	16	66	5	47
55,000	82.5	9.9	26	148	16	66	5	47
110,000	26.2	5.75	35	198	26	49.5	12	73
110,000	39.6	5.75	35	181	26	49.5	12	73
110,000	53.3	5.75	35	165	26	49.5	12	73
110,000	66	5.75	35	165	30	49.5	12	77
110,000	82.5	5.75	35	148	30	49.5	12	77
165,000	26.2	3.5	52	165	35	39.8	16	103
165,000	39.6	3.5	52	148	35	39.8	16	103
165,000	53.3	3.5	52	148	52	39.8	16	120
165,000	66	3.5	52	148	52	39.8	16	120
165,000	82.5	3.5	52	115	52	39.8	16	120

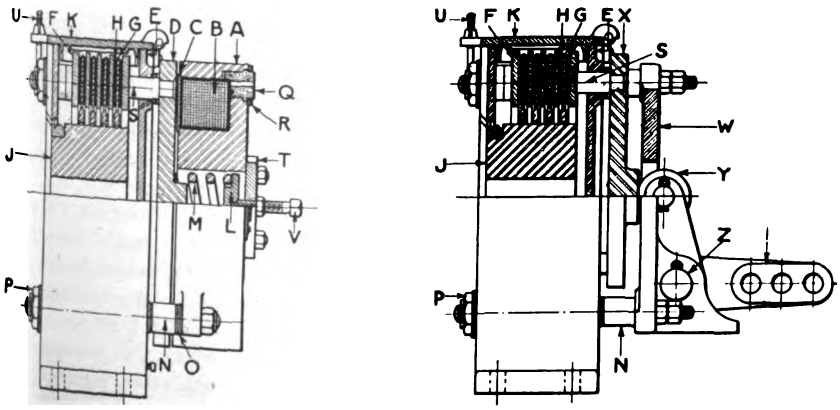


Fig. 5. Diagram of Magnetic Brake.

Horsepower requirements for cupola blowers (Kent) are given in Table I. The same authority gives the following facts about cupolas: "The actual melting range of a cupola is ordinarily between 0.6 and 0.75 ton per hour per square foot of cross-section. The limits of air supply per minute per square foot are roughly 250 to 400 cubic feet. The possible power required varies even more widely, ranging from 1.5 to 3.75 horsepower per ton per hour, for the melting rates specified. The power may be roughly calculated from the theoretical requirement of 0.27 horsepower to deliver 1,000 cubic feet per minute against a one-ounce pressure. The power increases directly with the pressure, and depends only on the efficiency of the blower." Current practice between limits is expressed in the table.

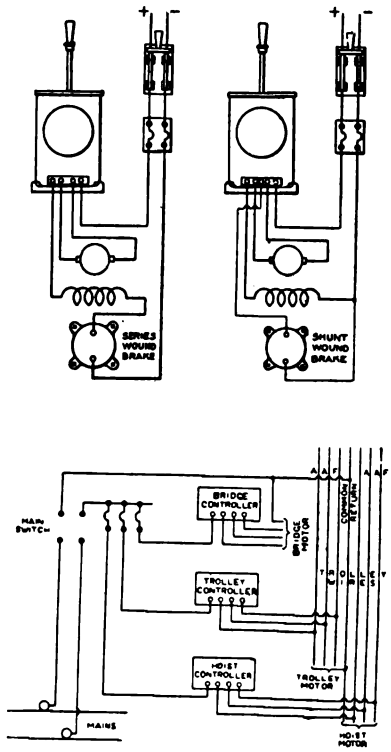


Fig. 6. Magnetic Brake and Controller Connections.

Crane Equipment.

The remarks under this section of the article are really supplementary to the article "Some Safety-First Features of Electrical Construction" which appeared in the Electrical Review and Western Electrician, April 24, 1915. In Fig. 5 the details of a magnetic brake for cranes and some types of machine-tool motors are given. Fig. 6 gives the brake and controller connections and the complete

Digitized by Google

crane connections for the bridge, hoist and trolley motors and controllers. The action of the type of brake shown in Fig. 5 is controlled by an electromagnet which consists of a magnet case, coil and armature plate, and is mounted on the studs which hold the stationary friction plates. The magnet case contains the coil, the spring and the spring cup. Three spuds riveted to the armature pole, extend into the friction case and transmit the pressure of the spring to the friction plates. The magnet is generally proportioned for series connections, but may be shunt-wound when required. When the operating controller is in the off position the magnet of the brake is dead and the pressure of the spring is transmitted through the armature plate and spuds to the friction plates, so that the friction disks and the stationary plates are clamped together and the shaft is held.

For solenoid-operated brakes the selection of the solenoid is important. In any type of electromagnet in which the end of the stroke is definitely limited by the plunger striking the stationary pole, the increase in magnetic pull will be extremely rapid as the plunger approaches the end of its stroke. This accelerates rapidly all the moving parts, and when their motion is suddenly arrested by the plunger striking the stop, a heavy blow is delivered, which is liable in time to loosen bolts and nuts. Some types of magnets are on the market where the travel of the plunger may exceed the end of the coil, and are known as magnetic-cushion magnets. In these the pull increases only in desirable proportion during the stroke of the plunger. Furthermore, the plunger does not encounter a definite, sudden stop, but floats in a condition of easy equilibrium between its magnetic pull and the pull exerted on the brake. Power required to operate different capacities of electric traveling cranes are given in Table II on the preceding page.

ILLINOIS CONTRACTORS MEET AT PEORIA.

Semi-Annual Convention of Illinois Electrical Contractors Held on June 25 and 26.

The semi-annual meeting of the Electrical Contractors' Association of the State of Illinois was held at the Jefferson Hotel, Peoria, on June 25 and 26. The delegates were slow in assembling on Friday morning, due principally to the fact that a large Chicago contingent had motored to Peoria and were delayed by accidents, bad roads, and losing their way. The automobile party left Chicago on Thursday morning, stopped at Starved Rock in the afternoon and put up at Peru for the night. The next morning things became interesting. Some of the chauffeurs seemed to think that all roads led to Peoria, and every road leading out of Peru was tried by some one of the cars. G. W. Berthold succeeded in making Peoria in good time, while the others straggled in from time to time until the middle of the afternoon. Some had lost their way, some were mired, some had carburetor trouble, while Jim Kerns tried to demolish a county bridge. But they all arrived.

The total attendance at the convention was about 130, of whom 52 were members, and over 40 representatives of manufacturers and supply houses.

President W. J. Ball called the first session to order on Friday at 11:45 a. m. In his introductory remarks, Mr. Ball referred to the excellent work which had been accomplished by the Illinois Association in the past. The insurance scheme now in force has saved the members a great deal of money. The segregation of the electrical work from the general contract on state work has been accomplished, and has already resulted in taking work amounting of $250,000 out of the hands of the general contractor. Such things can only be accomplished by organization and co-operation. Sometimes it seems as if not very much were being accomplished by the organization, but on looking back 15 years it is seen that conditions have been vastly improved.

Representatives of the jobbers and others were then called upon for brief remarks. The following responded: Gus Harter, of Harter Manufacturing Company; W. Kearns, of Monarch Electric and Wire Company; M. G. Lloyd, of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN; E. H. Joseph, of Electric Appliance Company; A. R. Dean, of Federal Sign System (Electric); Thomas M. Endsley, of Diamond Electric Company; L. T. Block, of Utilities Indemnity Exchange; Louis Privat, of Central Electric Company; G. W. Berthold, of Electric Apparatus Company; H. L. Dollahan, of King Foundry Company; C. C. Coulter, of Electric Appliance Company; C. H. Methot, of Manhattan Electrical Supply Company.

Group at Illinois Contractors' Convention—Left Half.

At the session on Friday afternoon President Ball made a brief address and turned the chair over to Vice-President Marron, on account of having to leave the convention early.

Reports were made by the Board of Directors and by the secretary. The latter dealt largely with the insurance problem, and showed what a large saving had been made by the members by placing liability and casualty insurance through the Association.

The resignation of Secretary Burns was presented, Mr. Burns announcing that he had made arrangements which would prevent his giving the necessary time to the work of the office.

A resolution which was presented endorsing one-cent letter postage, was tabled.

C. E. Stapp made a report for the

Digitized by Google

Boosters Committee. A motion was passed to appoint a committee to confer with the Board of Directors on ways and means. The chairman appointed R. W. Poelma, E. E. Gibson and R. A. McLaughlin.

The remainder of the session was devoted to a discussion of the insurance problem. L. T. Block explained the workings of the Utilities Indemnity Exchange and the Chicago Association presented a report by an insurance actuary advising against reciprocal insurance.

At the session on Saturday morning the following new members were elected: George B. Marshall, Decatur; Electric Construction Company, Chicago; Alloway Electric Company, Chicago; Calumet Electric Company, Chicago.

R. W. Poelma made a report for the special committee on ways and means. It was decided to dispense temporarily with a paid secretary, and to continue the assessment of 0.1 per cent until finances are straightened out.

Proposed amendments to the constitution and by-laws of the National Electrical Contractors' Association were then discussed. It was voted to oppose the amendments to the constitution and to support the amendments to the by-laws.

It was voted to send a copy of the report on interinsurance presented at Friday's session to the Utilities Indemnity Exchange, St. Louis, Mo., with opportunity to answer the points brought out. The secretary is to send a copy of report and reply to each member.

The following officers were then elected for the ensuing year:

President, Norman Pierce, Chicago.

Vice-president, John Hughes, Champaign.

Secretary and treasurer, Matthew Blumenthal, Chicago.

State directors, Guy Carlton, Bloomington; L. L. Crawley, Peoria; E. F. Pendergast, Rockford.

National directors, J. T. Marron, Rock Island; F. L. Decker, Chicago; E. E. Gibson, Decatur.

The next meeting of the Association will be held in Chicago in January, 1916.

The entertainment features of the convention were well carried out. On Friday there was a supper party at Ye Olde Tavern, Prospect Heights, which commands a beautiful vista of the Illinois River and surrounding country. On Saturday evening there was a banquet at the Jefferson Hotel, the entertainment features consisting of music, dancing and elocution, to which Miss Green and Mrs. Becker contributed. The ladies were taken on automobile rides on Friday and Saturday, luncheon being served on Saturday at the I. V. Y. Club.

On Saturday afternoon a four-inning baseball game was won by the supplymen by a score of 22 to 2. The one-sided score was due to excellent battery work by Russell and Kent for the supplymen combined with four fielding and numerous errors on the part of the contractors.

Group at Peoria Convention—Right Half.

Market for Electrical Goods in Portugal.

Owing to the closing of some of its usual sources of supply by the war, Portugal is in the market for electrical goods of all descriptions. Heretofore American manufacturers have not been able to compete with those of other countries, because of the much higher prices they quoted, and also because they have been unwilling to supply the relatively poor quality of equipment desired by the dealers in that country; but local stocks are being rapidly depleted, and the time seems favorable for the introduction of American goods, according to the report of the American consul at Lisbon. The matter is of more than temporary importance, and if the market is properly served future development is well worth consideration.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has samples of sockets, shade-holders, swit hes, fuses, plugs, boxes, Bergmann tubing, etc., that are commonly used in Portugal.

Cutting Out Plaster for Ceiling Outlets.

In wiring an old building much trouble is caused on account of the brittleness of old dried plaster, which crumbles away around places where outlets are to be located. Therefore, instead of forming a neat, round hole for outlets, an irregular hole is frequently left and the plaster drops in an unexpected way, making a very bad mess.

To cut plaster for ceiling outlets in such buildings, I have used this scheme. I take a ceiling plate and file teeth in the edge of it so that it looks like a small circular band saw. I break out the center knockout, and in the center hole I then fasten a piece of one-inch pipe (five or six inches long) by splitting the end and bending the sections over. I take an old brace and fasten the chuck end in the end of the pipe. I then use the outfit to cut the hole in the plaster exactly where the outlet is to be located. In the case of combination outlets, the top of the pipe centers the tool by slipping over the gas pipe. In straight electric outlets, a stout nail driven in the center of where the outlet is to be may serve to center the tool. In either case, by turning slowly the saw edge cuts a neat hole without crumbling the plaster and the plaster that drops out falls into the ceiling plate which acts like a saucer or dish to catch it.

Samuel L. Brenner.

Digitized by Google

Outfit for Making Special Conduit Bends.

While engaged in wiring the factory of the Woodward Motor Company, which installation was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 27, 1915, it was necessary to make a large number of special conduit bends to fit around the brick columns along the two sides of the building. An idea of what the proposition was is shown in Figs. 2 and 3 of the article referred to. (One of these illustrations is reproduced

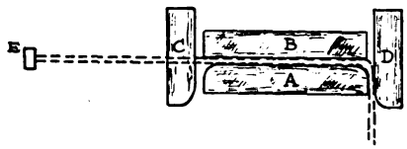
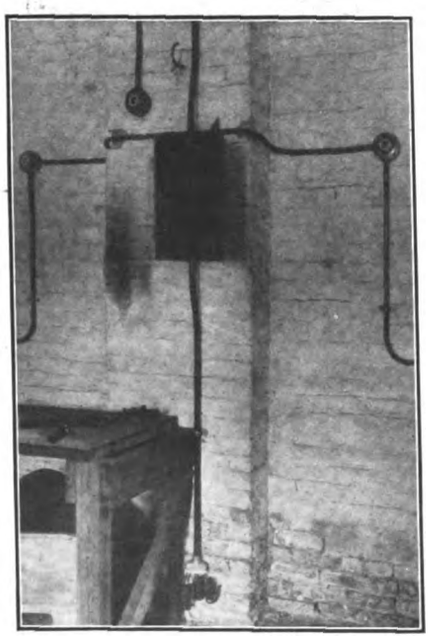


Diagram of Conduit Bend.

herewith.) These brick piers were about 24 inches wide, as I recall them, and projected from the face of the wall about six inches. The conduit between the two wall outlets on each side of the pier had to be given two double or reversed bends. To do this by hand without some means of easily locating the proper point for the bend and to make these reverse bends so close together would have been a long, tedious and laborious job.

To overcome this difficulty I rigged up a set of blocks on top of a work bench as shown in the accompanying diagram. Blocks *A* and *B* were of 4 by



Run of Conduit Around Brick Column.

4 timber nailed to the bench with a space between them of a little over one inch to admit one-inch conduit. Blocks *C* and *D* were of 2 by 4 size nailed flat. The edges of blocks *A*, *C* and *D* were rounded in the manner shown so as to form a good template for the bends. The length of *A* and the relative positions of the adjacent blocks *C* and *D* were such as to exactly suit the nature of the bends required. A little block *E* was nailed at the left at such a distance as to act as a gauge. The pipe was laid in the groove between blocks *A* and *B*, the block *E* being so placed that when the bend was completed the left end of the pipe would just come to the outlet box at one side, so as to avoid cutting the end. The right end of the pipe was then bent around as shown dotted. The pipe was then reversed so as to have the bent end between *A* and *C* and the long end projecting over *D* to the right. A bend was then made between blocks *A* and *D*. The two projecting ends of the pipe were then bent around the lower curves of blocks *C* and *D* by means of a hickey, thus completing the bends. One end of the pipe then had to be cut off about six inches to bring it to the proper position for the other wall outlet.

By this means all the bends were made very quickly and all of them were exactly alike, thus producing a very neat finished job. Several dozens of these bends had to be made and they were all finished in one afternoon. This scheme has been used by me in other buildings where similar conditions have had to be met.

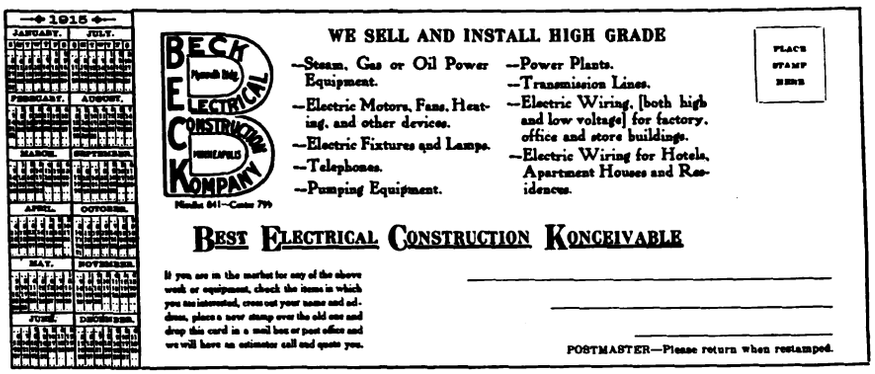
Samuel L. Brenner.

Effective Advertising by Contractor.

The progressiveness and originality of the Beck Electrical Construction Company, of Minneapolis, Minn., is reflected in its advertising which has gained for the company an enviable reputation. In addition to a liberal amount of general advertising, special publicity matter is issued at frequent intervals. Recently blotters of two sizes have been prepared for distribution, one 9 by 4 inches, to be used for direct mailing and a smaller one, 6 by 3.5 inches, to be used as envelope stuffers.

The accompanying illustration shows the larger blotter. As is indicated in the text, by placing a stamp over the old one and crossing out the name of the recipient the blotter can be used as a return card. The smaller blotter is likewise arranged as a return card; in this case, however, it is necessary to fill in his name and address.

The company has received considerable favorable comment relative to its trade mark letter "B," and its slogan, "Best Electrical Construction Konceivable," employing the letters of the name "Beck."


1915
JANUARY.
JULY.
FEBRUARY.
AUGUST.
MARCH.
SEPTEMBER.
APRIL.
OCTOBER.
MAY.
NOVEMBER.
JUNE.
DECEMBER.
BECK
Plymouth Bldg.
ELECTRICAL
CONSTRUCTION
MINNEAPOLIS
KOMPANY
Number 641—Center 799
WE SELL AND INSTALL HIGH GRADE
—Steam, Gas or Oil Power Equipment.
—Electric Motors, Fans, Heating, and other devices.
—Electric Fixtures and Lamps.
—Telephones.
—Pumping Equipment.
—Power Plants.
—Transmission Lines.
—Electric Wiring, [both high and low voltage] for factory, office and store buildings.
—Electric Wiring for Hotels, Apartment Houses and Residences.
PLACE STAMP HERE
BEST ELECTRICAL CONSTRUCTION KONCEIVABLE
If you are in the market for any of the above work or equipment, check the items in which you are interested, cross out your name and address, place a new stamp over the old one and drop this card in a mail box or post office and we will have an estimator call and quote you.
POSTMASTER—Please return when restamped.

Advertising Blotter Issued by Beck Company.

Electricity Extensively Used On Large Construction Job.

The extensive use of electricity and electrical equipment on one of the largest construction jobs handled in Cincinnati, Ohio, for several years is proposed by the Charles McCaul Company, which has the contract for the building of the new courthouse. All machinery which can be electrically operated will be arranged for motor drive, the company believing that the elimination of smoke and the other advantages resulting from the use of electricity will be important.

Missouri Electrical Contractors Change Meeting Dates.

The Electrical Contractors' Association of the State of Missouri will probably change its plans of annual and semi-annual meetings to harmonize more closely with the plans of the national meetings. Heretofore the semi-annual meeting has been in December, the annual in July, whereby the appointment of national delegates and officers has not fitted well with the necessary work that they do at the national convention. It is planned to hold the Missouri annual the third Saturday in January; and the semi-annual just before the national in July. The semi-annual meeting this year will be July 10, at Kansas City, Mo. The Kansas Electrical Contractors' Association will also meet in Kansas City, Mo., July 10, and the two associations will hear the reports of the committees appointed to consider a plan of consolidation.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

Members will have seen in the Electrical Review and Western Electrician recently that a statute requiring the registration and licensing of electricians has just gone into effect in Massachusetts, though certain of its penal provisions do not take effect for three months from July 1. This is a bill for which the electrical interests have been working for years. It was first put forward by the Massachusetts Contractors' Association but met with defeat several times; then it was taken up by what is now the Eastern Massachusetts Section, National Association of Electrical Inspectors. A bill was drafted, the Contractors' association and the Wiremen's Union were interested, and smooth sailing was had all through the legislative committe public hearings, only to have it turned down after objections by certain theatrical interests had been presented.

It was then taken up again by the Contractors' association and pushed for several years, our position being that we would back any bill embodying the desired principles but that we would not take issue over any specific point as to fees, examiners, etc., preferring to leave such details to those more vitally concerned with them.

This year practically every electrical interest was represented on the committee headed by Mr. Hixon, a well known electrical contractor of Boston and as a result of untiring efforts this bill has resulted.

It was reported against in the Senate, the committee report appealed from on the floor, overturned and the bill passed. It then went to the House, again was turned down, but in spite of adverse report taken up and passed in the very last days of the session, when the calendar was loaded with Boston & Maine Railroad business, being amended however in one unimportant particular, necessitating sending it to conference; but it succeeded in weathering this and was finally engrossed and signed.

It is the belief and hope of the inspectors that it will affect the work of wiring in the commonwealth for good.

I give below two answers to questions 301 and 302 which were printed in the issue for June 19. These are from Excommitteeman "O" and were received just too late for use.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

But one question is printed in this number, the main portion of the space being given over to the paper on "Inspection Problems at the Panama Exposition."

Members will please note that Mr. F. L. Warner's address is changed from 65 West Sixty-ninth Street, New York City, to 139 Clinton Street, Brooklyn, N. Y.

Any member expecting to be in San Francisco at the time the Insurance Congress meets (between October 4 and 16) will please notify our representative, C. W. Mitchell, 914 Merchants' Exchange Building, San Francisco, to that effect as soon as reasonably sure of his plans.

Answers to Questions 301 and 302.

301. An incomplete outlet with wires not soldered and not taped or with outlet box not covered either by the fixture or by approved box cover unquestionably introduces Code violations which should be noted by the inspector. However, it is not within the province of the Code nor is it as a rule the duty of the inspector to fix the responsibility for this incomplete condition of the work. When a dispute arises as to what particular subcontractor should complete the work at outlets, it would then be the duty of the inspector to report the conditions to all of the parties at interest, such as the owner, the occupant, the architect, the builder, the wiring contractor and the fixture contractor.

302. The terms "accessible" and "readily accessible" occur at frequent intervals in the Code and must be defined according to conditions, and with particular reference to the devices referred to in each case. In Rule 23c, "readily accessible" refers to location of fuses. Fuses are automatic devices and do not have to be handled, and, therefore, there is no reason for requiring the fuse to be within reach from the floor in order to be accessible, such as is the case with a switch, a manually-operated device; in fact for many years it has been customary in certain forms of exposed wiring to locate branch fuses on the ceiling and, while centers of distribution are recommended, the location of the fuses on the ceiling has not been considered contrary to the Code.

Flexible Armored Cable in New Residences.

Question 303.—In wiring new frame houses with flexible armored cable there seems to be a difference of opinion among inspectors as to whether the cable may be laid directly on the top of the joist and the under floor fitted up to it on each side; the joist notched and the notch covered with sheet metal; the joist bored for the ca-

Digitized by Google

ble. What does the Code require in this instance?

Answer 1(U). I know of no rule to prohibit any of the three constructions; there might be objections to each in some cases.

Answer 2(M). The Code does not specifically state that any of the three is required. Either would be considered satisfactory from a mechanical standpoint, the Code stating only that "the entire system must be mechanically secure."

Answer 3(K)*. Rule 27a simply requires mechanical security. Regardless of which might be considered "the best method," either of the three will comply with the Code.

Answer 4(P)*. The Code is silent upon this point, the presumption being that the armor is considered of sufficient strength to resist penetration by nails. This presumption is probably true, unless both cable and nail are held rigidly in position with reference to each other while the nail is being driven. Answering specifically then: Laying the cable on the joist and fitting under floor up to it is not good practice; notching the joist and covering with sheet metal is good practice; boring the joist and pulling cable through would comply with the Code, but is unusual.

Answer 5(R)*. Apparently the Code does not specify anything beyond mechanical security. The most popular method in this territory seems to be boring the joists.

Answer 6(F&G). In this territory most of the new houses are concealed knob and tube construction. However in houses already built the armored cable is sometimes used. In these cases we require either that the joists be bored at least three inches below floor level or else that the joist be notched and covered with sheet metal strong enough to turn a ten-penny nail. We do this because an ordinary nail will penetrate the armor of some cable, and this is liable to occur when the floor is laid. We require this under Rule 26-e—"Wires must, where exposed to mechanical injury, be suitably protected."

Answer 7(L). The Code does not contain anything specifying which of these three ways should be used.

Answer 8(J). In territory I have visited where the Code is closely followed the usual practice seems to be to bore the joists and pull the cable through.

Answer 9(B)*. The proper way, in our judgment to run armored cable in new frame house is on the side of joist or under edge of same and not on top of joist with floor fitted to it, as under such conditions a nail is liable to be driven through the cable armor.

Answer 10(T). The Code does not specify as I can see how the armored cable should be installed, and I do not believe an inspector under the present Code rules can make any rulings requiring any particular one of the methods mentioned in the question to be followed.

Answer 11(N)*. I do not know of any installation of this type in this territory. However, I do not think it the province of any inspector to prescribe methods, he can only insist on mechanical safety. Under this I should rule out the first plan; either of the others might be acceptable. I like drawing in under the joists, parallel with the strapping pretty well, and that is done in the short bits of cable construction I have seen here.

Answer 12(H)*. The Code is silent on these particular points; however, I think running parallel with joists and securing to middle of same, and boring joists where necessary would be the safest construction.

Answer 13(O). The special rules for the installation of armored cable do not cover specifically the point in question, but it is clearly necessary to give some thought to the protection of armored cable against nails. It has been the practice in this department to prohibit the placing of armored cable over a joist in such a manner that it will be held in a fixed position and so subject to puncture by nails used in fastening the floor. This ruling is defended by the clause in 26-e, "must, where exposed to mechanical injury, be suitably protected."

Problems in Electrical Inspection at the Panama-Pacific International Exposition.[1]

During the past ten years it has been customery for various electrical inspection departments throughout the United States, which have adopted the National Electrical Code as their standard, to make numerous and diverse rulings suited to their local conditions, and which are either amplifications of the Code or special rulings attached thereto. These rulings have been made frequently, a cause for the claim that the National Electrical Code does not completely cover the field, or that it is not self-explanatory to the desired degree, and, therefore, it has been necessary to make these rulings in order to clear up certain disputed points.

It will probably be of considerable interest to know that all of the electrical work installed at the Panama-Pacific International Exposition has been installed and inspected under the standards set forth by the National Electrical Code as interpreted by the representatives of the Board of Fire Underwriters of the Pacific.

It is believed that the electrical installation at the exposition is the largest installation ever constructed where the slogan "Let the Code Decide," may truthfully completely apply.

In considering the problems which confronted the inspector, in fact, in looking at any problem, we are anxious to know, first the problem, and secondly to know how it has been successfully solved. The problems involved in the inspection work at the exposition resolved themselves into three classes: the material, the men, and the rules.

While it would seem to everyone connected with the electrical industry, that the problem of material would be readily solved by means of the List of Approved Fittings and the reports of the Underwriters' Laboratories, such was not the case. In the past it has been customary to unload at expositions, all of the sub-standard, low-grade, and non-Code material available throughout the country—on the grounds: first, that it was cheap; and second, that the installation was of a temporary nature.

Past experience has shown that at the expiration of an exposition, vast quantities of non-Code material, such as wire, receptacles, switches, etc., were bought up and resold as standard. This material was disposed of through channels which made it difficult to determine its final destination. Even in this enlightened era it would not be difficult for unscrupulous contractors to install in districts where inspection was lax—or worse still, a negative quantity—non-Code material, which, when installed would render the installation defective.

The elimination then, at the exposition, of non-Code material, obviates not only a certain fire hazard, there, but will prevent the flooding of the immediate field with wire and devices that would require "eternal vigilance" on the part of those entrusted with maintaining the fire hazard to property, from an electrical standpoint, at the minimum.

I presume that the greatest offender, in regard to unapproved receptacles, was our old familiar friend the receptacle with the single screw hole in the

[1] A paper by G. A. Cleary, of the Bureau of Fire Underwriters or the Pacific, Secretary of the California Section N. A. E. I.

Digitized by Google

center. Contractors who have been in business for years never heard of the receptacle being non-Code, and that it was not permitted particularly for exterior lighting!

This problem of exterior wiring was quite a serious one, because outlining was the rule rather than the exception in the Concession district. Cleat weatherproof receptacles were required, but the fact that receptacles which separated the wire one inch from the surface wired over were on the market seemed to be a matter of absolute indifference to some of the contractors. As this form of construction is not permitted in many of the larger cities, the requirements for outline lighting had to be explained in detail. It was frequently found that while an approved one-inch receptacle was used on the outside of a building the wires would be supported on cleats which separated the wire but one-half inch from the surface wired over.

A condition was met at the exposition which greatly interested the fire underwriters' representative; namely, that of the motion picture installations, of which there are 59 in the various palaces, State and foreign buildings. The first problem introduced by this was the question as to what portion of the building should be wired in accordance with rule No. 38 of the Code, which relates to Theater and Moving Picture Wiring. Due to the fact that in all large cities this section of the Code is intended to mean the entire building rather than that portion of the building affected, the opinion prevailed that the entire building would have to be wired in conduit or its equivalent, but of course this is not the case, inasmuch as the Code specifically defines that "that building or that part of a building regularly or frequently used for motion picture shows" shall be wired in conduit or its equivalent. It was therefore necessary to decide which portion of the building fell under this section; inasmuch as it was not the desire of the Inspection Department to make the installation any more expensive than was absolutely necessary.

The general ruling decided upon then was that all wiring in or on the walls, ceiling, or floor joists, of that portion of the building, namely the room or auditorium used in conjunction with the motion picture show should conform to Section No. 38.

The type of operating room most widely used is wood, metal lined. This type of room has sheathing walls and ceiling tongue and groove wood at least three-quarters inch thick, with the inside of room presenting flat surfaces, all studding, braces, etc., being on the outside. Lining is of sheet metal at least No. 30 U. S. gauge with the joints locked one-half inch and nailed under seams. Openings for machine and operator's view are provided with sheet iron shutters which slide freely in metal grooves.

Motion picture exhibitors appeared never to have heard that magazine rewinders or approved film storage boxes were ever required by the Code, their belief being that the ordinary open rewinder and film box which permits communication between reels were satisfactory.

The location of the oil-cooled transformers for stepping down the high-potential to that of the supply mains in the buildings was a question which early confronted the Underwriters' interests. The class of construction decided on consisted in locating the transformers in a concrete vault with communication and ventilation only to the outside of the building.

The voltage on the high-potential side of the transformers is 11,000. The primary feeders are brought into the vault underground, all high-potential wiring terminating in the vault.

The switchboards for controlling the various low-potential feeders inside the buildings are mounted against the walls of the transformer enclosures within the building and with the feed wires brought through in duct.

In one instance it was necessary in order to have a "live" exhibit for a transformer to be located inside one of the exhibit palaces. This was accomplished by using an over-capacity oil-cooled transformer without the case and oil and mounting it for air-cooled operation.

The use of approved type of cabinets appeared to belong to some future period. Anything made of wood or iron was presumed to meet the standard, as set forth in the Code, until it was rejected and ordered removed. It was thought that in lining wooden cabinets sheet paper asbestos was a satisfactory substitute for rigid asbestos board. Regarding the requirements for cabinets, as for instance the proper gauge metal, lining material, rabbits, riveting, maximum width for a single door, etc., on such details a certain class of electricians appear to be vaguely informed.

It was difficult to impress on wiremen that the use of a terminal fitting that did not have a separately bushed hole for each wire, was not in accordance with the inspection requirements.

Some contractors had never heard that theater borders were supposed to be wired with slow-burning wire and to have the joints where the border-light cable connected to the wiring of the border proper located in an accessible splicing box; also with the splices relieved of all strain.

It was not known that wiring at the back of switchboards, where they are bunched or cabled or brought close together in any manner should be flameproofed. The objection to the use of rubber-covered wire in this case was overcome by serving the wire with a wrap of asbestos tape.

The fact that conduit was required to be grounded appeared not to concern certain of the contractors. The amount of conduit not required to be grounded differed, depending on the locality in which the electrician was accustomed to work, and the inspector passing on his work, but they were all agreed that a few lengths of conduit need not be grounded.

The men took the attitude that they had been doing these things for years and "getting away with it;" they reasoned that inasmuch as the exposition lasted only one year there was no reason why they should not do the same thing at this exposition also. They have been accustomed to rulings not in accordance with the Code, or to the winking at certain infractions of the Code rulings, and thought that this was the place where everything was to be free and easy; and that so far as the Code was concerned it was a closed book. This naturally meant that the duty of the inspector was not only to make a ruling, but also to assign a reason why and then educate the men up to the standard of doing work in accordance with the Code.

In many instances exhibits were installed with electrical devices and materials of foreign manufacture. A considerable problem consisted in determining whether they did or did not comply with the Code requirements or introduce an additional fire hazard when installed.

Exhibits were received from Germany, England and Holland in the "knocked down" condition, having been already wired in these countries ostensibly in accordance with the standard of these respective countries. It was not believed, however, that unlined brass shell sockets, No. 16, B. and S. gage, rubber-covered wire secured to button knobs with tie wires, receptacles with insufficient clearance, lack of insulating bushings and canopy insulators and certain types of lamp "holders," etc., reasonably fulfilled the requirements of the Code. These are illustrative of details objected to in exhibits of foreign origin. Installations of this character necessarily were required to be reconstructed. Not being familiar with the electrical standards of this country, it was difficult for the exhibitors using certain foreign materials to appreciate the reasonableness of the requirements of the Code. It was interesting, however, to note that

Digitized by Google

the electrical equipment sent from Japan was mostly of American manufacture or standard.

Some of the foreign countries exhibiting at the exposition have a stock exhibit which they send from one exposition to another. In one instance an entire installation was required to be rewired with approved material.

While on the subject of non-Code material it might be said that Eastern manufacturers of this country were the greatest offenders. For instance, in the matter of sign-flasher boxes, they seemed to think that anything that was used to cover a sign flasher constituted suitable protection. They were invariably rejected when not constructed of metal of the proper gauge. Cut-out boxes not an integral part of a sign, and located in the same as required by the Code, were made of the same gauge metal as the sign itself, instead of conforming to the required standard for cabinets. They appeared evidently, not able to differentiate between a cabinet for the enclosure of cut-outs on the ordinary circuit, and a circuit supplying lights on a sign.

Low-voltage lighting is used extensively on maps, models, etc., and it was required that the primary side of the transformers feeding these exhibits should be installed in accordance with the rules for Class "C" wiring. In several instances, transformers supplying this class of exhibit were of two and three kilowatts capacity. It was required that flame-proofed wire be used on the low-voltage side, as the leads developed considerable heat, and it would have been quite impractical to maintain any separation. This class of exhibit was usually shipped to the exposition already wired and it was interesting to note the different degree of precaution taken by wiremen in the different sections of the country. In the majority of the cases the work was well executed but in several instances models required a complete overhauling.

A large model was received lighted with low-voltage lamps in non-approved receptacles connected in series for use on a 110-volt circuit. It was required in this instance that the receptacles not being approved for use on 115-volt circuits, they should be connected in parallel and supplied with current from a low-voltage transformer.

Exhibits were installed in which were incorporated alternating-current motors so wired that the motor had no fuse protection during the period of starting.

Starting devices were sent with motors which if installed necessitated that one leg of the three-phase mains be hot in the motor at all times. It was required in these cases that a switch be provided so that all wires of the circuit could be disconnected from the motor.

The question frequently arose as to the size of wires to be used where motors were used for demonstration purposes only, although they were of sufficient size to drive the connected machines at their rated load.

Where 1,320 watts should be allowed on a circuit, the No. 14 feed wire running direct to keyless porcelain receptacles and located so as to render unlikely the attachment of flexible cords thereto was a question which arose frequently, the condition being quite general, as gas-filled lamps are widely used.

To appreciate fully the inspection problems met with it must be remembered that the exposition was a clearing house for wiremen from all over the United States. If a certain objection were taken to certain details of construction one would be informed most likely that it was an approved method in such and such a place.

In analyzing the conditions presented at the exposition one point appears predominant, namely, the lack of uniformity in the interpretation of the Code.

It is safe to say that the major portion of electrical contractors are more than anxious to install work properly if they are aware of the requirements. They claim that when left to the inspector the interpretation of the Code is too flexible. "Some require one thing and some another more drastic, and yet both claim it is in accordance with the Code," is the wireman's argument.

The conditions at the exposition were no different than those of other parts of the country regarding contractors. Here as elsewhere you knew which of those concerned installed work properly, which had no thought of evasion but were simply lax, and you quickly spotted the individual whose sole aim was to skin the job.

To the inspectors of the electrical department of the exposition is due great praise for the manner in which they handled so complex a problem of installation. By a system of certificates, similar to municipalities an absolute check was kept of all work installed, and it was required that all work be in accordance with the Code before service was connected.

It is believed that many wiremen are better informed as to the requirements of the Code as a result of the exposition, for as many have remarked, especially those from large centers, it was the first straight Code job they had ever worked on. For instance, due to local rulings in many places against wood moulding and cleat wiring, the majority of the mechanics thought these classes of construction were absolutely prohibited by the Code.

Under like conditions what is deemed safe from an electrical viewpoint in one locality, is safe in another, but experience shows that while certain types of construction are prohibited in different localities the inspection interests are far from being of a like mind. To agree on and require the same thing in each instance is the ideal for which we should all strive.

Lynn Station Remodeled.

The Lynn Gas & Electric Company, Lynn, Mass., is making radical changes in its generating station. A new 5,000-kilowatt-ampere steam turbine has been installed. The rectifier units, of which there are a large number, operated in connection with the new magnetite arc street-lighting system, have been removed from the wooden station floor and relocated directly beneath in the concrete basement which, the floor being removed, is now open to the roof.

Iron galleries have been constructed along the front of the switchboard, to take the place of the floor, and also along the station wall, to connect with the generating area opposite. An electrically-operated traveling crane of large capacity has been installed over the new turbine and an adjacent generating unit.

Water Resources of Rio Grande Basin.

The United States Geological Survey has issued, as Water-Supply Paper 358, a report on the water resources of the Rio Grande basin from 1888 to 1913, by Robert Follansbee and H. J. Dean. Systematic study of run-off in the Rio Grande basin was begun by the Federal Government near Embudo, N. M., soon after the passage of the act of October 2, 1888, which authorized the organization of the irrigation survey under the direction of the United States Geological Survey. At the end of September, 1913, records had been obtained at 93 gauging stations.

The report contains not only all data concerning stream flow in the Rio Grande basin collected by the Survey and co-operating parties, but also records furnished by individuals connected with private interests.

A copy of the report may be obtained free on application to the Director of the Geological Survey, Washington, D. C.

The United States Geological Survey places the American smelter production of copper during 1914 at 1,150,137,192 pounds and the refineries' output at 1,565,708,374 pounds.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

IDAHO.

Southern Idaho Water Power Company. The Pocatello Gas and Power Company filed a complaint with the Commission alleging that the Southern Idaho Water Power Company has discriminated in its charges in competing with the complainant for business in Pocatello. During the time the case has been pending before the Commission the parties have adjusted all of the difficulties except the question of proper charges for current used for water heaters. The complainant alleges that the rate offered by the defendant for water heaters is less than cost, discriminating against consumers using current for other purposes, and that it was instituted for the sole purpose of unfairly competing with the complainant in the water-heating business.

The schedule of rates filed with the Commission for the service in question is as follows: "For domestic heating, $2 per month for first kilowatt and $1.50 per month for each additional kilowatt capacity connected; and for commercial heating, $3 per month for first kilowatt, and $2 per month for each additional kilowatt capacity connected."

These flat rates are in effect in all places served by the defendant and by the Great Shoshone Company. The decision says: "Is the rate charged by the defendant company for water heating purposes unreasonable when compared with the rates charged for other uses? This is a big problem, and can only be determined from a full and complete valuation of the company's system and a thorough investigation into the cost of generating and delivering the several classes of power. This Commission has not yet undertaken this task, and is not now in a position to do so, by reason of the failure of the Legislature to make an appropriation with which such an investigation might be carried on, although we have now under consideration a general investigation into power rates. Evidence was introduced in this case tending to show that the average cost per kilowatt-hour at the consumers' meters in Pocatello, of electrical energy for all purposes was about one cent, and that the rate charged these water heater users, if the heater were used on high for the 24 hours of the day, would be only 2½ mills per kilowatt-hour so used. That this class of service is, therefore, furnished for about one-fourth of cost, and, therefore, must be unreasonable. The premises from which that conclusion is drawn have not been substantiated by proof. If this were the only class of service furnished by the defendant company the position taken might be true. This water heating service is only one of many classes of service and uses to which electricity is now put. It is recognized by all authorities that the use of electricity for illuminating purposes is, at the present time, the highest use to which it can be put. This use involves the use of the plant and equipment, generally speaking, from three to four hours a day, usually from seven to eleven in the evening. This use takes precedence over all other uses, and electrical energy must be furnished for this use at all hazards. The result is that in fixing rates the lighting rate must necessarily be the highest rate for any use. The great problem with hydro-electric public utilities is to find other uses to which this power can be applied for the other 20 hours of the day. Consequently, the rates for electrical energy for other uses must necessarily revolve around and be interdependent upon the lighting rate. The great aim of a public utility of this character is to secure a high load-factor. It is contended by plaintiff that the use for these water heaters interferes with the peak-load—that is, the lighting load—and consequently the above reasoning cannot apply. The answer to that in this case is that the evidence shows that the company has an abundance of surplus power, even when the peak-load is on. The evidence shows that this company has something like 2,300 lighting customers in the city of Pocatello, and that it has secured, after a lot of advertising and soliciting, only about 50 water-heater customers. So even at this low rate it has made no great progress in securing this class of business. The reason why must be that the cost of installing this class of service and the rate is not yet sufficiently low to induce a broader use of the same. This is true that if this class of service were cut out altogether (which result would inevitably follow the increasing of the rate to that advocated by plaintiff) the operating revenue of the company would be reduced just that much, and the rate for some other class of service might have to be increased to make up that loss, while the evidence shows that the additional expense for taking care of this class of service is very small."

The complainant offered evidence to show that the lowest price at which it could afford to furnish gas was $1.20 per 1,000 cubic feet, and at that price it could compete in this class of service with defendant, if the rate on electricity were increased to one cent per kilowatt-hour. This contention was not satisfactorily sustained, and, furthermore, the Commission says: "That being true we would hardly be justified in compelling defendant company to raise its rates 300 per cent for electrical energy for this class of service, so as to enable the plaintiff company to compete with it in that service. . . .

"A rate voluntarily established by a public utility must be regarded as prima facie reasonable. Home Telephone & Telegraph Company vs. Pacific Telephone & Telegraph Company (Cal.) P. U. R. 1915 A. p. 687. That being true, the rate voluntarily established by defendant company for this class of service must be presumed to be reasonable and the evidence introduced in this case is not sufficient to overcome that presumption."

The Commission finds that the complainant failed to sustain the allegations of its complaint, and the complaint was dismissed.

It was urged that under the Idaho law the case was not properly brought before the Commission. The complaint was not made by the Commission on its own motion, by the mayor of Pocatello, by a majority of the city council or by 25 consumers of either of the companies. The complaint was signed solely by a competing company. The Commission did not discuss the contention further, however, "preferring to decide the case upon its merits rather than on a jurisdictional question."

INDIANA.

The Southern Telephone Company, which recently took over the Indiana holdings of the Cumberland Telephone & Telegraph Company, has surrendered the franchises granted the company in 53 cities of Indiana, and will receive in-

Digitized by Google

determinate permits from the Commission under the provisions of the public utility law.

MARYLAND.

The Consolidated Gas Company filed a bill in court resisting the Commission's order, which gave the company the option of reducing its rate or maintaining the double standard of service. The company intimated, however, that it would drop the litigation and comply with the order if the date when it is made effective be postponed. The Commission has issued a supplementary order which postpones the order six months. It is understood that the company will reduce its rate to 75 cents per thousand cubic feet, on January 1 and put into effect the single standard of 600 British thermal units.

MASSACHUSETTS.

The Thirtieth Annual Report of the Board of Gas and Electric Light Commissioners has been issued for the year 1914. The report contains the decisions rendered during the year, and statistics and information compiled as in former reports. The rates for gas and electric companies are tabulated. General information is given regarding the municipal plants and the rates for these plants for private consumption, and the cost of furnishing street or public lighting is also tabulated.

NEW YORK—Second District.

The Buffalo General Electric Company. The Commission has rendered a decision authorizing the merger of the Buffalo General Electric Company with the Cataract Power and Conduit Company. The consolidated company will operate under the franchise of the Buffalo General Electric Company. The order provides for a reduction of 19 per cent in rates to consumers. The consolidation must be effected before September 1.

In the opinion, written by Commissioner James O. Carr, a brief statement is made of the relation existing between these companies in the city of Buffalo, as follows:

"The electrical energy which is used by these companies in the city of Buffalo is obtained from the Niagara Falls Power Company. At the time the rate cases were pending (2 P. S. C. R. (2D) 739), the Cataract Power and Conduit Company sold and at the present time it sells electrical energy at wholesale obtained from the Niagara Falls Power Company in the city of Buffalo and the Buffalo General Electric Company in turn sells electrical energy which it purchases from the Cataract Company at retail in said city. In some instances the former company also does some business which might properly belong to the Buffalo General Electric Company when considering the sale of energy at retail as distinguished from wholesale. The Cataract Company sells a large amount of its power to the Buffalo Company, and in many respects it might properly be considered as the middleman in the sale and distribution of electrical energy generated by the Niagara Falls Power Company and sold in the city of Buffalo. As was stated in the opinion of this Commission in the Canadian-American Power cases, 'The Cataract Power and Conduit Company has no true economic place in Buffalo. The Buffalo General Electric Company or some other corporation should be the sole distributing company. The Niagara Falls Power Company, both Canadian and American, should sell power to that company at the lowest price consistent with expenses, interest and maintenance.'

"There is no reason why the business in the city of Buffalo cannot be handled as well by one company as two, and, in fact, it is the general experience that in situations of this sort it is undoubtedly better for all concerned, the public as well as the companies, if there is but one concern distributing electrical energy in the community. Particularly is this true if the profits of the middleman are wiped out and the public is permitted to participate in the benefits thus obtained. While it is true that the two companies in question do not at the present time compete with each other to any extent, yet, it may readily be imagined that a situation might arise whereby there would be a severe competition between them which might create serious difficulties."

No new securities are to be issued upon the consolidation. While it was urged that the capital of the Cataract Company was too much to load on the new consolidation, Commissioner Carr points out that the liquid assets of the company seem to bear out the value placed on the stock.

"Another ground of opposition at the hearing was the fact that the Buffalo Company proposes to issue its securities in payment for the stock of the Cataract Company; that this ought not to be done because the Commission has decided in the Cataract rate case that none of the stock had been issued for cash or an equivalent in property. There was no dispute as to this fact, and the books of the Cataract Company clearly showed it. Notwithstanding this it was strongly contended by the Cataract Company that the rights obtained by the issuance of this stock did have a substantial value. However, the situation now presented is such that the Commission may properly require the companies, if this merger or consolidation is to become effective, to write off a substantial portion of the intangible value, which represents the stock, and, in the opinion of the Commission, this can be accomplished to a very large extent by requiring as one of the conditions of the merger that this intangible value should be written off to the extent of $1,384,000, which is the amount of the par value of the bonds of the Cataract Company now outstanding, and the order will so provide. If this is done then all of the objections against the merger or consolidation which have been presented would seem to have been properly disposed of."

WISCONSIN.

Oshkosh Waterworks Company. The Supreme Court issued a decision June 1, 1915, upholding the Circuit Court of Dane County in its judgment in the Oshkosh Waterworks Company case, finding that the purchase price for the taking over of the waterworks by the city was a fair compensation, and that the terms and conditions of the sale were reasonable as fixed by the Commission's order. (Decision of the Circuit Court, reported in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, November 7, 1914, p. 906.)

The court, in affirming the judgment of the lower court and upholding the order of the Commission, holds that upon appeal from an order of the Commission the burden rests upon appellant to establish "to all full satisfaction of the court" that the compensation fixed is unlawful.

"In the proper valuation of a public utility for condemnation or sale purposes certain main elements usually present in every case may legitimately be considered. These are the present value of its physical property, the present and prospective reasonable earnings of its business, the going value thereof, and the amount of money presently needed to put the plant in good condition. There may be other elements, but these are generally the essential ones. In determining the value of the physical property, due regard should be had to the original cost thereof, the reproduction cost, the amount of depreciation, and the amount of obsolescence. The going value of a utility is that part of its value due to its having an existing established business. In fixing its amount the actual cost of establishing the utility in question as modified by what, under all the circumstances ought to have been its reasonable cost, as well as the reasonable cost of establishing like enterprises under similar conditions, may be considered. The element of going value is usually one whose quantum is not easily subject to mathematical demonstra-

Digitized by Google

tion. That in a measure is true of all the other elements of value. And it is equally true that the elements of value spoken of, or others, if there be any, may not in their aggregate represent the just value of the utility. Such value may be more or less than the aggregate of the sum of the elements found. And it may be that some elements that enter into the main elements of value above stated should be entirely eliminated in fixing the just value of the utility as an entity. Its value must be fixed as such. C. & N. W. Ry. v. State, 128 Wis. 553, 108 N. W. 557; Appleton Waterworks v. Railroad Commission, 154 Wis. 121, 142 N. W. 476, 47 L. R. A. (N. S.) 770.

"It is because the valuation of a utility cannot be reduced to absolutely fixed rules, or to the mere appraisal of parts whose sum equals its value, that the subject is one upon which honest and competent men differ. In the last analysis it is the exercise of a sound and competent business judgment upon many elements of uncertain and debatable value considered as a business entity. Hence grave errors in arriving at and seriously affecting the final result must be shown before a valuation of the Commission can be set aside."

In taking this case to the court the company raised the question of the rights of the bondholders and the protection of their rights under the indeterminate permit. The court says:

"What has already been said disposes of the claim that the Commission should have provided that plaintiff receive its money without calling in its bonds. When it accepted an indeterminate permit it agreed to sell to the city at any time the latter might elect, and it must then have contemplated that, if the city did so elect before the bonds matured, it would have to call them in. The city is under no duty to assume plaintiff's contract obligations. Green Bay & M. C. Co. v. Kaukauna G., E. L. & P. Co., 157 Wis. 412, 147 N. W. 701. It is bound to pay only the just value of the utility. The fact that plaintiff has entered into a contract whereby it will cost it something to deliver the utility to the city cannot affect the reasonable value of the utility. The city is not concerned with the terms of settlement between the utility and its creditors so long as it receives the property free from liens. To require the city to pay the premium would be to require it to pay the bonus plaintiff agreed to pay for the use of money. Municipalities have nothing to do with past obligations incurred by the utility, except in so far as they may be a lien upon the property brought. If they are, the utility must satisfy them out of the purchase price, if that is sufficient to do so. That is all the Commission required in this case."

Pierce County Telephone Company.

Application was filed with the Commission by subscribers of the company for a reduction in telephone rates. The Commission finds that the company's financial condition, as reflected by the figures in its last report, is such that it can be required to furnish good service in strict accordance with the standards of telephone service as fixed by the Commission; but that the fact that the company is earning practically 7 per cent upon its investment cannot be held to be evidence that rates should be reduced. The Commission continues: "The only other matter which need be mentioned in connection with this case is the contention of petitioners that telephone companies in other parts of the state and in other parts of the country are furnishing good service at a lower rate than the rate charged by the respondent. In regard to this, it might be said that we have had occasion to investigate the cost of service of telephone companies in a great many cases, and although it is entirely true that rates lower than these of the Pierce County Telephone Company are in effect in many places for rural service on metallic lines, we have not found an instance where unlimited service is furnished to rural subscribers over a large system where lines are metallic and the number of subscribers properly limited where a rate much, if any, less than $15 per year would permanently suffice to meet the operating expenses of the utility, provide a reasonable amount to meet deferred maintenance or depreciation charges, and pay a fair rate upon capital invested in the business."

The Commission emphasizes the importance of providing for good service rather than low rates in its conclusion, as follows: "Whatever the interest of the subscribers may be in this case in securing lower telephone rates, it must be assumed that they have an interest in securing adequate telephone service, and any reduction of rates in this case must inevitably result in lowering the standard of service which the company can be expected to furnish. As matters stand at present, the company can be expected and required to furnish telephone service of a very high grade, and we do not believe that the interests either of the company or of the community would be served by such a reduction in the company's revenues as must inevitably prevent the utility from maintaining a proper standard of service. When this is considered in connection with the fact that the utility is now earning just about a reasonable amount for depreciation and interest it should be evident that the application in this case should be denied."

MICHIGAN SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION.

Convention Cruise, June 26-30.

Following its custom of several years, the fourth annual convention of the Michigan Section of the National Electric Light Association was in the form of a four-day lake cruise on the Steamer *Rochester*, starting at Detroit on Saturday afternoon, June 26, and ending at Grand Haven on Wednesday afternoon, June 30. The trip was up Lakes St. Clair and Huron and the St. Mary River to Sault Ste. Marie, then westward across the upper ends of Lakes Huron and Michigan, through Green Bay and Sturgeon Bay Canal, Wis., southward on Lake Michigan to Milwaukee, across the lake to the Kalamazoo River and Saugatuck, then north again in the lake to Grand Haven. Stops were made at the "Soo" to view the great locks and the power house of the Michigan Northern Power Company, at Mackinac Island, Sturgeon Bay, Milwaukee and Saugatuck.

Every feature of the cruise, including delightful weather throughout, made the trip most enjoyable. The business of the convention was not strenuous, only three sessions being held for the presentation of addresses and the discussion of these and other matters of general interest. The program was intentionally planned to make the cruise as much as possible a get-together meeting and outing of members of the association, their friends and their families. Among the entertainment features were prize card contests for the ladies. The total number of persons on the trip was 146.

The first session was called to order by President H. A. Fee at 10:35 a. m. Sunday. Mr. Fee proceeded directly to deliver the annual presidential address, in which he first reviewed the activities of his administration. The uniform-accounting requirements of the Michigan Railroad Commission had been given careful study and much help was accorded to the members of the Michigan Section by the association. The great value of systematizing the accounting was emphasized. Mr. Fee referred to attempts to secure needed utility legislation from the last Legislature. The act that was finally introduced had many defects and it was not unfortunate that it failed to pass. A good utility law is greatly needed, however.

President Fee referred briefly to municipal ownership, the safety movement and concentric wiring. He felt that the central-station interests should be more actively represented on the committee in charge of revising the National Electrical Code. He pointed out the need of a medium for passing on electrical appliances as to their serviceability and econ-

Digitized by Google

omy. At present effective agencies exist for testing fittings and appliances as regards fire hazard and to a less extent for testing as to personal safety; no institution, however, passes on the suitability of appliances for the consumer. He therefore urged that the National Electric Light Association establish a testing department for this purpose. He also urged that efforts be made to evolve a uniform and simple system for rate making. He spoke of the desirability of coordinating the legal work of the various Michigan utility associations and in conclusion commended highly the active cooperation which had been received from members of the Jovian Order.

A nominating committee and a committee to draft suitable resolutions in memory of many recently deceased prominent Michigan electrical utility men were appointed.

An address on "Safety" was then delivered by Dudley R. Kennedy, of the Youngstown Sheet & Tube Company. He opened his remarks by referring to the safety movement in steelworks. The steel industry has always been known to be a very hazardous one. The Youngstown plant employs over 8,000 men. Formerly it was common to have 15,000 accident reports per year. Until the magnitude of the losses due to accidents was strikingly presented, it was felt that they were an inherent feature of the steel business. However, efforts were gradually instituted to reduce the losses. Mr. Kennedy described some of the safety measures, particularly the formation of safety committees on which the workmen were actively represented. This is an important feature in order to secure the earnest cooperation of the men. The result was a decided reduction in the number of accidents, in hospital and surgeon bills and in claims for damages due to accidents. Special study was given to the liability of having electrical accidents because of the large amount of motor-driven machinery. The proper handling of cases of electric shock was determined and several Pulmotors installed.

Mr. Kennedy spoke of the formation and work of the National Safety Council. Valuable information is sent out by it to members. He urged affiliation with the Council. He called attention to the value of physical examination of employes at the time they enter service and, if necessary, at periodic intervals. Such examination discloses important weaknesses that may disqualify a man for some particular work; it also discovers minor weaknesses that may be rectified on proper advice, so that the efficiency of the employe is enhanced and his liability to accident diminished. Attention to safety measures that reduce accidents greatly decreases the number of substitutions that must be made of inefficient helpers to take the places of injured men. The high cost of breaking in new men is not generally realized.

Taking up the extraordinary increase of speed of transportation media and the considerable increase of other hazards to the public attendant on the growth of utility service, Mr. Kennedy emphasized the need for active propaganda to teach safety to the public. He called attention to some of this work done very successfully in several cities through lectures and moving pictures in the public schools, through newspaper publicity and other means. He said the "Safety First" slogan is no joke nor hobby; it is a clear-cut business proposition. Employers and operators of utility properties must be impressed first with the financial advantage resulting from safety work, then with the improvement in efficiency it promotes, and finally with the humanitarian aspects of the broader work among the public in general. Organized earnest work is necessary to accomplish these results.

An address on "Recent Decisions Influencing Public Utilities" was then made by James V. Oxtoby, counsel of the Edison Illuminating Company of Detroit. A recent decision of the California Commission was referred to in which the statement was made that the unscrupulous promoters who sap utilities are happily diminishing in number. This is a hopeful indication that public bodies are appreciating the efforts of the present-day utility men. Mr. Oxtoby touched on a recent United States Supreme Court decision reaffirming the right of the Wisconsin Railroad Commission to change rates specified in a franchise. This shows that if the state utility laws are broad enough to confer this power on the commissions, the exercise thereof despite apparent contract requirements will be backed up by the courts. Other important cases on which the Supreme Court has acted are the North Dakota lignite case and the Norfolk & Western case. These show that a uniform rate for any class of utility service will be approved even though in some isolated cases in the class they may not prove remunerative, provided the income from the class in general produces a reasonable profit. To make up deficits in one class of service by excess profits in another is not sanctioned. These and other important cases indicate that the courts are getting abreast of the progress of the times in matters of economic as well as political and social interest.

In the discussion that followed, Mr. Oxtoby was asked a number of questions of legal interest to utilities. He said that at present the Michigan Commission cannot change utility rates of its own volition but only on complaint. It has no authority to change agreed rates, and has no jurisdiction over the rates of municipal plants. Respecting new extensions, these will not be ordered constructed if they are bound to result unprofitably. However, extensions already giving service must be maintained, even though unprofitable.

Monday evening a session was held at which Evan J. Edwards, Cleveland, O., presented an illuminating lecture on the "Romance of the Lamp Industry." This was illustrated with a very large number of views tracing the historical development of artificial lighting from ancient times and leading up to the development of modern illuminants, particularly the electric incandescent lamp. The construction and manufacture of incandescent lamps was described in some detail and views shown of various stages in the process. Mr. Edwards then took up the portrayal of some fine examples of special lighting, particularly of the Panama-Pacific International Exposition at San Francisco. Other examples of flood lighting by means of projectors using Mazda type C lamps were also shown.

Samuel A. Freshney, Grand Rapids, Mich., then made an address on "Reminiscences of the Early Days of the Electrical Industry." Though the industry is said to be one of young men, yet the financing, public policy and general administration are largely in the control of men who have been engaged in electrical work for very many years. He touched on a number of incidents in the development of the industry, referring to such matters as when it was customary to employ a separate generator for each arc lamp. The old installation rules were very quaint in the light of modern practice. Mr. Freshney reviewed some of the developments of station equipment and described early business and sales methods. The early saelsman was frequently called upon to be promotor, designer, installation and consulting engineer, operator, and general all-around man. Some of these men have developed into leaders of the industry today. In the early days rule-of-thumb methods and guesswork were employed instead of mathematics. From these crude beginnings, however, the industry has evolved in a marvelous manner, and the extraordinary advance achieved has been with no little stress and strain on the part of those who participated.

On Tuesday afternoon a session was held in the nature of a round-table discussion of important problems before the central-station industry. President Fee introduced the subject of what may be expected in the way of further improvements in Mazda type C lamps. E. J. Edwards said that just as the vacuum type tungsten lamps have been steadily improved during the past five or more years, so it may be expected that the gas-filled lamps will likewise be improved. Through

Digitized by Google

further concentration of the filament and employment of special gas filling, it may be possible to reduce the size of lamp which can be manufactured of this type. However, the improvement in the efficiency of the small lamp will probably not be so radical.

Replying to a question by Mr. Freshney as to result of the new gas-filled lamps on central-station load and revenue, Mr. Edwards said that when the vacuum-type tungsten lamp was introduced this question aroused much trepidation on the part of central stations. However, it was found that the standard of illumination was greatly increased on account of the improved efficiency of the lamps and the load was not materially decreased. The tendency toward further improvement in standards of illumination is marked, and there is an urgent demand for more light and not less cost. Moreover, indirect lighting and semi-indirect lighting are coming into much greater vogue; these methods of illumination require more wattage than the older direct methods, and the increased efficiency of lamps now available permits this improved illumination without increase in cost. In many places, such as dry-goods stores, color-corrected lamps are also coming into more general use for accurate daylight color matching. As to whether the blue-bulb lamps are superior to mercury-vapor lamps in photographic work depends on whether it is desired to secure a light closely approximating daylight or an intensely actinic light.

The question of the comparative cost of magnetite arc lamps and gas-filled tungsten lamps was brought up and J. H. Lobban, of Detroit, presented the comparative costs of an installation of four-ampere magnetite arcs and one using 20-ampere 600-candlepower gas-filled tungsten lamps, each provided with a compensator. Included in the data were cost of power generation at one cent per kilowatt-hour, all incidental line and substation equipment costs, cost for trimming, lamp renewal, etc., and fixed charges on the investment. Each lamp was assumed to be operated 4,000 hours per year. The annual running cost per lamp for power consumed was given as $16.90 for the magnetite arc, and $17.09 for the tungsten lamp. The annual running cost per lamp for renewals, trimming, repairs, etc., was $7.12 for the magnetite, and $14.52 for the tungsten lamp. The annual fixed cost per lamp for transmitting power from the generating station to the substation 2,300-volt bus was $8.90 for the magnetite and $9.00 for the tungsten lamp. The annual fixed cost per lamp on the investment in special street-lighting equipment was $17.12 for the magnetite and $14.17 for the tungsten lamp. The summary gave the total annual cost per lamp as follows: $50.04 for the magnetite and $54.78 for the tungsten lamp. By the use of the new high-efficiency electrodes, the case for the magnetite lamp would be improved. By the use of prismatic refractors, the distribution curve for the tungsten unit would also be improved.

F. R. Mistersky, Detroit, agreed in general with the figures that Mr. Lobban had presented. The Public Lighting Commission of Detroit employs magnetite arcs for street lighting extensively and the results achieved check closely with the data cited. The study of the relative economy of the magnetite and type C lamps also gave similar conclusions. In the Detroit street-lighting system, the average life of mercury-arc-rectifier tubes is found to be 1,352 hours.

H. A. Reid, Cleveland, O., quoted some figures showing that the annual total cost for magnetite lamps was about $4 more than the new Mazda type C lamp. He said that the four-ampere magnetite lamps can be replaced to better advantage by 400-candlepower instead of 600-candlepower gas-filled lamps in order to give the same amount of light. This makes more favorable the use of the type C lamp. A valuable feature of using the latter units is adaptibility in that different sizes of these lamps can be used for different places in the city on the same standard series circuits, it being necessary to provide merely the proper compensators. In Mr. Reid's opinion refractors have been developed to such a high point that renewal thereof is necessary less than once a year and not as high as three times a year, as Mr. Lobban had thought would be required. The development of the refractor, in fact, is on a par with that of the development of the gas-filled lamp. W. J. Trott agreed with Mr. Reid as to the improved life and value of refractors. H. A. Fee said his central-station company in Adrian will replace old arc lamps with Mazda type C lamps equipped with the refractors; a higher price will be obtained for the lamps so equipped on account of the better light distribution they give.

S. A. Freshney cited a case that had recently come to his attention where a series arc generator had given after twelve years of continuous operation the low maintenance cost of only about 17 cents per lamp per year. He thought that this indicated that the old type of machine should still have a field instead of being replaced entirely by the mercury rectifiers. The question of the power-factor of magnetite-lamp installations was discussed by J. Gilmartin, J. H. Lobban and E. J. Edwards; the latter said that for a magnetite-arc circuit complete, including the substation equipment, the power-factor was about 65 per cent, whereas with the gas-filled lamps, including compensators and constant-current transformers at substation, the power-factor is 80 to 85 per cent.

President Fee and D. B. South, Detroit, then brought up the question of the need of a uniform system of rate making. This matter was discussed by H. W. Cornville, of Jackson, John A. Cavanaugh, of Benton Harbor, S. A. Freshney, F. B. Drees and others. Mr. Freshney emphasized the need for a demand rate on power customers in order to get a just return for emergency and breakdown service. He said that the rate question hinges entirely on two features. First the use of a demand rate based on, say, thirty hours' use of the demand and a low secondary rate. The latter encourages use of appliances and is the real source of profit in business. Mr. Drees agreed that it is necessary to have such a system as takes care of meeting the fixed charges through the first hour's use per day of the demand. Then a low secondary rate for prolonged use of current improves the load-factor and makes the business remunerative. He spoke of the possibility of trying out an experimental rate for any new class of customers which becomes a uniform schedule rate after one year, open to all customers in any similar class. Several speakers cited the rates which they employed and there was a general consensus of opinion that what was desired was not uniformity of rates but a uniformity of system, the exact rates depending upon local conditions.

When the question of farm lines came up for discussion J. A. Cavanaugh, Benton Harbor, spoke of the development his company has brought about in rural lines. Most of these have over twenty customers per mile and an average income of about $36 per year per customer. The average transformer installation per customer is one kilowatt. The regular residence rates are used and the same rate is made for power and lighting, with the demand based upon the number of rooms in the house. The company furnishes all of the line equipment and transformers. Single-wire lines that formerly were employed have practically all been abandoned and two or three-wire lines are now in general use.

The question was further discussed by D. B. South, H. W. Cornville and L. B. Schneider. The latter said that his plant at Tecumseh supplies farmers' lines that are tapped off from a transmission line to an adjacent town.

Digitized by Google

The branch lines are built by the company and the farmers pay two-thirds of the cost of construction; they also pay for their individual transformers. These payments, however, are a pure donation on their part, and the company owns the entire line and transformer equipment. The farmers are glad to secure the services and have contributed freely to enable them to obtain it.

On Wednesday morning a brief executive session was held at which the chief item of interest was the report by the nominating committee of a list of officers to serve for the ensuing year. These were elected as follows:

President, Samuel A. Freshney, general manager, Grand Rapids-Muskegon Power Company, Grand Rapids.

Vice-president, Thomas Chandler, Edison Sault Electric Company, Sault Ste. Marie.

Secretary and treasurer, Herbert Silvester, Edison Illuminating Company of Detroit.

Executive Committee, A. C. Marshall, Detroit; John A. Cavanaugh, Benton Harbor; A. D. Furlong, Saginaw; H. W. Cornville, Jackson; H. A. Fee, Adrian.

The Supply of the Netherlands With Electric Energy.

A special commission, which was appointed some three years ago in order to investigate the question of the rational supply and use of electric current in the Netherlands, has recently completed its report. This report is very exhaustive, and deals in a clear and comprehensive manner with the question, at the same time throwing a considerable amount of light upon the use of electric energy generally. Thus a table deals with the electric installations in several of the smaller countries:

Countries.	Area in Square Miles.	Number of Inhabitants.
Holland	12,200	6,114,000
Denmark	15,000	2,172,000
Wurtemburg	7,500	2,505,000
Switzerland	15,500	2,753,000
Belgium	11,200	7,490,000
Pavaria	29,200	6,887,000

If the number of installed kilowatts is taken at 1 per 1,000 inhabitants as a unit, the figures for the following countries are:

Bavaria	0.8
Denmark	0.9
Wurtemburg	1.5
Belgium	2.7
Switzerland	6.4

The average consumption of electric energy per inhabitant in 75 European municipalities is, respectively, for municipalities with up to 50,000 inhabitants, 29.9 kilowatt-hours; municipalities with up to 100,000 inhabitants, 56.3 kilowatt-hours; municipalities with more than 100,000 inhabitants, 68.9 kilowatt-hours. In Holland the figures for respectively, 9, 6 and 3 municipalities are 16.1, 30.9 and 42.1 kilowatt-hours per inhabitant. In Germany the average consumption per inhabitant was 30 kilowatt-hours in the year 1911, against an average of 16.2 kilowatt-hours in Holland.

In Holland there were in 1913 altogether 82 electric stations for public supply of current, viz., 24 town stations, of which 10 also supplied current to tramways, 40 private stations, 4 private tramway stations, and 14 stations or auxiliaries at industrial undertakings. The aggregate capacity of the generators was 87,500 kilowatts.

The capital invested in the above undertakings amounted to $13,400,000. The energy supplied in 1912 was:

	Kilowatt-Hours.
For lighting purposes	32,231,446
For power	32,772,792
For tramways	31,365,946
Total	97,370,184

The number of factories with an electricity supply of their own was on January 1, 1913, 1,360, with a capacity of 129,500 kilowatts, and with these were connected 7,057 motors, with a capacity of 62,984 kilowatts, while 11,049 motors, with an aggregate capacity of 36,606 kilowatts, were fed from the above mentioned 82 stations.

As regards the future probable consumption for lighting purposes, the increase appears to be fairly regular, on similar lines to that of gas. The consumption of electric current for lighting is expected shortly, or within the next few years, to amount to, respectively, 20, 15 and 8 kilowatt-hours per inhabitant in towns of more than 100,000 inhabitants, in towns with from 10,000 to 100,000 inhabitants, and in the country, making an annual consumption for the whole country of 84,787,000 kilowatt-hours.

The question as to whether industrial concerns might be disposed to discard their own supply of electric energy, and draw their requirements of current from the existing or new central stations, has also been fully gone into. A number of concerns were of opinion that the most advantageous arrangement for them would be to run their own stations regularly at their maximum yield, and only take any additional requirements from public supplies. The price for current for various branches ranged from 0.8 to 2.4 cents per kilowatt-hour. Factories with a large consumption of steam were somewhat differently situated. The result of the investigation shows that the larger industries should not pay more than 0.8 to 1.2 cents per kilowatt-hour (and at this price some of the large stations are already able to supply current), while the smaller industries probably would use electric energy even at a price of 3 to 4 cents per kilowatt-hour. The annual consumption to be expected is calculated at 170,858,000 kilowatt-hours for the larger industries and 12,151,000 kilowatt-hours for the smaller industries.

The amount of electric energy likely to be wanted for agricultural purposes is estimated at 3,690,000 kilowatt-hours, but a considerably larger amount is calculated for the many pumping stations, locks, etc., peculiar to Holland. These installations require a considerable amount of power, which is at present supplied by windmills, steam engines, motors, and several electric stations. The former represent an aggregate capacity of 6,700 kilowatts; the steam engines, etc., of 18,740 kilowatts, and the likely annual requirement of electric energy is calculated at 13,500,000 kilowatt-hours. This figure would be more than trebled should electric power also be used for the contemplated laying dry of the Zuyder-Zee, inasmuch as this is expected to demand an annual aggregate of energy of about 34,000,000 kilowatt-hours. At present there is electric traction on the Hague-Rotterdam railway and on eight tramways, but there is a question of electrifying, perhaps, a half dozen other lines where steam traction is used at present.

The future consumption of electric energy from central stations in Holland is specified as follows:

	Kilowatt-hours.
Industry	183,009,000
Lighting	84,787,000
Agriculture	3,690,000
Laying dry of land	13,394,000
Traction	36,605,000
Total	321,485,000

Dutch municipal electric stations often develop into power supply plants, but the area is not, as a rule, larger than what is covered by a radius of 10 miles; with a maximum voltage of 10,000 volts underground cables can be used without hesitation. The area can be extended by means of feeding lines and distributing stations, either with the former voltage of 10,000 volts or with a much higher voltage, say, 30,000 to 40,000 volts, which would make it possible to supply an area within a radius of, say, 35 miles on a financially satisfactory basis.

Steam is mostly used in Holland for generating electric energy; coal is the usual fuel, peat is used at one place, but does not, as a rule, answer.—*Engineering.*

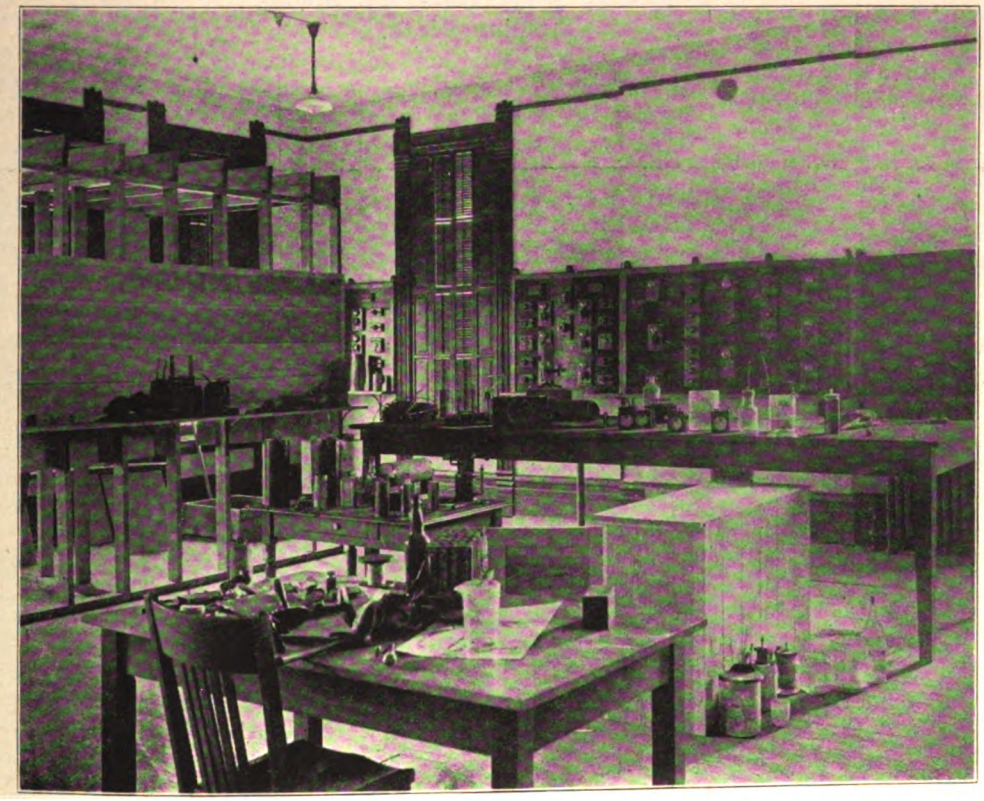
All electrical signs in Baltimore, Md., must hereafter be kept lighted until 11 p. m., according to an order issued by the local Board of Estimates.

Digitized by Google

Rockford Vocational School Co-operates with Central Station in Training Employees.

One of the questions which is receiving careful consideration from central-station companies throughout the country is that of educating employees. In the larger communities, even where there is an almost unlimited supply of experienced help, utility companies have found it expedient to establish schools for training employees or in some other way to provide for the education of their men.

The Rockford (Ill.) Electric Company is particularly fortunate in this respect, in that there has recently been established there the Rockford School of Engineering, a vocational school covering not only electrical work but mechanical engineering, civil engineering, drafting and machine designing, architecture, furniture designing and other subjects.



Section of Electrical Laboratory of Rockford School of Engineering.

While the Rockford vocational school is an entirely independent institution, self-supporting in every respect, its electrical department is virtually a training school for Rockford Electric Company employees and applicants and Adam Gschwindt, vice-president and general manager of the utility, is a director of the school and very active in its affairs.

The practical electrician's course is intended to give a thorough practical and theoretical course in all the branches which an electrician must know such as wiring, trouble "shooting," armature winding, sign lighting and a general course in alternating and direct-current work. An electrical-engineering course is also available which covers, in addition to the foregoing, design of electrical machinery and general electrical engineering problems.

Experienced employees of the Rockford Electric Company assist the regular staff of instructors in the electrical department and papers and addresses are also given by representatives of manufacturers and others.

The school is open to all who pay the tuition and no guarantees are made as to positions or to employer after graduation but the growth of the electrical business in Rockford practically insures employment for graduates, either with the utility company, electrical contractors or with one of the local manufacturers. Night and day classes are held and also part-time courses, the latter enabling students to work certain days of the week while obtaining a schooling in that work. Several of the employers of Rockford have arranged for their apprentice employees to take such practical courses.

The Rockford School of Engineering has a present enrollment of over 175 students, many of whom are taking electrical courses. H. A. Taveira is director and the faculty comprises eight instructors. A partial view of the electrical laboratory is shown herewith.

Government Electric Power and Telephone System in Uruguay.

The new president of the National Power Houses Board, Señor B. Lascoity, Usina Eléctrica de Montevideo, Montevido, Uruguay, has stated the intentions of the government in regard to electric power in Uruguay. The object is to give good service to the public and to devote profits to improvement of the service and reductions of the rates. It is hoped to reduce the rate for small industries in Montevideo from 5.5 to 4.5 cents per kilowatt-hour, an advantage already enjoyed by the larger industries, as those taking power on a large scale get it for 2 cents. The board is also considering means to reduce the rate for poor people, and for employees of the power house. The present rate is 12 cents per kilowatt-hour, and a reduction of from 2 to 4 cents is anticipated.

Light and power will be extended to the principal towns. La Paz and Las Piedras are about ready. At Pando and Tacuarembo the power houses now building will be finished in four or five months. The government expects to purchase the corporation-owned power houses, and is already negotiating for those at Paysandu, Rivera, and San Jose.

Part of the profits of the national electric light and power system will be applied to the construction of national telephone lines, which will be underground in the capital city (Montevideo) and aerial in the interior. Tenders will be called for to supply either an automatic or a manual system, and the kind of system will be decided upon after the bids are made. A double copper circuit with central-battery system will be used, and the aerial lines will also have a double copper circuit. The line will cover a wide area, embracing the capital and contiguous departments. The total cost is placed at $2,500,000.

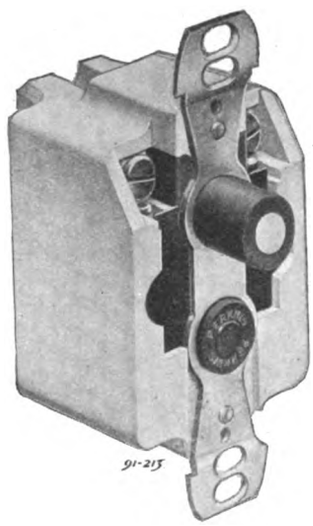
To effect all this the governmental power house (Usina Eléctric de Montevideo) must be considerably improved. It is intended to increase its capacity with an alternating-current unit of 8,000-kilowatt rating. Another plan under consideration is to transform some of the boilers in order to burn crude petroleum, which is cheaper than coal and fluctuates less in price. It is also contemplated to electrify about ten miles of government-owned street railway.

Digitized by Google

New Electrical and Mechanical Appliances

New Push-Button Wall Switch.

The Perkins Electric Switch Manufacturing Company, Bridgeport, Conn., has put on the market a new two-button push switch of simplified design and construction, which is known as the "Capax" switch. Every part is thoroughly substantial and of mechanically correct design. While the action of the device is positive and quick, the movement of the buttons is less than seven-sixteenths of an inch, the button which is projecting standing out only one-half inch beyond the face plate. A fiber shield, protecting the entire mechanism from dust and dirt during and after installation and until the face plate is applied, is permanently secured in position by the supporting yoke.



New Perkins Wall Switch.

The switch is rated 10 amperes, 125 volts; 5 amperes, 250 volts. It is National Electric Code standard and labeled. The "Capax" switch has been developed to enable the manufacturer to offer an exceptionally good article at the price of other competitive switches. It is not expected, however, that it will noticeably affect the sales of the higher-priced switches made by the Perkins company.

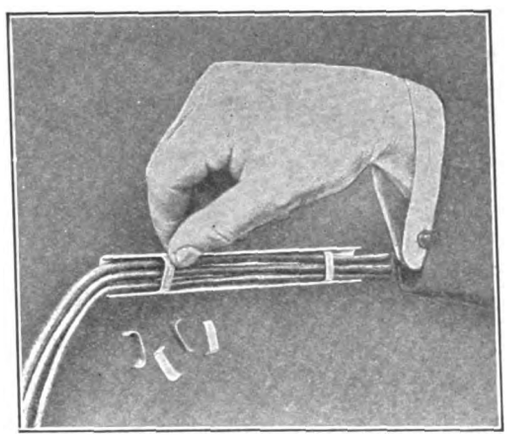
Arizona Asbestos for Electrical Insulation.

A report by the United States Geological Survey states that the asbestos which during the past year has begun to be produced in Arizona is of a high grade of fiber that compares favorably with that found in Canada. For electrical purposes it is even better than the extensively used Canadian product, for it contains a lower percentage of iron.

Edwards Wire Hold for Metal-Molding Work.

The Edwards wire hold is a unique device, one of a new line of metal-molding fittings being produced by Edwards & Company, Incorporated, 140th and Exterior Streets, New York City, under the patent granted to James Stewart.

The wire hold is a small spring-steel article formed to fit inside the base of metal molding into which it snaps with very slight pressure, and securely holds the wires (two or three, as the case may be) in position, so that both hands of the workman are free to apply the capping to the base. The wire hold is so small that it may be left inside the molding when the capping is put on, without interfering in any way with that operation.

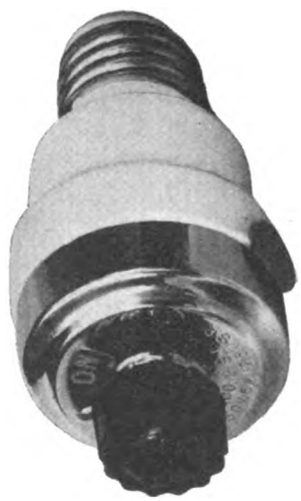


Wire Hold for Metal Molding.

To those who use metal molding the new wire hold will prove itself of great advantage not only in the efficiency and facility which it assures, but also in the economy of time and labor which its use affords. On ceiling and side-wall runs, the difficulty of applying the capping and at the same time holding the wires in position is well realized by those familiar with this type of installation. The new device does away with this difficulty. Where two men are usually required to wire the molding and apply the capping, the wire hold reduces the work to a one-man job. Furthermore, by the use of this simple and inexpensive wire hold, a job may be wired completely before the capping is put on, the wires being left exposed for inspection if desired.

Combined Snap Switch and Separable Attachment Plug.

A combined snap switch and separable attachment plug, a device designed especially for increasing the flexibility of fan-motor control, has recently been marketed by the General Electric Company. The separable cap consists of a single-pole snap switch with two finger contacts which fit into the body of a separable attachment plug. The plug, in turn, is screwed into any available socket or receptacle, and from this point, the fan or other portable appliance can be turned on or off. In some cases this additional point of control is of great convenience. The switch cap may also be used without the attachment plug, as the finger contacts fit any standard General Electric separable receptacles.



Attachment Plug With Snap Switch.

New Electric, Tankless Air-Pressure and Vacuum Outfit.

This outfit is made for air-pressure and vacuum service in doctors' and dentists' office. The principal advantage of the outfit is that no pressure tank is required and the outfit there-

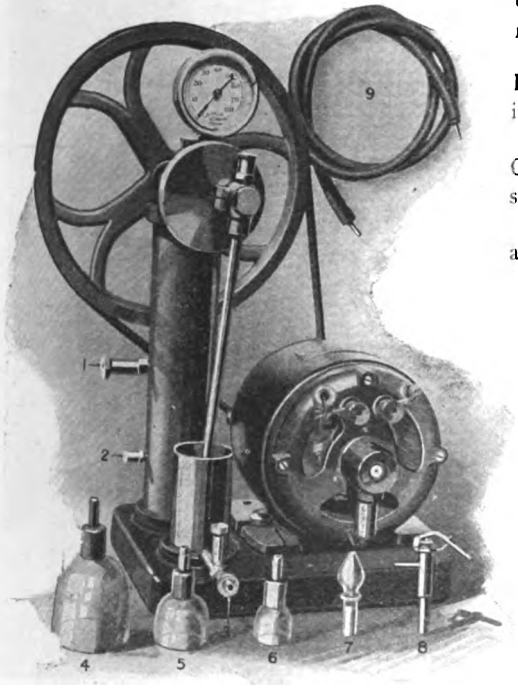
Digitized by Google

fore requires very little space. The total bench or floor space required is 7 by 9 inches and the overall height is 16 inches.

The outfit is started and stopped as the air service is required, the various attachments being connected directly to the pump. It is equipped with a one-tenth horsepower motor, alternating or direct current, supplied by the Robbins & Myers Company, Springfield, O. The motor is started and stopped by a foot switch.

All parts of the machine except the base and motor are of nickel finish. The motor and base are finished in black japan.

In using the machine for massage treatment alternate pressure and suction are applied, thus bringing the blood to the surface as well as supplying vibration.



Direct-Acting Air-Pressure and Vacuum Outfit.

In the illustration *1* is the pressure regulating valve; *2* is the connection for air pressure; *3* is the connection for vacuum; *4*, *5* and *6* are cups for general massage, cupping and hyperemia; *7* is the nozzle for nasal and ear massage; *8* is the automatic cutoff valve for pressure, and 9 is the tube for connecting the pump and attachments.

The outfit is furnished complete with the above attachments, cord, plug and motor. It is manufactured by the Engeln Electric Company, Cleveland, O.

High Honors Awarded Western Electric Products at Exposition.

The International Jury of Award of the Panama-Pacific International Exposition announces that it has awarded the following medals to the Western Electric Company.

The Grand Prix for the exhibit as a whole.

Gold medals, each were awarded as follows:

One for telephone switchboards and equipment.

Another for telephone train dispatching and control apparatus.

A third for insulated wires and cables.

Two bronze medals were awarded for the company's mine rescue equipment and mine telephones.

The following silver medals were awarded to manufacturers of electrical devices, with the distribution of whose products the Western Electric Company is closely identified. These companies had their products displayed in the Western Electric Company's exhibit.

To the American Electrical Heater Company for electric irons.

To the Gray Pay Station Company for telephone pay stations.

To Edwards & Company for annunciators.

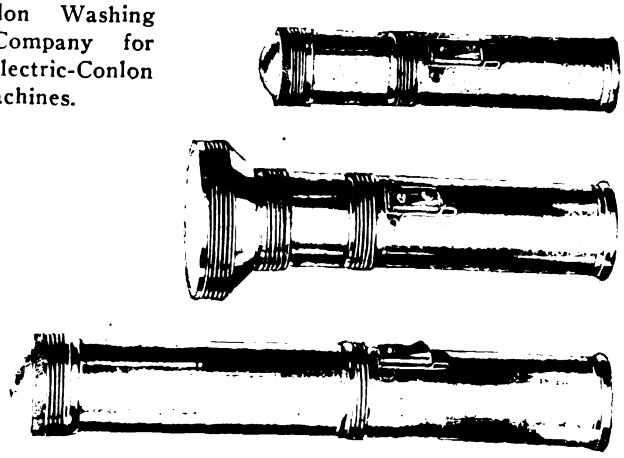
To Conlon Washing Machine Company for Western Electric-Conlon washing machines.

Metal Tubular Flashlight.

A new line of metal tubular electric flashlights has recently appeared on the market. These are said to have several superior features. They are particularly durable, the cases being drawn from solid sheet brass. The lower piece telescopes the upper near the center. This insures maximum strength and permits engaging the screw threads without effort, an obvious advantage over the old, aggravating method of attempting to screw on a small end cap with a spring in it. The construction is such as to eliminate the danger of short-circuiting the battery.

The lens is secured by a separate screw end ring. This allows a broken lens to be replaced without procuring an entire new head. Five different sizes of the new flashlight are made, and each is offered in the following finishes: heavy polished nickel, gun metal and statuary bronze.

The metal tubular flashlight briefly described and illustrated above is but one of the many styles of "Kwik-lite" flashlights and battery lanterns now being manufactured by the Usona Manufacturing Company, 1 Hudson Street, New York City, and 309 South St. Clair Street, Toledo, O. The company manufactures 65 different kinds and finishes of flashlights and lanterns, together with a full line of "Kwik-lite" batteries and Mazda flashlight lamps.



New Types of Metal Tubular Flashlights.

Outdoor Switch Houses.

Outdoor substations have made necessary an outdoor type of switching and metering equipment to control and measure their output satisfactorily. As economy and simplicity are generally the determining features in the selection of this type of substation, conditions call for an efficient, yet compact and inexpensive, equipment to be provided for the low-tension circuit. Primarily intended for outdoor mounting, the exposed location demands a housing that is weatherproof and at the same time affords protection to the apparatus contained therein against marauders or unauthorized persons.

To meet this demand, the Westinghouse Electric & Manufacturing Company has developed a line of outdoor switch houses filling the requirements outlined above. Two designs have been developed, one for pole, wall or tower mounting is illustrated in Fig. 1; the design shown in Fig. 2 is intended for mounting on the ground. The idea of simplicity has been kept foremost in working out these designs.

The housing of both types consists of sheet steel, built up on structural steel framework with a large door in front to permit ready access to the apparatus. All the apparatus contained within the switch house is accessible from the front, and it is not

Digitized by Google

necessary to remove the back of the house in order to get at any of the apparatus or wiring.

The switching equipment consists of a full-automatic, self-contained, series-tripping, oil circuit-breaker mounted directly on the steel framework of the house. This eliminates the necessity of a slate panel for mounting the breaker and its operating handle. Such a panel is objectionable, as it involves the necessity of a door for the back of the house in order to remove the tank of the breaker or to properly inspect the apparatus. Another feature made possible by the use of this breaker is the decreased depth of the house over that required in one using switchboard-mounted breakers; approximately 18 inches being saved.

The metering equipment consists of a standard house-type polyphase watt-hour meter together with the necessary current and voltage transformers, fuse blocks and fuses. The meter is mounted on a small slate panel on which are also placed the necessary current and voltage terminals provided for the connection of the operating company's testing and calibrating meters. In the house illustrated in Fig. 2, two single-phase watt-hour meters are used in place of a polyphase meter.

"Safety First" has also been considered, the voltage transformers being mounted in such a manner and all other voltage leads placed in such a way that accidental contact with them is impossible. The inlet and outlet bushings are placed high enough above ground to prevent the possibility of any one coming in contact with the incoming or outgoing leads.

The pole-mounting feature of the switch house in Fig. 1 is claimed as an exclusive feature. Eliminating the necessity of removing the back makes it possible to install this house on hanger irons for pole-mounting in the same manner as a transformer, the approximate weight being about 600 pounds. It may also be mounted on steel towers, which method is being rapidly adopted by a great number of operating companies. The switch house is also adapted for mounting on a wall in proximity to the apparatus controlled.

These houses are shipped completely wired and equipped ready for service with the exception of mounting the watt-hour meter and filling the breaker tanks with oil, so that the only work necessary after arrival at destination is to perform these two operations, connect the incoming and outgoing leads, and the outfit is ready for service.

A complete line of these switch houses is now available of either type in any capacity up to 300 amperes, 2,200 volts and 4,500 volts.

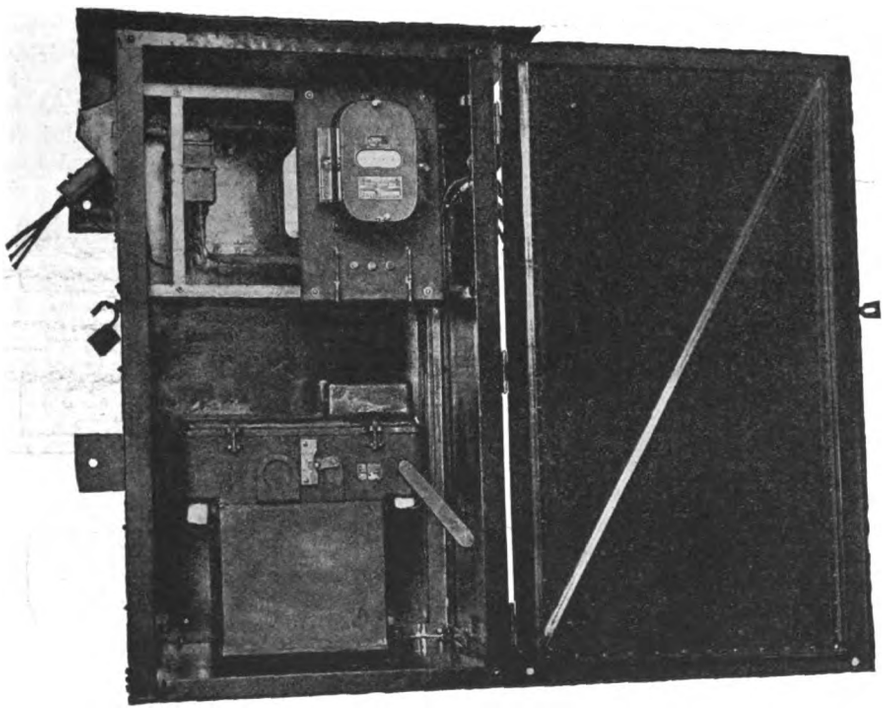


Fig. 1.—Outdoor Switch House for Pole, Wall or Tower Mounting.

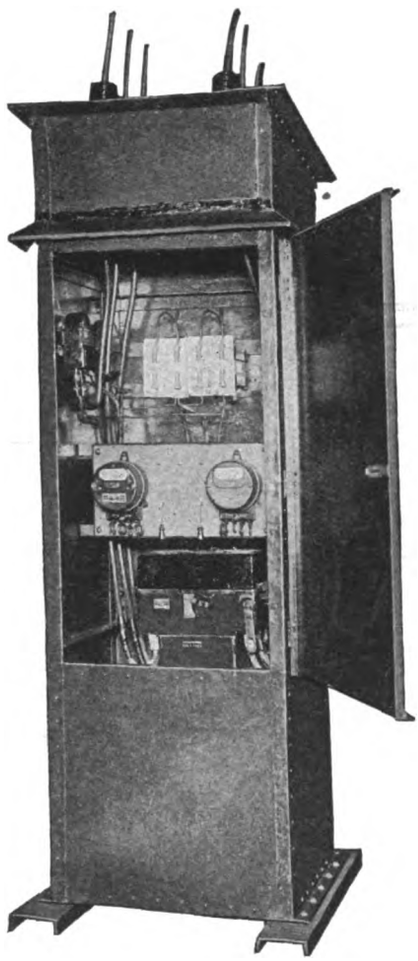


Fig. 2.—Switch House for Use on Ground.

Copper Deposits of Ketchikan.

The copper deposits of the Ketchikan district, southeastern Alaska, were known to the Russians before the acquisition of the Territory by the United States, and there was a crude attempt to develop them as early as 1880. It was not until 1901, however that systematic mining was begun and not until 1905 that a large annual output was made. Up to the close of 1913 the copper mines of the Ketchikan district had produced about 22,640,000 pounds of copper, valued at $3,760,000, and about $500,000 worth of gold and silver.

Most of the mines of the district lie at or near tidewater. There is an abundance of timber, and the relief favors the undercutting of the ore bodies. While there are as yet only a few producing mines, there are many undeveloped copper prospects which give promise of containing commercial ore bodies. Many of the copper deposits show an irregularity of occurrence that is unfavorable to cheap exploitation, but otherwise the conditions are favorable to low mining costs.

Improved Industrial-Type Oil Switch.

The type of oil switch illustrated herewith, is used extensively in industrial establishments to control and protect induction motors up to 2,500 volts and 300 amperes. It can be mounted on a wall, post or other vertical flat surface, or by means of suitable supports on the machine operated by the motor. The switch is made by the General Electric Company in both non-automatic and automatic forms; the first is used simply like an ordinary switch to start and stop the motor, and the second as a starting and circuit-breaker to cut off current from

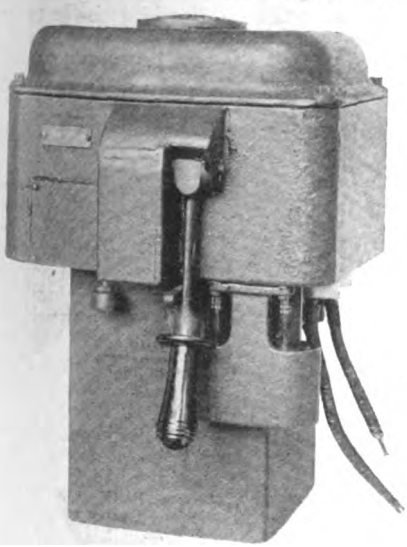
Digitized by Google

the motor automatically on the occurrence of an overload.

Through a recent improvement in the design of the mechanism, a low-voltage trip can be added to the automatic switch as an attachment at any time. To the non-automatic switch, either a low-voltage trip or a series-overload trip, or both, can be added whenever desired.

Up to 550 volts (except on 110-volt, 60-cycle circuits, where the trip coil alone is sufficient), an autotransformer is used in place of the resistance previously required in series with the low-voltage tripping coil. This transformer has taps to which proper connections can be made for the operating voltage. For 2,200-volt circuits, a new type of voltage transformer replaces the transformer and series resistance used heretofore. The use of the new autotransformer, or voltage transformer, makes the watt loss in the low-voltage device practically negligible.

Switches can also be furnished with



2,500-Volt Oil Switch With Series Overload and No-Voltage Release.

covers arranged to mount a round-pattern ammeter and thus provide, in addition to control and protection, a means of knowing at all times the amount of current taken by the motor.

Fargo Connecting Devices.

The accompanying illustrations show three of the connecting devices made by the Fargo Manufacturing Company, Incorporated, Poughkeepsie, N. Y. Fig. 2 shows the Fargo grounding device, which eliminates the use of bolts and nuts, providing a permanent and reliable ground. This grounding device establishes a positive connection, the wires being locked together, forming a joint of high conductivity. The ease of installation of this grounding device makes it a great time-saver, and the simplicity of construction enables it to be manufactured and installed at a low cost.

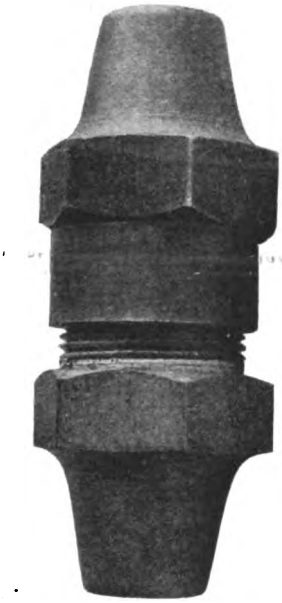


Fig. 1.—Straight Connector.

Fig. 2.—Ground Device.

Fig. 3.—Cable Lug.

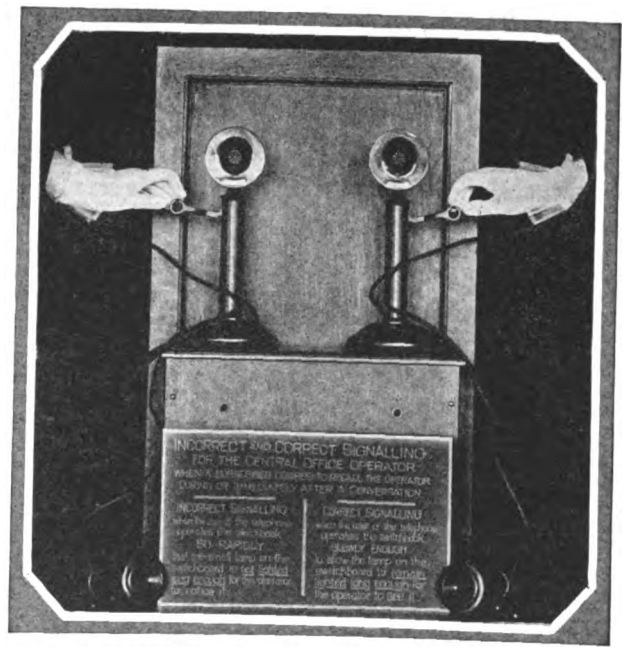
Fig. 1 shows the straight-type connector This connector establishes a joint of low resistance, the gripping part having three times the cross section of the wire or cable.

Fig. 3 shows the cable lug.

These devices all establish an intimate metallic contact, the joints having an extremely low resistance. They depend upon the principle of reciprocating conical wedges so disposed that as the strain increases the greater is the gripping effort of the connecting devices.

Instructive Telephone Window Display.

An electrically operated demonstration of the right and the wrong way to call central operator, once a telephone call has been made, is on exhibition at the Tremont Street commercial branch office of the New England Telephone & Telegraph Company, Boston, Mass.



Effective Telephone Demonstration.

In the window is displayed a cabinet about 3 feet high and 2 feet 9 inches wide, made of oak frame and back, with red plush sides through which a plaster of paris hand protrudes from either side and touches the switch hook of two telephone desk sets which are on a shelf, beneath which are ruby switchboard lights.

In the box under the cabinet is located a one-third-horsepower motor, which operates eccentrics that lift and lower the two hands. The hand at the left is operated fast, and the other hand slowly, denoting the proper and improper manner of calling "Central's" attention. At the same time, the switchboard lights flash quickly and slowly, respectively, evidencing to the public that the slow way is the right way to operate the hook.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

SOUTH NORWALK, CONN.—A new ornamental street-lighting system is being considered, to consist of combination poles with arms to support tungsten lamps and an extension to carry electric railway wires. The city is considering the purchase of a 250-kilowatt motor-generator set for conversion of 11,000-volt alternating current to 230 volts direct current.

BRIDGETON, N. J.—The Ferracute Machine Company will shortly begin the erection of a new building at their plant here.

BETHLEHEM, PA.—The Catholic Church of the Holy Ghost will erect a $50,000 church and orphanage here.

SPRING HOPE, N. C.—The Eastern Carolina Light and Power Company will construct a hydroelectric plant on Tar River, three miles from Spring Hope, and electrical transmission systems to several towns, and will ultimately develop 2,000-horsepower.

NORTH CENTRAL STATES.

ATHENS, O.—The Athens Electric Company has increasd its capital stock from $10,000 to $75,000.

CANTON, O.—The lighting committee of the City Council is considering plans for the type of posts and other details of the street-lighting system to be installed, which may be extended to a number of streets not at first to be improved. Residents have petitioned for the new system on their streets, and it may be found possible to extend the system. L.

CINCINNATI, O.—The extensive use of electricity and electrical equipment on one of the largest construction jobs handled here for several years is proposed by the Charles McCaul Company, which has the contract for the building of the new courthouse. All machinery which can be electrically operated will be arranged for motor drive, the company believing that the elimination of smoke and the other advantages resulting from the use of electricity will be sufficiently important. L.

CINCINNATI, O.—The power house at Ohio River Dam No. 29 will probably be constructed and equipped by Geo. W. Ward & Son, of Ashland, Ky., on their low bid of $18,777. The bids are in the hands of the War Department, with a recommendation in favor of the concern named. L.

SPRINGFIELD, O.—About $15,500 will be expended by the city in the installation of a boulevard lighting system for a number of streets in the central part of the city, plans and estimates having been approved by the City Commission. Items estimated include posts (294), $7,056; globes, $1,764; lamps, $449.82; cable, $7,711; installation and wiring, $1,470. L.

CANTON, ILL.—Members of the City Council are considering the installation of a municipal electric light plant at the waterworks. City Engineer Brickner is making an estimate on the cost and plans showing the distributing system.

OREGON, ILL.—Arrangements are being made to install a new system of lighting. Address Mayor.

WESTBY, WIS.—The contract has been awarded and work started on a municipal electric plant. Address E. E. Dillion, constructing engineer, Madison, Wis.

CLOQUET, MINN.—Bids on the fire alarm and signal system of the new fire hall were rejected at a meeting of the Council June 22. Councilman Yetka has made an examination of the Duluth fire alarm system and will report and make recommendations to the Council. A desirable system, it is thought, will cost about $5,000. X.

COLERAINE, MINN.—Work on the high-tension transmission line of the Great Northern Power Company, from Nashwauk to this village, is in progress, and it is expected that within a month Coleraine will receive power and light from Virginia. X.

LAKEFIELD, MINN.—This village has voted $31,000 worth of bonds for the construction of an electric light and power plant. X.

MENAGHA, MINN.—B. Gunderson, of Park Rapids, Minn., is investigating the feasibility of installing an electric light and power plant here. X.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company is to supply power and light to Osseo, Rockford, Deleno, Watertown, St. Bonifacius and Waconia by means of a trunk-line extension from the Coon Rapids power dam. The line will be completed by November 1, and will have an aggregate length of 65 miles. In Osseo the distribution will be by the General Electric Company, but in the other towns the current will be wholesaled to local companies.

FREDERICKSBURG, IOWA.—The citizens have voted in favor of a bond issue for an electric lighting plant. Address City Clerk.

FULLERTON, NEBR.—A bond issue of $28,000 was voted for the establishment of an electric light and power plant. Address City Clerk.

GOFF, KANS.—The town is agitating the calling of an election to vote bonds for the purpose of establishing an electric light system. It is planned to build a 12-mile transmission line from Corning, and Soldier promoters promise to stand half the expense. Address City Clerk.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—In order to be able to make extensions of its service, under the usual regulations, at will, inside Jefferson county, outside the city of Louisville, the Louisville Gas and Electric Company has asked for a franchise covering the whole county. Several transmission wires extend out into the county now, but whenever it is desired to run service wires from them, if these wires cross a public road, it is necessary to get special permission to construct it. It is to obviate this troublesome formality that the franchise is asked for. The Fiscal Court is expected to grant the right to do business outside the city, an upset price of $100 having been set on it. This does not indicate an immediate extension of service all over the county, though it would enable the company readily to supply service wherever it was demanded.

LOUISVILLE, KY.—Electrical contractors of Louisville are looking forward with considerable interest to the award of the contract for construction of the $300,000 Y. M. C. A. building, at Second Street and Broadway. The general contractors' bids are in but not as yet awarded. John Bacon Hutchings is the architect.

MAYSVILLE, KY.—G. A. Hill & Company, of Maysville, have been awarded the contract for electric wiring and fixture installations for the new public school house at Ripley, Ky.

OWENSBORO, KY.—The City Council has voted to supply electric current from the municipal power plant free to those who will install and maintain "white way" standards in Frederica and Second Streets. A previous installation has been allowed to deteriorate, but on the signed promises of property owners to keep the posts and globes in repair and lamps burning, the Council has renewed the free offer of current.

BENTON, TENN.—By the terms of an agreement reached between the local Chamber of Commerce and W. F. Hoover, vice-president of the Tennessee Power Company, Benton is to be given an electric light service. The company will make the surveys and install the lines while the community supplies the rights of way. Mayor Copeland and a committee are making final arrangements with the company.

DANDRIDGE, TENN.—A bond issue of $10,000 to construct an electric light plant is under consideration here. The Mayor is directing the project.

MARYVILLE, TENN.—Specifications have been issued by Mayor Sam Everett, and R. C. Huston & Company, engineers, of Memphis, for a municipal water system, calling for alternate bids for electric-driven units to operate from deep wells.

WAVERLY, TENN.—Slayden & McNabb have asked for prices on electric wiring for a $6,000 residence at Scottsville, Ky.

BOSWELL, OKLA.—The city will build an electric light plant to cost about $14,000. Bonds have been issued for the purpose. D.

BARTLETT, TEX.—The electric light plant has been sold to the Texas Light and Power Company, of Dallas, for the sum of $22,000. The company has been granted a fifty-year franchise, and will take possession of the plant on September 1.

Digitized by Google

DALLAS, TEX.—At a called meeting of the board of directors of the Texas Power and Light Company, favorable action was taken on a proposition to vote $140,000 additional bonds to be used in making improvements and extensions of the company's properties. Address J. F. Strickland, president.

DENISON, TEX.—The Texas Power and Light Company will build a big power plant in Denison. Address R. B. Sticher, general manager of the Texas Traction Company.

VICTORIA, TEX.—Steps will be taken soon to construct a municipal electric light plant here to cost $40,000. Bonds have been issued and approved by the Attorney General's Department for the purpose. D.

WESTERN STATES.

ANACONDA, MONT.—The City Council has passed a resolution of intention creating Improvement District 65, including Hickory, Locust and Maple Streets, and cross streets in the district; also Improvement District 64, including Main Street, above Third Street, wherein an up-to-date lighting system is to be installed. O.

PRESCOTT, ARIZ.—The Arizona Power Company will use the proceeds of the $200,000 bonds which it recently issued for constructing a second hydroelectric plant on Fossil Creek, near here. The new plant, in connection with the one which the company already operates on Fossil Creek, 48 miles from Prescott, will be used to supply power for industries in Prescott and other towns and communities of this region. They will also supply electrical energy to the Prescott Gas and Electric Company, a subsidiary concern. D.

BLACKFOOT, IDAHO.—The City Council has announced its intention of investigating several available water power sites with the view of installing a municipal lighting and power plant. A majority of the members of the council, as well as influential business men, favor the proposition. O.

COEUR D'ALENE, IDAHO.—The City Council has instructed the light committee to apply to the Idaho Public Utilities Commission for permission to construct and operate a municipal electric light and power plant.

GRACE, IDAHO.—W. A. Kraner & Co., Chamber of Commerce Building, Portland, Ore., has been awarded the contract for the penstocks in connection with the 15,000-horsepower hydroelectric development of the Utah Light and Power Company here. The contract will include the erection of 1,000 tons of plate steel, seven and one-half feet in diameter penstocks, to operate under a 500-foot headway, and for the installation of a Butterfly gatevalve, Ys., etc. Work on the project, it is understood, will be started as soon as materials can be placed on the ground. O.

MISSION CITY, B. C.—Reported property owners on July 20 will make application for the creation of a rural street lighting district on the local improvement system. Alexander Stephens, et al., here, are back of the proposition, which entails the expenditure of several thousand dollars. O.

BEND, ORE.—This city on August 4 will vote on the proposition of granting an electric light and power franchise to the Steidl-Tweet Company. If same is granted the company plans the expenditure of thousands of dollars in Bend and vicinity. O.

EUGENE, ORE.—The proposition of installing a steam electric auxiliary of 1,250 kilowatts to the present municipal power plant, is being considered by the Council. The present plant consists of two 700-kilowatt generators. Estimates, specifications and tentative plans have been presented to the City Council who, as a whole, favor making the improvement. O.

MEDFORD, ORE.—The City Council here has been petitioned by the Rogue River Public Service Corporation for a light and power franchise. The light committee has recommended that the Council grant the petition. O.

PRAIRIE CITY, ORE.—The Prairie City Light Company, according to reports, will start within the next few weeks on the construction of a $50,000 light plant; according to report, machinery has been ordered for the power house, which will have an 800 horsepower capacity. Water will be conveyed from the river at a point near the present power house, about three miles above Prairie City. O.

SEASIDE, ORE.—This city has entered into a contract with the Pacific Light and Power Company, of Portland, whereby a system of streamer lights will be installed the entire length of Broadway, leading to the beach. Several blocks of cross streets in the business portion of the city will be illuminated in the same manner. Installation will be made as soon as materials and equipment can be purchased. O.

COLVILLE, WASH.—The Stevens County Light and Power Company recently leased a large power site at Myers Falls, owned by George E. Myers, of Spokane, and according to all reports, will construct a large power plant on the site in the immediate future. Current to be generated will be sold to Colville, Kettle Falls and other small towns in Stevens County. O.

ELLENSBURG WASH.—The County Commissioners, of Kittitas County, have been petitioned by the Pacific Telephone and Telegraph Company, head offices in San Francisco, for a franchise to construct, maintain and operate telephone lines along county roads in Kittitas County. O.

ELLENSBURG, WASH.—The County Commissioners, Kittitas County, have been petitioned by R. N. Bull, of Ellensburg, for a 50-year franchise for the right to construct, equip and maintain electric power and transmission lines along certain highways in Kittitas County. It is reported Mr. Bull and associates will spend thousands of dollars in constructing transmission lines throughout the county, active construction to begin as soon as the franchise is granted. O.

LANGLEY, WASH.—H. E. Wood, electrical engineer, Prince Rupert, B. C., is reported to be investigating the feasibility of constructing an electric lighting and power plant here, to furnish current for illuminating Langley and contiguous territory. O.

METALINE FALLS, WASH.—The Engineering firm of Hugh L. Cooper & Company, New York City, which was recently retained by eastern capitalists to make an exhaustive study and examination of the engineering and commercial possibilities of the so-called Z-Canyon Water power, on the Pend O'Reille River, near this city, has established a branch engineering office and camp in Metaline Falls, same being in charge of D. R. Cooper. At present, the engineering party is making a careful measurement of the stream flow at Metaline Falls, checking up the rating flow curves, and drilling exploration shafts, tunnels and test pits at the selected dam and power house sites.

MONTESANO, WASH.—The City Commission has indefinitely postponed action on the application of George H. Tilden, and associates, of Seattle, for electric light and power franchise, which was petitioned for some time ago. No doubt, their action was the result of refusal of other cities in the Grays Harbor country to grant a similar request. O.

MORTON, WASH.—The County Commissioners have granted a franchise to C. O. Smith to extend the service of the Morton Electric Company over all roads leading out of Morton.

OKANOGAN, WASH.—The Okanogan County Commissioners, F. A. Grainger, auditor, have granted to H. I. Stoolfire, of the Arlington Mining Corporation, a franchise to construct a power transmission line from the plant of the Okanogan Valley Power Company here to the Arlington mines. J. B. Ingersoll, of the Spokane & Inland Electric Company, will have entire charge of construction work, which will be started as soon as materials can be placed on the ground. According to reports, a considerable amount of electrical equipment will be installed in the mines this year. An electric tram for handling ore is also considered. O.

OLYMPIA, WASH.—The sum of $60,000 will be expended for the erection of a municipal light plant. Address mayor.

PORT ANGELES, WASH.—Board of County Commissioners, Clallam County, have granted a franchise for the erection and operation of an electrical transmission line for distribution of electrical energy for lighting and power purposes, along the highway between Sequim, Dungeness and Fort Williams, to J. L. Keeler, of Sequim. It is understood construction will begin in the near future. O.

SEATTLE, WASH.—The Board of King County Commissioners, at a recent meeting, granted to the Puget Sound Traction, Light and Power Company, of Seattle, a franchise for furnishing light and power to Mercer Island. At the same meeting, Commissioners also granted a franchise for similar purpose to Glenville A. Collins, L. C. Smith Building, Seattle. The Puget Sound Traction, Light and Power Company announces immediate construction, and Mr. Collins and associates, according to terms of franchise, must begin work within 60 days.

YARDLEY, WASH.—An electric lighting system is to be installed on the principal streets and arc lights on business corners by the Washington Water Power Company, of Spokane. Reported the installation will be made at once. O.

CHICO, CAL.—Plans have been presented to the city trustees for the installation of an ornamental lighting system in the business district of this city.

LOS ANGELES, CAL.—Sealed bids are being taken by the Board of Supervisors for the installation and maintenance of a street lighting system in the Angeles-Mesa Lighting District.

LOYALTON, CAL.—City officials are preparing to call a special election to submit the question of voting bonds for a municipal light plant to cost $3,200.

RIVERBANK, CAL.—The Pacific Fire Extinguisher Company, of San Francisco, has been awarded the contract for the installation of a lighting system here for $4,185.

Digitized by Google

FINANCIAL NOTES.

Stockholders of the Camaguey Electric Company voted to give a 90-day option to the Electric Bond & Share Company to purchase at 50 per cent of par value the company's $1,000,000 capital stock.

Directors of Texas Power & Light Company have voted to issue an additional $140,000 bonds to provide for improvements at Sherman, Waco and Denison.

American Gas & Electric Company is offering at 97.5 and interest an additional $500,000 of its six-per-cent 100-year debenture bonds dated May 1, 1914, making the total issue now outstanding $1,500,000.

Dividends.

	Term.	Rate.	Payable.
Am. Pub. Serv. pf	Q	1.75%	July 1
Aurora, Elg. & Chi. pf.	Q	1.5 %	July 1
Bell Tel. of Pa	Q	1.5 %	July 15
Cent. & So. Am. Tel.	Q	1.5 %	July 9
Chi. City & C. Rys. pf.	S	$1.25	July 1
Cin., Newport & Cov. Lt. & Trac. pf	Q	1.125%	July 15
Cin., Newport & Cov. Lt. & Trac. com	Q	1.5 %	July 15
Elec. Lt. & Pr. of Ab. & Rockland	S	$4.00	July 1
Elmira Water, Lt. & R. R., 1st pf	Q	1.75%	July 1
Harrisburg Lt. & Pr. pf.	Q	1.5 %	June 30
Interstate Rys. pf	S	30c	July 1
Kaminestiquia Pr.	Q	1.5 %	Aug 16
Mass. Ltg. pf	Q	$1.50	July 1
Mass. Ltg. old com	Q	$1.75	July 1
Mass. Ltg. new com	Q	25c	July 1
Mex. Teleg.	Q	2.5 %	July 16
Mont. Lt., Ht. & Pr.	Q	2.5 %	Aug. 16
Mont. Tel.	Q	3 %	July 15
Mountain Sts. Tel.&Tel.	Q	1.75%	July 15
Omaha & Coun. B. St. Ry. com.	Q	1 %	July 1
Pac. Tel. & Tel.	Q	$1.50	July 15
Phila. Co. com	Q	1.5 %	Aug. 2
Porto Rico Rys.	Q	1.75%	July 2
So. Cal. Edison pf.	Q	$1.50	July 15
Un. Gas. & Elec. pf.	S	2.5 %	July 15
Winnipeg Ry.	Q	2.5 %	July 2

Reports of Earnings.

PACIFIC GAS & ELECTRIC.

	1915	1914
May gross	$1,525,189	$1,368,892
Net after taxes	779,763	642,156
Surplus after charges	428,933	250,220
Five months' gross	7,749,538	7,070,229
Net after taxes	4,105,658	3,523,326
Surplus after charges	2,294,263	1,561,898

After providing for depreciation and dividends on the preferred stocks, the balance for the common stock for the five months was at an annual rate of 9.70 per cent.

WISCONSIN EDISON COMPANY.

	1915
May gross	$ 672,826
Operating expenses	423,436
Net earnings	249,390
Balance available for depreciation and holding company	111,988
Twelve months' gross	8,541,582
Operating expense	5,052,582
Net earnings	3,488,999
Balance available for depreciation and holding company	1,861,326

The appropriation for depreciation of operated properties for the 12 months ended May 31, 1915, was $885,142, an increase of 3.94 per cent over the appropriation for the preceding 12 months.

SOUTHERN CALIFORNIA EDISON.

	1915	1914
May gross	$ 373,356	$ 387,516
Net after taxes	200,382	212,158
Surplus after charges	117,908	135,946
Balance after depreciation	77,908	75,947
Five months' gross	1,880,849	1,910,500
Net after taxes	1,029,044	916,333
Srrplus after charges	620,675	538,894
Balance after depreciation	391,675	378,894

BRAZILIAN TRACTION, LIGHT & POWER.
(Earnings in Milreis.)

	1915	1914
April gross	$ 6,333,460	$ 5,941,220
Operating expenses	2,627,690	2,578,680
Net earnings	3,705,770	3,382,540
Four months' gross	24,422,060	24,074,458
Net earnings	14,054,670	13,688,658

CONSUMERS POWER OF MICHIGAN.

	1915
May gross	$ 289,562
Net earnings	197,140
Surplus after charges	102,842
Balance after preferred dividends	69,342
Five months' gross	1,522,067
Net earnings	1,053,732
Surplus after charges	576,761
Balance after preferred dividends	409,261
Twelve months' gross	3,511,901
Net earnings	2,317,298
Surplus after charges	1,179,992
Balance after preferred dividends	795,492

REPUBLIC RAILWAY & LIGHT.

	1915	1914
May gross	$ 247,644	$ 256,325
Net after taxes	99,019	96,861
Surplus after charges	42,239	40,407
Balance after preferred dividends	16,282	14,450
Five months' gross	1,210,228	1,247,905
Net after taxes	455,418	470,471
Surplus after charges	171,132	191,284
Balance after preferred dividends	41,347	61,499

PROPOSALS.

FIRE STATION.—Separate bids will be received till July 19, for the electric work on a fire station and city hall at Detroit, Minn. Proposals must be accompanied by certified check for five per cent of bid. Address, E. J. Bestick, City Clerk. Plans in the office of C. E. Bell, architect, Minneapolis. X.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 13, for furnishing 200 storage batteries, Schedule 8513, f. o. b. Works; 600 receiver cords and miscellaneous twin conductor wire, Schedule 8525, both for delivery at Navy Yard, Brooklyn, N. Y.; one three-unit, six-bearing motor generator set, Schedule 8509, for delivery at Navy Yard, Annapolis, Md.; two 200-kilowatt generating sets, Schedule 8511, for delivery at Navy Yard, Philadelphia, Pa.; four five-kilowatt turbo-generator sets, Schedule 8511, for delivery at Navy Yard, Norfolk, Va.; three 50-kilowatt transformers, Schedule 8512, for delivery at Navy Yard, Norfolk, Va.

ELECTRIC LIGHT PLANT EQUIPMENT.—Sealed proposals will be received by the secretary of the Board of Public Works, Chillicothe, Mo., July 15, for furnishing machinery, materials and labor required to make certain extensions and improvements at the electric light plant. Work consists of furnishing and erecting one direct-connected steam engine and generator, 375 kilovolt-amperes, three-phase, 60-cycle, 2,300 volts; or one turbine-driven unit of the same size. Furnishing and erecting one turbine-driven exciter for above generator; alternate bid on motor driven exciter. Furnished f. o. b. cars, one switchboard panel and instruments, and one power-circuit panel and instruments. Furnishing one 500 gallons-per-minute centrifugal pump, with motor; one 12-inch barometric condenser; one 12-inch horizontal oil separator. Furnishing pipe, valves, fittings and installing pump and condenser. Complete plans and specifications are on file with Board of Public Works, or may be seen at the office of the consulting engineers, Harper & Stiles, 914-15 Grand Avenue Temple, Kansas City, Mo. Address C. F. Adams, President of the Board of Public Works, Chillicothe.

NEW CORPORATIONS.

NEW YORK, N. Y.—Metropolitan Wiring Company, Incorporated. To do electric wiring, etc.; capital, $5,000. Incorporators: Abraham Greenblatt and A. M. Leving, of New York City, and Herman B. Levine, of Brooklyn, N. Y.

NEW YORK, N. Y.—Gertler Electric Company, Incorporated. Electrical construction, etc.; capital, $5,000. Incorporators: Carrie Gertler and Nathan G. Gertler, of New York City, and Rose Markowitz, of Brooklyn, N. Y.

LOND ISLAND CITY, N. Y.—Comet Storage Battery Company, Incorporated. To Manufacture electrical apparatus, storage batteries, etc.; capital, $10,000. Incorporators: Gustav Kiel, Hugo Kiel and Jay A. Hurst.

PERSONAL MENTION.

M. L. HIBBARD, general manager of the Union Light, Heat & Power Company, Fargo, N. D., has been elected a member of the House Committee of the Fargo Commercial Club.

MR. GEORGE A. ARNOLD, formerly manager of the Chicago district for the Lincoln Electric Company, of Cleveland, Ohio, has accepted the position of general sales manager of the American Rotary Valve Company of Anderson, Ind.

E. F. STONE, superintendent of light and power of the Arkansas Valley Railway Light & Power Company, Pueblo, Colo., has been elected a vice-president and director of the Pueblo Commerce Club. Mr. Stone has been chairman of the Manufacturers' Bureau of the club for some time and will continue in that capacity also.

MR. WILLIAM T. GUNNISON, of Rochester, has been appointed and confirmed as a member of the New Hampshire Public Service Commission, to succeed John E. Benton, whose term expired recently. Mr. Gunnison is a law partner of former Governor Felker and is at present judge of the local court at Rochester. Mr. Benton was nominated for reappointment by Governor Spaulding, but failed of confirmation.

MR. CARL PFANSTIEHL, president of the Pfanstiehl Company, North Chi-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 28.	June 21.
American Tel. & Tel. (New York)	123⅜	123½
Commonwealth Edison (Chicago)	134	134
Edison Electric Illuminating (Boston)	237	237
Electric Storage Battery, common (Philadelphia)	52½	54¾
Electric Storage Battery, preferred (Philadelphia)	52½	54¾
General Electric (New York)	171	172
Kings County Electric (New York)	119	23¾
Massachusetts Electric, common (Boston)	5¾	79
Massachusetts Electric, preferred stamped (Boston)	36	65
National Carbon, common (Chicago)	140	66½
National Carbon, preferred (Chicago)	117	97
New England Telephone (Boston)	129	125
Philadelphia Electric (Philadelphia)	23½	119
Postal Telegraph and Cables, common (New York)	79	79
Postal Telegraph and Cables, preferred (New York)	64	36½
Western Union (New York)	66⅛	140
Westinghouse, common (New York)	100	117½
Westinghouse, preferred (New York)	125	125

Digitized by Google

cago, Ill., was married on June 24 to Miss Caryl Cody, of Chicago. After a wedding trip including New York, New Orleans and San Francisco, Mr. and Mrs. Pfanstiehl will occupy the home now undergoing construction at Highland Park, a suburb of Chicago.

MR. A. B. WILSON, commercial manager at Plainfield, N. J., of the New York Telephone Company, was awarded the degree of Mechanical Engineer at the eighty-third annual commencement of New York University, held on June 9. Mr. Wilson was graduated from New York University as a Bachelor of Science in Chemical Engineering in 1911, and has been in charge of the Plainfield office since 1913.

MR. J. B. CRANE, for a number of years superintendent of the Great Northern Power Company, of Duluth, has announced the acceptance of a position as consulting engineer with the New York Bond & Share Company, of New York City. The change is a promotion for Mr. Crane and is in recognition of the excellent work done by him while in the service of the Duluth company.

MR. ALTON W. LEONARD, president of the Puget Sound Traction, Light and Power Company, of Seattle, Wash., MR. GEORGE R. COOLEY, of Buxbaum & Cooley, electrical supply dealers, Seattle, and MR. J. I. COLWELL, manager of the Western Electric Company, Seattle branch, have been appointed to act on the special committee having in charge Seattle's proposed celebration of "Electrical Prosperity Week," which will be held in all the large cities of the United States, November 29 to December 4.

MR. JOHN F. TRUMBULL, of New Haven, has been chosen chief engineer of the Public Utilities Commission of Connecticut, at a salary of $5,000, succeeding C. C. Elwell, who resigned to become a member of the commission. The choice resulted from a civil service examination in which Mr. Trumbull attained the grade of 97.5 per cent, Commissioners having a part in examining 15 candidates, four of whom attained 90 per cent and became eligible for the place. Mr. Trumbull is a graduate of the Sheffield Scientific School at Yale University, has engaged in railroad and electric railway engineering since graduating in 1902, and hitherto has been chief clerk to the chief engineer of the New York, New Haven & Hartford Railroad.

MR. RUSSELL H. BALLARD, who was elected a vice-president of the National Electric Light Association at its San Francisco convention recently, was born in 1875 at Hamilton, Ontario, Canada. He started his business career as an office boy in the firm of Thomson-Houston Electric Company, of Chicago, in 1890 and remained with them until 1894. During this time he improved himself by attending night school, accumulating the rudimentary principles of business in general and accounting practice in particular which he later developed to a high degree. Mr. Ballard's career is a distinctive one in that he has never deviated from his first choice, the entire 25 years of his business life having been devoted exclusively to the electrical business in one form or another. When the General Electric Company took over the Thomson-Houston Electric Company in 1894, Mr. Ballard was transferred to the treasury department of the former company at Schenectady, N. Y., from which place he was sent out to several of its branches through the East and South. In 1897 he went to Los Angeles and secured a position as bookkeeper with the Westside Lighting Company, the original of the present Southern California Edison Company. In 1900 he accepted an offer from the Butte Electric and Power Company, of Butte, Mont., as cashier and office manager, but four years later the Edison Electric Company of Los Angeles, pred-

Russell H. Ballard.

ecessor of Southern California Edison Company, induced him to return to Los Angeles by offering him the position of auditor. His rise since that time has been extremely rapid and today he enjoys the important position of secretary and assistant general manager through his untiring devotion to duty, his progressive spirit, detailed knowledge of the important questions vitally affecting the company's affairs, and his complete mastery of the many and complex problems arising daily in the operation of such a large enterprise, together with his great executive ability.

OBITUARY.

MR. RICHARD S. BROWN, one of the best known New England electrical men, died on June 5, at the home of his daughter, Mrs. H. R. Stone, 829

Richard S. Brown.

West End Avenue, New York City. Mr. Brown was 76 years old He was born and grew up in Great Barrington, Mass., and early developed a local reputation as an amateur actor, being manager of a number of productions. Later on he moved to Boston and engaged in business as a wholesale flour merchant. From there he went to New York and became connected with the Belt Railway, subsequently joining forces with the Daft Company in its early electric-railway exploitation. In 1890 he entered the services of the Westinghouse Electric & Manufacturing Company, continuing on the roll of that company until the end. Practically his entire period of service was spent as a salesman for railway apparatus. He was connected with the Boston office, to which he gave loyal and energetic support until advancing years called a halt. Of a cheerful, rugged personality, genial and witty, as is given to but few to be, his relations with his customers and his associates were close and to a remarkable degree personal. There was probably no one among the New England electrical fraternity of his day better known or more popular than R. S. Brown, who was always in demand as presiding officer for banquets or association meetings, where his inexhaustible fund of anecdotes and his quick good-natured repartee served to enliven and make successful many an otherwise dull or ordinary occasion.

DATES AHEAD.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 20-23. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Fifteenth annual convention, San Francisco, Cal., July 21-24. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

American Electrochemical Society. vancement of Science. Summer meeting, San Francisco, Cal., August 2-7. Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Digitized by Google

With the Electrical Manufacturers

The Reading Chandelier Works, 503 Penn Street, Reading, Pa., has published a 124-page catalog illustrating and describing its latest designs in electroliers, gas and combination fixtures, with glassware and colored section devoted to art domes. This catalog will be sent to those interested upon request.

The Franklin Electric Manufacturing Company, Hartford, Conn., announces the removal of its New York City office to more spacious and convenient quarters in the new Equitable Building, 120 Broadway, New York. H. J. Solon, formerly Pittsburgh manager for the Westinghouse Lamp Company, is now the New York manager for the Franklin Electric Manufacturing Company, and in charge of the new offices.

Edison Lamp Works of General Electric Company, Harrison, N. J., has issued two attractive booklets, of which the one entitled "How Our House is Wired" gives some excellent ideas and diagrams on the wiring of an old residence so as to permit liberal and ready use of electric lighting and other electrical conveniences without necessitating the general tearing up of the house for the wiring. "The Illumination of Billboards by Edison Mazda Lamps" is the self-explantory title of a booklet that describes the use of projectors with gas-filled Mazda lamps for the flood lighting of not only billboards and signs, but also of building fronts, statuary, etc.

Willy Lamot, Shardhighs, Halstead, Essex, England, announces that several Belgian business men have created an organization to introduce in Belgium as soon as the war is over, American products and manufactures, and to employ as agents and representatives Belgian manufacturers and business men with capital enough to establish necessary guarantees. Those interested are requested to address their inquiries to Mr. Lamot, who suggests that owing to the risk of non-delivery, a second copy of communications be forwarded within a week or two.

The Metal Specialties Manufacturing Company, 732 West Monroe Street, Chicago, Ill., is experiencing a heavy demand for its automobile specialties. One of the innovations this company is manufacturing is the "Car-Cool" which is attached to the under side of the floor boards to prevent heat radiating through the slots and floor insulation. The equipment may be attached underneath the car irrespective of the position of the levers, and interferes in no way with the free action of the car or the taking off of the floor boards.

Fairbanks, Morse & Company, Chicago, has recently issued a booklet in which irrigation projects in many parts of the United States are attractively illustrated and briefly described. The plants shown therein are supplying, water to land growing crops of beets, wheat, alfalfa, rice, corn and potatoes, and the land irrigated is located not only in the semi-arid tracts of the west but in the southern and eastern states. One of the larger tracts mentioned is located in the beet-raising district of southern Kansas. To the land irrigated, a Fairbanks-Morse centrifugal pump delivers about four million gallons of water per day. The use of this water resulted in the yield of nineteen tons of sugar beets to the acre in the large field shown in the illustration. A very good idea, both of the machinery used and the character of the soil irrigated, may be gained from the text and illustrations in this publication, which is entitled "Practical Irrigation by Pumping."

Westinghouse Electric & Manufacing Company, East Pittsburgh, Pa., reports the following orders among those recently received: Merchants Heat & Light Company, Indianapolis, Ind., one 1,500-kilowatt, 250-volt, six-phase, 60-cycle, synchronous booster-converter with 15 per cent buck or boost; three 550-kilovolt-ampere, single-phase, 4,-150-volt high tension to rotary voltage low tension transformer; one three-panel switchboard for the control of same. Scranton, Binghampton Railroad Company, Scranton, Pa., one 400-kilowatt, 600-volt direct-current, six-phase, 25-cycle, compound-wound, alternating-current self-starting, rotary converter; three 150-kilovolt-ampere, single-phase transformers; one two-panel switchboard. Woman's Hospital, New York City, one 100-kilowatt, 250-volt, compound direct-current generator suitable for reduction-gear drive. Queensborough Gas & Electric Company, Rockaway, N. Y., one 75-kilowatt, 125-volt, compound direct-current generator, and one turbine and gear for driving same. City of Seattle, Seattle, Wash., one 75-kilowatt, 125-250-volt, three-wire compound direct-current generator. Laclede Gas Light Company, St. Louis, Mo., one 30 kilowatt, 125-volt, compound generator, driving turbine and gear; one 30-kilowatt and one 75-kilowatt induction motor-generator exciter set; one 11-panel switchboard for the control of the above apparatus; a 5,000-kilowatt turbo-generator. Indianapolis City Hospital, Indianapolis, Ind., one 150-kilowatt, 125-volt compound direct-current generator suitable for geared drive. Duquesne Light Company, Pittsburgh, Pa., one 500-kilowatt, 125-250-volt, three-wire, 11,300-volt three-phase, 60-cycle, synchronous motor-generator set; one switchboard starting panel for controlling the alternating-current end of this set. Pacific Electric Railway Company, Los Angeles, Cal., one 1,000-kilowatt, 600-volt direct-current, 15,000-volt alternating-current, three-phase, 60-cycle, synchronous motor-generator set. Brooklyn Edison Company, Brooklyn, N. Y., one 1,000-kilowatt, 270-volt direct-current, 6,300-volt alternating-current, three-phase 25-cycle, synchronous motor-generator set.

Record of Electrical Patents.

Our weekly record of the United States electrical patents issued is based on the *Official Gazette* of the United States Patent Office. Owing to the practical exhaustion of the appropriation for printing the *Gazette* and specifications of patents issued, the *Official Gazette* for June 22, 1915, giving the patents issued on that date, will not be published until some time in July, when the appropriation for the next fiscal year becomes available. Our record of electrical patents of June 22 will therefore appear as early in July as receipt of the *Gazette* makes possible.

Patents Expired.

The following United States electrical patents expired on June 28, 1915:

606,199. Instrument for Calking Ships. W. P. Freeman, New York, N. Y.

606,208. Transformer Box and Hanger. L. Gutmann, Peoria, Ill.

606,279. Electromechanical Musical Instrument. G. H. Davis, New York, N. Y.

606,285. Telephone System. V. A. Gustafson, Joliet, Ill.

606,312. Electric Igniter for Gas Engines. A. J. Tackle, Oakland, Cal.

606,329. Printing Telegraph. B. A. Brooks. Brooklyn, N. Y.

606,330. Electrohydrostatic Automatic Car Brake., J. Buchel and F. McGloin, New Orleans, La.

606,342. Apparatus for Welding, Brazing and Soldering by Electricity. A. Hirsch, Berlin, Germany.

606,356. Electrical Sign. M. Norden, New York, N. Y.

606,369. Current Indicator. T. W. Varley, New York, N. Y.

606,405. Alarm System. C. Coleman, Chicago, Ill.

606,407. Dynamo-Electric Machine. R. S. Dobbie, Jersey City, N. J.

606,449. Telegraph Instrument. J. L. Cutler, Cincinnati, O.

606,450. Railway Signaling System. C. H. Davis, New York, N. Y.

606,526. Secondary Voltaic Battery. L. Epstein, London, England.

606,549. Portable Electric Drill. E. Holmes, London, England.

606,560. Regulation of Rotary-Transformer Direct-Current Electromotive Force. B. G. Lamme, Pittsburgh, Pa.

606,562. Push-Button. F. J. List, Chelsea, Mass,.

606,589. System of Electrical Distribution. C. F. Scott and B. G. Lamme, Pittsburgh, Pa.

606,605. Electric Motor. J. G. Truman, Lemon City, Fla.

606,620. System for Electrical Communication. A. T. Brown, Syracuse, N. Y.

606,630. Alternating-Current Motor-Meter. J. A. Mollinger and K. Kurda, Nuremberg, Germany.

Digitized by Google

Electric Vehicle Section

The Use of Electric Vehicles in Municipal Service.

At the meeting of the Incorporated Municipal Electrical Association held at London, England, on June 17, F. Ayton, honorable secretary to the Electric Vehicle Committee, presented an extensive and highly interesting report entitled "The Use of Electric Vehicles in Municipal Service."

The report reviews the rapid development which has been made in efficiency and reliability within recent years, and points out the many factors which make for advantage in the handling of the electric vehicle by municipalities operating electric light and power stations. Continuing, the report says in part:

"While economy in cost of operation should undoubtedly be considered an important factor in determining the system of haulage to be employed, a municipality should not lose sight of the influence that the use of any particular type of vehicle may have upon the health of the population and the amenities of the locality. It may be said, in reply to this assertion, that the vehicles which the municipality will employ are, or will be, so few, by comparison with the total of motor vehicles in use, that whatever good or bad features the type adopted may possess in the two directions mentioned, it will make no difference. So much may be granted, but it can be urged with justification that it is the duty of a municipality to set a good example in everything it undertakes. As a general rule it may be said that in the treatment of their employees, for instance, the municipalities of this country set a good example to all other employers of labor. Is there any reason, therefore, why the same broad principle should not guide them in the selection of a system of haulage? Good and useful as the horse has been, the principles of modern hygiene dictate that its continued use in congested areas is incompatible with the preservation of the best health among the populace and the maintenance of the lowest possible rate of mortality. The place of the horse has, in future, to be filled by the self-propelled vehicle, and the type which is going to eventually supersede it is that vehicle which will do the same work at the same or a lower cost and which, besides, will be characterized by silence in operation, general cleanliness and absence of odor, ease and simplicity of control, rapid acceleration, and safety in regard to the risk of fire. The electric vehicle is the only automobile taking the road today which meets fully each and every one of these requirements. It is safe to say that were the self-propelled vehicles operating in London, and other large centers, of the electric battery type, those places would, today, be very much pleasanter and healthier to live in. Here then is the opportunity for the municipalities to lead the way in regard to an improved means of locomotion the advantages of which are fully established."

The report urges municipalities to set a good example by using electric vehicles for every department. The advantages are many, and the brief test of this equipment in the work of an electric supply department of any size will soon make an enthusiast of any engineer.

Delivery vans are now in use or on order by the electric supply departments at Glasgow, Edinburgh, Derby, Westham, Croydon, Blackburn, Bootle, Hereford, Ipswich, Grimsby, Brighton, Wolverhampton, Southampton, Liverpool and the Burrough Councils of St. Marylebone, Syepney and Poplar.

These equipments are of various capacities, and the report in every case indicates that the vehicles have operated at high efficiency, low maintenance cost and with a negligible attendant charge for replacements of parts and renewals.

An interesting feature of the report is the suggestion made as to various ulterior forms of usefulness which the electric vehicle may take in municipal service. It is pointed out that in demonstration work connected with the obtaining of new business, that with the aid of a flexible cable carried through the front window, of the house from the electric vehicle standing outside in the roadway, the canvasser may be able to demonstrate the utility of many current-consuming devices.

In the collection of house refuse the electric vehicle may be used to particular advantage, because of its efficient operation where many stops and starts are to be made. It possesses the advantage also that when standing no waste of power is going on. The highly creditable performance of electric vehicles in this service is reviewed, and a number of very practical suggestions with respect to type and arrangement of vehicle are given. Furthermore, "It should be obvious that in the replacement of horsedrawn vans or carts by motor vehicles, no matter whether they be petrol, steam or electric, the latter will show the best results where the refuse destructor is at a distance from the area of collection, the saving, of course, being in the higher speed at which the motor vehicle can traverse this distance, and its greater carrying capacity. It is quite possible, on this account, that, in some towns, the best economy might be obtainable by a combination of ordinary horsedrawn vehicles for the districts in propinquity to the destructor, with the use of electric vans for the districts further away. Possibly in the latter districts, also, the local collection could be best done by horse vehicles conveying the material to a central depot from whence it would be transported to the refuse destroyer by large electric vehicles. An arrangement of this latter sort has been in successful operation in a large Continental city for some time. The horse carts are provided with removable box bodies, so that when the cart arrives at the depot, the body is lifted off it by an electric crane, and placed upon the flat platform of a large electric vehicle, which, when it has received its ful complement of these full boxes, proceeds on its journey to the destructor. In the meanwhile empty box bodies are placed upon the tumbrils which once more proceed upon their rounds of collection.

"An alternative method to that described above is the employment for local house-to-house collection of a special type of small electric vehicle, with tipping box body. In this machine, which has the advantage of possessing a low body, there is no seat for the driver; the latter stands upon a driving platform a few inches from the ground. The saving of time in getting on and off the vehicle, when compared with the ordinary type of vehicle, is obvious. For districts some distance from the destructor these small wagons could tip into a hopper, at a district depot, from which large

Digitized by Google

capacity electric vehicles could be loaded for transit to the destructor, or the small vehicles could have removable bodies which could, by means of a crane at the district depot, be placed direct—several of them—on a large vehicle for the same purpose."

The electric vehicle for ambulance work is highly endorsed. It has been employed in this service by the City of London Corporation, by the Board of London Authority and the Metropolitan Asylums Board.

Electric battery vehicles have been used to a considerable extent for fire brigade work. In this service the ease of operation and promptness of action are desirable features.

There are three municipal tramway undertakings making use of the electric battery bus as an adjunct to their tramway services. At Southend-on-Sea, South Shields and York it is understood that the vehicles are giving satisfaction.

"There are still many districts where cesspool emptying has to be done, and, where the health and comfort of the residents are studied, the vacuum tank system has taken the place of the old and crude methods. The vacuum pump is generally driven by a petrol engine in the most modern plant, but surely the aim, in constructing apparatus of this kind, which is generally put to work during midnight hours, should be to produce something which is silent in operation—and the little petrol engines employed certainly lack this feature in no small degree. It is, however, possible to construct an electrically propelled vacuum tank wagon —the usual capacity required is about 350 gallons—fitted with an electrically driven air pump. As such a pump will only need some two horsepower to drive it, the ordinary size of battery such as fitted to a three-ton wagon, would easily supply the energy required while the wagon is standing. The advantages would be that ordinary laborers could work the plant, the cost of working and up-keep would be small, and the plant would operate with absence of noise.

"The expenses of conveying the municipal officials about on their business visits and rounds, aggregate into a fairly large annual sum in any town of size, and this is especially the case where hired vehicles are concerned. It would undoubtedly pay any large municipality to invest in a few electric cars for such service, which could be garaged with the electric supply or tramways departments. The simplicity of control is cuch that chauffeurs would hardly seem necessary. The figures already quoted in this report indicate how low is the running cost of the passenger 'electric,' and this feature as well as the fact that the vehicle is free from all the starting difficulties, the vibration and the fire risk of the petrol type should act as a strong incentive towards its adoption for this particular service."

Frank Ayton.

There are few electricity supply officials in England who have done so much to forward the electric vehicle movement as Frank Ayton, honorary secretary of the Electric Vehicle Committee of the Incorporated Municipal Electrical Association. Mr. Ayton is the borough electrical engineer of Ipswich, and he is a zealous advocate of the extended use of electrics for assisting the load of public electric supply works. Writing to the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, through our British correspondent, he says:

Frank Ayton,
Honorary Secretary to the Electric Vehicle Committee, Incorporated Municipal Electric Association.

"My views on the electric vehicle question are pretty well summarized in the report I have just written for submission to the annual meeting of the Incorporated Municipal Electrical Association. Within the next few years, it is certain that street traffic in English cities and towns will be entirely motorized. From the point of view of civic amenities, from the standpoint of economy and reliability, the electric battery vehicle has advantages so unique and transcendent that it needs but that these merits should be made widely known for the greater portion, if not the whole, of that class of road traffic which lies within its rational field of utility to be dealt with by that type. The benefits which will directly, as well as indirectly, accrue to almost all branches of the electrical engineering industry by the general adoption of the electric vehicle will be so great that efforts to popularize it ought not to be confined to the central stations and the electric vehicle manufacturers alone. Every electrical man, if he has any real interest in his profession, should make himself familiar with the attributes of the modern 'electric'—many of them seem to be pretty well primed up with the failures of days gone by; let them now be equally assiduous in seeking out the reasons why the modern electric vehicle is so successful today—and then let them talk 'electric vehicle' on every suitable opportunity. That is not all—the big electrical manufacturing firms should come forward and help financially in the advertising campaign, and a much larger proportion of the electric supply undertakings might follow the lead of their more enterprising neighbors in the same direction. It must be a 'pull all together' if we are to achieve the full degree of success. It will be many years, of course, before we in England can match the results obtained on your side, but we have made a good start. What is most insistently needed, however, is the marketing of electric vehicles at a more reasonable price. It looks as if British manufacturers now starting in this field might be able to go some way in solving this problem. The best vehicles from your side cost too much to enable a wide market to be obtained."

Mr. Ayton in 1889 entered the Woolwich works of Siemens Brothers & Company as a pupil, afterwards joining the firm's staff and obtaining experience in their various departments. In 1894 he was a member of the cable engineering staff engaged upon the actual laying across the Atlantic of the Commercial Cable Company's new cable of that year. Later on, he was engaged in a similar capacity laying a cable up the river Amazon from Para to Manaos. Subsequently he was placed in charge of the electric railroad and tramways work at Siemens' head office and in that capacity superintended the carrying out of contracts for electrifying the Waterloo and City (London) underground tube and a number of tramways. In 1898 he joined the staff of Sir Alexander Kennedy, Fellow of the Royal Society, etc., one of the best known consulting engineers in England, and from that office he went to Ipswich as Sir Alexander's resident engineer upon the laying out of the electric tramways there, the construction of the power station and the laying out of the electric mains distribution system. In 1903 he was formally appointed chief engineer and manager of the combined electricity and tramways system of Ipswich.

Mr. Ayton is a member of the Institution of Electrical Engineers, of the Council of the Municipal Electrical Association, of the new Electrical Development Committee, etc.

Digitized by Google

Did You Get a Copy—

of this new bulletin on the "Exide" Stand-By Battery? It has just been published and contains 18 pages of information and illustrations which are well worth the careful attention of Central Stations.

The bulletin gives up-to-date engineering data concerning modern practice in the installation and operation of Stand-By Batteries for Central Station Service.

The extensive use of Stand-By or Emergency Batteries by many Central Stations indicates the increasing importance attached to the reliability of service such batteries insure.

Any one of our offices will be very glad to mail you a copy of this new bulletin, No. 148.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator"

The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

Boston Atlanta Rochester Cleveland **PHILADELPHIA, PA.** Chicago Denver San Francisco
New York Washington Pittsburgh Detroit **1888-1915** St. Louis Los Angeles Toronto

Digitized by Google

The Electric Vehicle and the Central Station.

At the San Francisco convention of the National Electric Light Association, John F. Gilchrist, president, and A. Jackson Marshall, secretary, of the Electric Vehicle Association of America, presented an imposing and highly valuable paper entitled "The Electric Vehicle and the Central Station." The paper is replete with extended and authentic data regarding the relation of the electric vehicle charging load and the revenue of the central station, and one chapter is devoted to depicting several types of electric vehicles employed by a number of central stations. There are many charts, tables of statistics and other illustrations of immediate application to the work of the electric light and power companies.

The report states that comparatively few central stations appreciate the tremendous opportunities attending the further development of the electric vehicle, and only a few have placed their organizations properly behind the movement.

The central station can assist the sale and use of electric vehicles in two principal ways: First, use them. Second, advocate and otherwise promote their use. The central station that advocates the use of electric vehicles and proceeds to use the gas type when the electric would do the work, is creating confusion and otherwise clogging the wheels of progress. The electric vehicle will be found available for practically every department of service in the central station. The greatest obstacle encountered in the general use of the passenger vehicle by central stations is the desire upon the part of employees to use the machines for pleasure-seeking and other purposes entirely outside of the central-station work, for which they have been purchased. Where the officers of the central station insist that an electric vehicle be used for every purpose that it may advantageously, this element will soon be eliminated.

Transportation at least in cities and their suburbs will be motorized within the next ten years. If prompt and vigorous action on the part of the central station is not immediately forthcoming all chance of the electric vehicle being adopted on a proper scale will be forever lost. Prompt and sustained action is imperative.

The principal lines upon which central-station men can most rationally aid in the introduction of electric vehicles will be:

To bring home to the horse-vehicle user the very high price which he pays for animal transportation, independent of the prevailing prices at which horses, feed and other required materials may be purchased. In other words, horse transportation costs very much more for the performance of any particular work than the owner of horse equipment usually appreciates.

To analyze the performance of the work at present done by horse vehicles so thoroughly that suitable machines may be consistently recommended in any particular case.

To bring out for consideration all the advantages which machine operation carries with it in regard to precision, regularity and reliability.

In outlining the subject to avoid as much as possible diverting the prospective machine user's attention from the real issues to the relatively unimportant details of mechanical equipment.

To deal with him in terms which will enable him to arrive at a true economic value of machine installation, either as to serviceability or as a time or labor saver.

To avoid undertakings of a doubtful or experimental nature with regard to the machine's ability.

To induce the prospective user to regard the project in the same manner as he would the installation of a power plant for other purposes.

To render such assistance during the preliminary period of use as will prevent the misapplication or abuse of machines.

There should be no hesitation in making a reasonable outlay to improve conditions for the electric vehicle. The money spent is sure to return in the form of a valuable off-peak load. Many central stations already have a large income from power supplied from electric-vehicle charging.

With regard to solicitation the central station can help promote the sale and use of electric vehicles in a number of ways. If the field justifies it an experienced man can be secured to conduct an aggressive campaign. In the small city the work at the beginning can be delegated to some logical member of the staff, devoting part time to the work until results or the outlook warrant an extension of effort. The Electric Vehicle Association of America will co-operate with central stations inaugurating a campaign of this character.

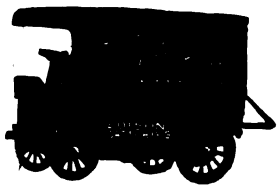
Indicating methods which might be employed, the report presents a synopsis of the methods of the Commonwealth Edison Company, of Chicago, and the New York Edison Company.

The Commonwealth Edison Company devotes considerable of its space in the *Electric City Magazine* to the electric vehicle propaganda, and utilizes special advertising space in trade magazines going to directly interested constituencies. Bill-board advertising, booklets giving information regarding care and operation of batteries and vehicles, specimen record sheets, folders and maps showing location of charging stations and character of roads, moving-picture films showing electric vehicle performance and illuminated outdoor electric signs are utilized. The company has worked out an off-peak schedule applying to installations having a maximum demand of 50 kilowatts or above, which brings the rate for electricity used by the larger garages, handling from 75 to 150 cars each, down to from one and three-fourths cents to two cents per kilowatt hour. This has enabled the company to take over practically all of the vehicle-charging business in Chicago. Much attention has been given to the bettering of operating conditions, and the company has advertised the fact that specialists are retained who are at the service of vehicle users for advice and consultation. The company's representatives visit periodically all the large garages, advising with the garage owners and giving the latter the results of observations the representatives make in the various garages in the city. Twenty-one substations have been equipped for emergency charging with duplicate parts, and in the outlying districts motor-generator sets of ample capacity to give 200 ampere booster charges to electric trucks have been installed. The company carries on a plan of co-operative advertising whereby vehicle agencies and the central station combine in various localities to carry on an advertising campaign. The company also pays commissions to those of its representatives who are instrumental in the selling of electric vehicles.

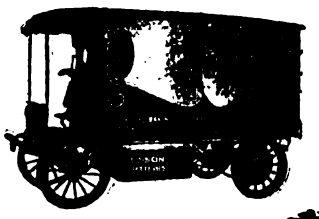
Four years ago the New York Edison Company established its Automobile Bureau, and the man placed in charge was instructed that his duty was to co-operate in every way possible with the electric vehicle manufacturers who were selling in New York territory.

After the Bureau became acquainted with all local electric vehicle-selling agencies, it set about the task of getting in touch with the users of "Electrics." A list of New York City automobile registrations was obtained from the Secretary of State, the electric-vehicle owners selected therefrom and listed on cards. A list of customers taking service from the company for charging purposes was next obtained. Calls were then made on all persons whose names appeared on either list, the preliminary record was checked and a permanent record established. This record is kept on cards which show the name of the owner of the car and his address, the make of the car, where it is garaged and the source of the charg-

Digitized by Google



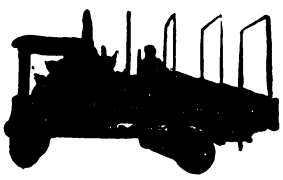
WASHINGTON, D. C.



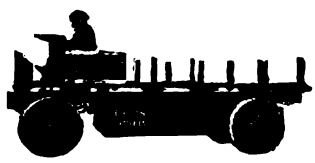
NEW YORK

SAN FRANCISCO

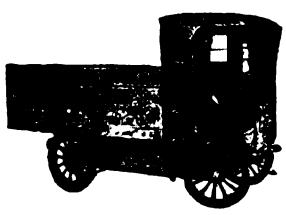
LOS ANGELES



DETROIT

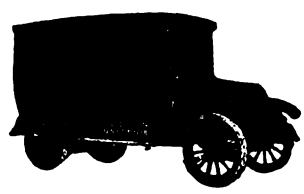


CHICAGO



WINNIPEG

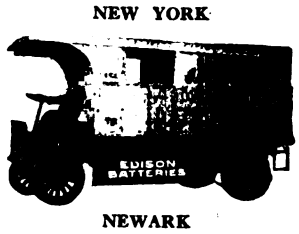
The Edison Storage Battery and the Battery Exchange System



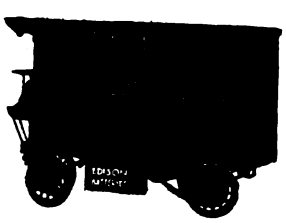
NEW YORK

THE "Battery Exchange" System of Electric Vehicle Operation gives the Central Station a profitable and advantageous load that is awaiting development in practically every city of the country.

In the "Battery Exchange" System the Central Station owns the Batteries and the Customers pay for the Vehicles alone. The low price and small operating cost afford a sales argument to the customers that cannot be denied. The increased revenue to the Central Station is obtained at a minimum selling effort and expense. **Central Stations can double their vehicle load in a few months by this method.**



NEWARK



NEW YORK

LONG ISLAND CITY

CHICAGO

On account of its permanent reliability, negligible maintenance cost, high-service efficiency and long life the Edison Alkaline Storage Battery is the most economical equipment for this duty.

Before Adopting a "Battery Exchange" System Get Our Proposition

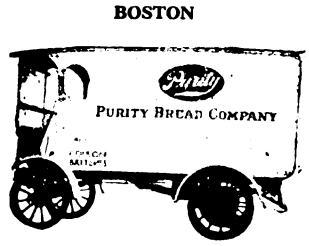
BOSTON

BOSTON

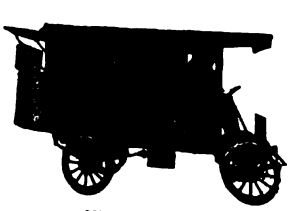
Edison Storage Battery Company

Main Office and Factory, Orange, N. J.

Distributors in New York, Boston, Chicago, Cleveland, Washington, San Francisco, Los Angeles, Portland, Ore., Seattle



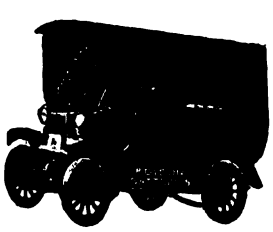
ST. PAUL



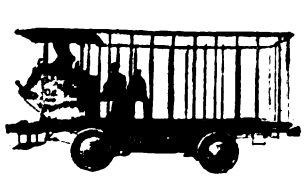
NEW YORK

The Vehicles of a few representative users of Edison Batteries are shown in the border.

NEW YORK



CHICAGO



FORT WAYNE

SEATTLE

Digitized by Google

ing current, whether Edison service or a private plant.

This list of vehicle owners is kept up-to-date by daily reports from the State Automobile Registration Bureau, and whenever a new registration appears the car owner is interviewed, the purpose of the Automobile Bureau explained and its services offered. The Bureau aims to keep in touch with the operation of every "Electric" in the city, and whenever possible, performance and cost data are obtained. A call is made at least once annually on every user in the city.

Owners of cars and electric-vehicle manufacturers were advised by letter that the Company had established an Automobile Bureau and stood ready to assist in the care and operation of electric vehicles.

The next very important step was the establishment by the Company of twenty-two outlet charging stations throughout the city. This network of emergency charging-stations covers the city very completely, and it never happens that a vehicle wanting a boost is too great a distance from the supply of charging current.

A booklet containing a list of all garages and charging stations within a radius of 100 miles of New York City is published annually by the Company, and given wide distribution. Electric vehicle and storage-battery manufacturers are advised that they may have as many copies as they may want for their own mailing lists or for their showrooms.

The Automobile Bureau of the New York Edison Company is now composed of eight people, one of the number being a woman, who makes demonstrations and gives driving lessons in any of the cars offered for sale in the city. One of the men is an office engineer, who collects and compiles statistics and all the performance and cost data he can get hold of.

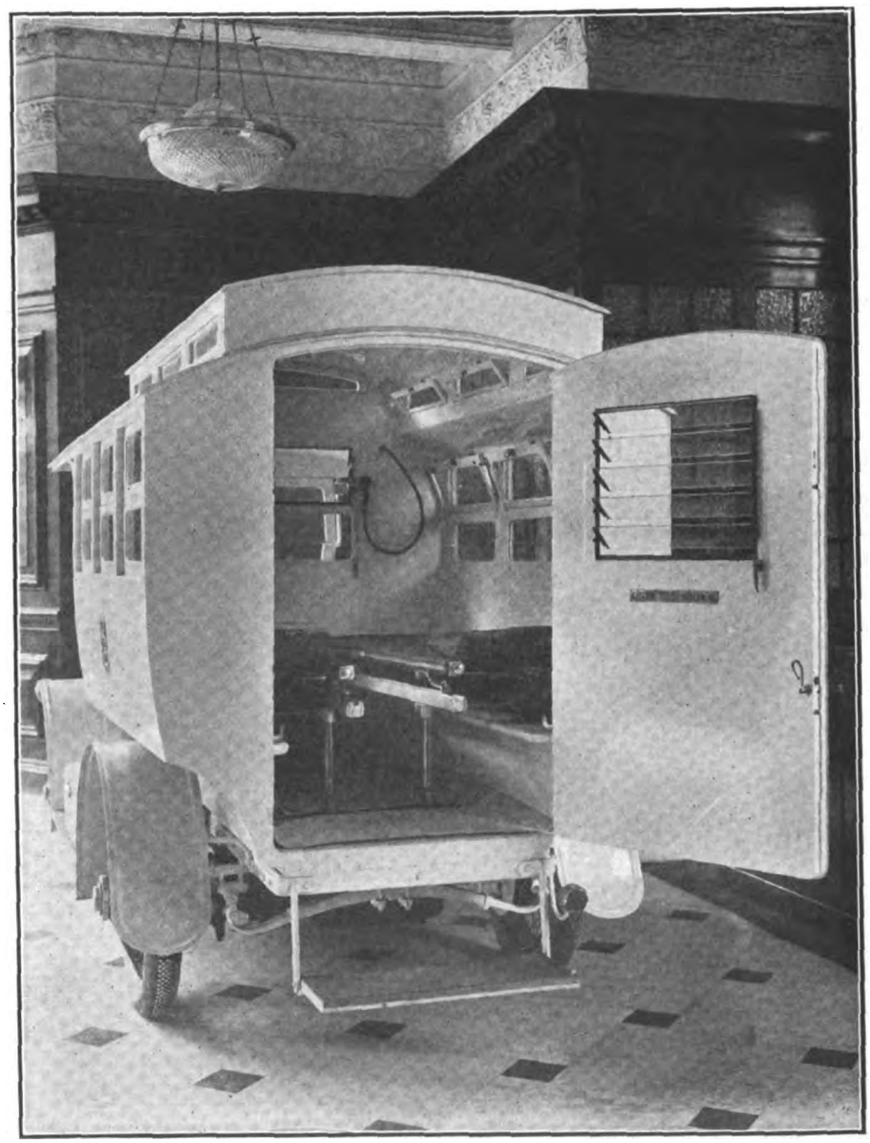
If the electric-vehicle purchaser will permit, the Bureau will direct the installation of the necessary garage apparatus and give advice as to proper maintenance of the vehicle. If the purchaser does not wish to care for the car himself he is supplied with a list of nearby garages where satisfactory service may be obtained. In this manner the service of the Bureau is two-fold: first, by arranging garaging facilities for the new car, and, secondly, by increasing the business of the garage man who is trying to earn a lower rate.

Another duty of the Bureau is to select and maintain a list of New York business houses now using horse-drawn vehicles, but whose volume of business handled seems to warrant the adoption of a more economical mode of transfer. This list is circularized at intervals and attention is drawn to the advantages to be derived from the use of electric trucks. A reply to one of the letters being received, a representative immediately calls and determines the requirements of the case, submitting interesting performance data, and figures on cost of operation and maintenance. He also has with him a list of satisfied users of electric vehicles. With the prospective purchaser's permission his name is sent by letter to the local representatives of the different electric vehicle manufacturers, with the request that descriptive matter be sent and followed by a salesman. The Automobile Bureau becomes acquainted with the salesmen in the case and keeps in touch with the progress made, giving information where it is wanted on the cost of charging current and the necessary charging apparatus.

The company spends a good part of its advertising appropriation on electric-vehicle publicity. Space is purchased in both newspapers and magazines, and each advertisement carries the names and addresses of all electric vehicle-selling agencies in the city. Copies of its advertisements are always sent to vehicle manufacturers, irrespective of whether they are represented in the city or not. It is interesting to note that two years ago there were but eight or nine manufacturers represented in New York, while at the present writing there are twenty-one agencies or branches.

Electric Ambulance for Durban.

The accompanying illustrations depict what is believed to be the first electrical motor ambulance used in South Africa. It has been supplied to the City Corporation of Durban by Carters, of London, ambulance specialists. The mounting of the vehicle and the design of the body with the interior accommodation are quite new. The chassis is in type identical with those now in use in the city of London. It has Greenwood and Batley's eight



View of Interior of Electric Ambulance for Durban, South Africa.

Digitized by Google

Books on Electric Vehicles

"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr. and Frank W. Smith

Fellow Am. Inst. Elec. Engrs., Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America.

President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

362 Pages, Fully Illustrated, Flexible Leather Cover, Pocket Size. Price, $2.00.

CHAPTERS

I.—Electric Vehicle Development. By William P. Kennedy, Consulting Transportation Engineer.
II.—Lead Storage Batteries; Descriptive Lead Batteries; Charge and Discharge Rates; Care of Storage Batteries.
III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
XIII.—Comparative Cost Data. ..

The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 220 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.

The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 220 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

This is a brand new book from cover to cover—1911 Edition—and must not be confounded with any former editions of this popular work.

PRACTICAL AUTOMOBILE DICTIONARY. By S. KRAUSZ

English-French-German; French-English-German; German-French-English. With an introduction by C. J. Glidden. Twelve thousand technical terms and other words employed in connection with motor cars and motoring. For use in office, factory, repair shop and touring in foreign countries. 16mo. Leather. 129 pp. Price $2.00.

SELF-PROPELLED VEHICLES. By JAMES E. HOMANS

A practical treatise on the theory, construction, operation, care, and management of all forms of automobiles. Seventh Edition, revised. 500 illustrations. 6x9. Cloth. 667 pp. Price $2.00.

The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

THE AUTOMOBILE. By P. N. HASLUCK

A practical treatise on the construction of modern motor-cars, steam, petrol, electric and petrol-electric. Three volumes. Special Edition, enlarged. 1,200 illustrations. 8vo. Cloth. 1,800 pp. Price $10.00.

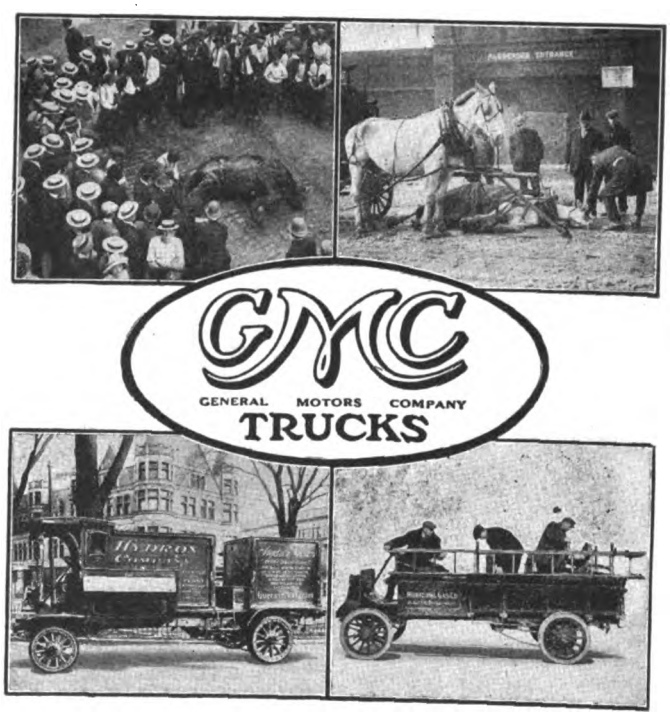
A very handsome set of instructive books brought up to date in the third volume containing many elaborate illustrations of cars now in use.

Electrical Review and Western Electrician

Western Headquarters for Electrical Books

608 S. Dearborn St.
CHICAGO

Relief From Heat Stricken Haulage Service



Past experience proves that the delivery and haulage service of thousands of merchants is being crippled every year by the summer's broiling heat. All this can be avoided and millions of dollars saved by the substitution of motor trucks.

This applies with equal force to the delivery and haulage work of business houses and the service of central stations that still rely on horse-drawn equipment. The maintenance of good service demands your anticipation of summer heat conditions. And you can safely do this by installing GMC Trucks. You can select from our comprehensive line a machine that will fit your service with utmost economy and satisfaction.

Now is the time to look the situation squarely in the face—to insure prompt service to your customers and yourself—to guard against unnecessary expense either in your construction or repair departments.

Whether you are considering the installation of trucks in your own service or desire data for one of your power customers—you can secure complete co-operation from the nearest GMC dealer or from our factory. We can supply a heat-proof hauling machine for any service—one that will meet its requirements exactly.

GENERAL MOTORS TRUCK CO

One of the Units of General Motors Company

PONTIAC MICHIGAN

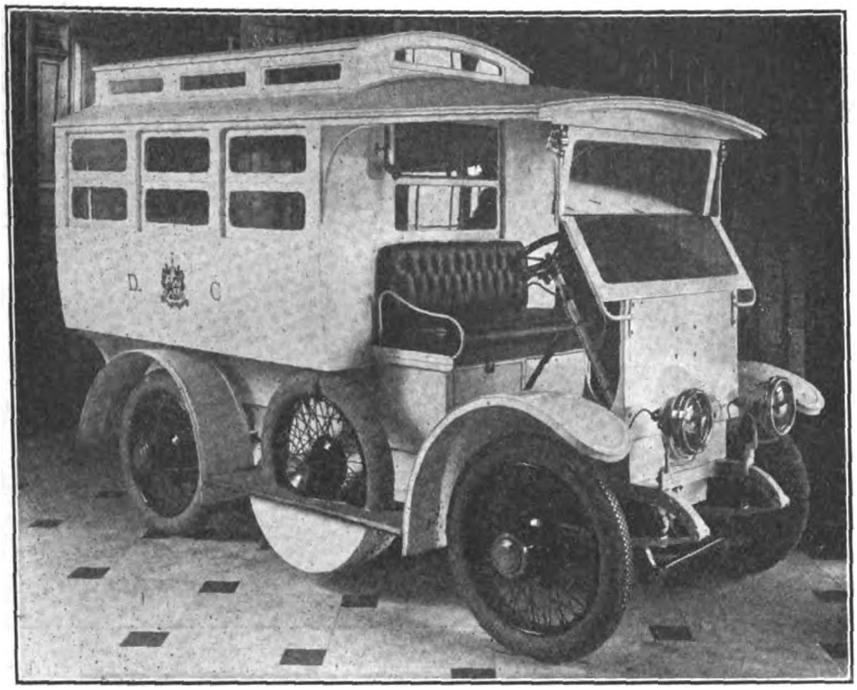
Direct Factory Branches: New York, Boston, Chicago, Philadelphia, St. Louis, Kansas City, San Francisco

(17)

Digitized by Google

horsepower twin motor and Tudor KYB9 type battery.

The car is fitted with six speeds forward, reverse, and electric brake, in addition to hand and foot brakes. It is mounted on Rudge Whitworth steel detachable wheels, complete with spare wheel, and Dunlop pneumatic tires. Teak is used and the car is finished in white Ripolin. The interior is lined with aluminum and finished in white Ripolin. Accommodation is provided for two invalids or injured cases, the stretchers being fitted with patent extension gear which enables the patient to be loaded without the attendant climbing into the car. There is a metal aseptic detachable seat inside the car for nurse, metallic speaking tube from driver to nurse, complete first aid equipment, etc.



Electric Ambulance for Durban, South Africa.

Mercury Industrial Tractor.

To facilitate and reduce the cost of baggage and freight handling in railroad depots, freight houses, steamer docks, and various kinds of warehouses, the use of electrically-driven trucks has steadily increased in recent years. In some cases, however, the investment in a fleet of such trucks is a stumbling block that has retarded the more general use of such equipment.

It has occurred to engineers who have studied the problem of expeditions and economical freight handling that in such cases the solution lies in the use of one or several electrically-driven tractors designed for large tractive effort so as to be capable of hauling a train of ordinary four-wheel hand trucks, such as are commonly in use about freight and warehouses. This type of tractor can be employed continuously without losing any appreciable time waiting for loading or unloading. Thus a group of the ordinary trucks are loaded in the warehouse or shipping room and assembled into a train. As soon as ready the tractor draws up and pulls the train to the railroad cars or into the shop hold, returning with a train of empty trucks ready to be reloaded. In the meantime another batch of trucks has been loaded and made ready for the tractor. In unloading cars, vessels or drays, the same procedure is followed, the tractor being in constant active service and thus earning the largest return on its investment.

The tractor serves admirably also in hauling partly finished goods from one department to another in large manufacturing plants. In all these uses, it reduces the cost of handling goods, since hand trucking is practically eliminated. A comparatively small number of stevedores, loaders, unloaders or checkers is required The goods are also handled with much greater dispatch.

The electric tractor designed particularly to meet the conditions discussed in the foregoing is illustrated in the cut herewith, which gives an excellent idea of its capacity in this service. This tractor is built primarily to pull and has no provision for carrying anything but the operator, storage battery, controller and motor. It is a very compact and ruggedly built machine with channel-iron riveted and welded frame. The battery box accommodates any standard storage-battery trays and any battery selected by the purchaser may be installed. The battery is to have a capacity of 250 ampere-hours. By placing the battery box directly over the two rear wheels, which are the drivers, maximum tractive effort is obtained.

A heavy-duty Westinghouse motor with ball bearings is used; it has liberal overload capacity. The controller provides for four speeds forward and two reverse. The handle of the controller is automatically locked when the driver leaves his seat. Power is transmitted from the motor to the rear axle direct through a worm-gear drive.

On the rear axle are two contracting brakes with a friction surface of 130 square inches. These brakes are controlled by a pedal. Their bands are lined with wire-woven asbestos. The rear driving wheels and the single front steering wheel are of special steel and equipped with extra large solid rubber tires rigidly pressed on. All wheels have roller bearings. Steering is by a simple lever direct to the steel fork supporting the front wheel. This fork turns on cup and cone ball bearings.

These electric tractors are built by the Mercury Manufacturing Company, 4100 South Halsted Street, Chicago, Ill.

The Mercury Industrial Tractor.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVII, No. 2. CHICAGO, SATURDAY, JULY 10, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Convention of the American Institute of Electrical Engineers 49
Electric Rates 50
Dielectric Losses 51
Electric Cooking 51
DEPARTMENTS:
Commercial Practice 59
Electrical Construction 62
Public Service Commissions 65
New Electrical and Mechanical Appliances 82
Current Electrical News 86
Record of Electrical Patents 91
LEADING ARTICLES:
Electricity in Ice-Cream Manufacturing 55
Contractors' Office Forms and Systems.—By M. J. Lavalle. 62
Handling Out-of-Town Work.—By A. W. Lindgren 64
American Institute of Electrical Engineers 69
The Illumination of Glass Factories.—By William A. D. Evans 78
LETTER TO THE EDITOR:
Exaggerating an Ordinary Electric Vehicle Performance.—By John S. Codman 81
BOOK REVIEWS 81
MISCELLANEOUS:
United States Light & Heating Company Sold 52
Convention of Telephone Pioneers 52
Electrical Progress at Leeds 52
Report on Electric Vehicles at Birmingham 52
Samuel A. Freshney 53
Electric Motors on Dutch Farms 53
Electric Iron-Ore Smelting in Norway 54
English Electric Vehicle Committee 54
Central Station Participates in Parade 59
Concord Advertises Advantages of House Wiring 59
Lighting Installation to Aid Real Estate Sales 59
Flat Rate Abandoned by Municipal Plant 59
New Offices of Utah Power & Light Company 60
Street Lighting System in Hartford 60
Electric Vehicle Parade 60
Panel-Board Campaign Successful at Louisville 60
Domestic Science Lectures to Give Impetus to Electric Range Sales 61
Attractive Show Window Aids in Iron Sale 61
H. N. McConnell 61
Unusual Accidents in Substations 63
Among the Contractors 64
New Combination Substation of the Philadelphia Electric Company 67
Increasing Use of Aluminum 68
Electricity in the War 76

Copyright, 1915, by Electrical Review Publishing Company, Inc.

CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The thirty-second annual convention of the American Institute of Electrical Engineers, which was held at Deer Park, Md., last week, added another to the long list of felicitous gatherings of that organization. This convention was a decided success and added one more argument to the growing sentiment in favor of holding conventions at summer resorts. The attendance at such points is, of course, never so great as at conventions which are held in the large cities. The latter bring together a large registration of local members which swells the records of attendance and gives opportunity for a large number to take some part in the activities who would not otherwise participate. It is to be noted, however, that the actual attendance at the sessions is little, if any, larger in the city conventions than at the summer resort. At the latter place there are not the distractions which are encountered in the large city and the members are kept closer together. The attendance at the sessions reflects this influence.

The discussion at the sessions of the convention this year was probably above the average in quality and fullness. Perhaps this was due to the excellent work of the Papers Committee, which succeeded in rounding up most of the papers well in advance, and members had the opportunity of going over the printed copies in the *Proceedings* well ahead of the convention.

Unfortunately the weather at Deer Park was not as propitious as might have been desired and interfered somewhat with the games which were planned to add a little recreation to the more serious work of the convention. Weather conditions form one of the elements of a convention which, with all our modern science, we are not yet able to accurately forecast, and, consequently, have to be satisfied to take on chance. The golf enthusiasts, however, were not deterred from wielding their sticks and another name was added to the Mershon cup. The baseball game fell upon a clear day and the spectators witnessed one of the best contests among the many that have been played at the Institute conventions.

As usual certain sessions of the convention were devoted to particular subjects arranged under the auspices of certain of the Institute committees. A departure from the usual practice was evidenced, however, in confining the papers to a very small portion of the subject coming under the scope of the committee. Thus, the papers dealing with railway

Digitized by Google

problems were confined to a discussion of contact systems, while the special subject considered in connection with transmission lines was the foundations for towers. This policy, which promises well as a definite one for future practice, enables the subjects to be gone into in much more detail than would otherwise be the case, and permits the assemblage of the opinions of a number of specialists in the chosen line. A volume of opinions and data is thus acquired which probably cannot be brought together in any other way. This policy is consequently to be highly commended.

It is a little difficult to pick out from the two dozen or more papers presented at the convention any particular one as being of prime importance, as there were a number which elicited an unusual amount of interest. Among these was a discussion provoked at the opening session by the papers on "Irregular Wave Forms" presented by Prof. Frederick Bedell and his co-workers. The appreciation of the advantages of using an electric wave having the sine shape; that is, one in which the fundamental frequency is not accompanied by any higher harmonics, has been steadily growing in recent years. It has been fully recognized that the method provided in the Standardization Rules for determining the departure of any given wave from the standard sine, is not all that can be desired. This method is to measure the difference in ordinates between the wave and the equivalent sine wave, and express the maximum difference in terms of the latter. There are various factors which serve to express the amount of distortion in a given wave and each of these is useful for some particular purpose, but none has been proposed which expresses distortion in a quantitative way equally well for all purposes. It seems evident that no measure of this kind can be adopted which will suit everybody. Thus, the telephone interests find distorted waves on power lines objectionable on account of the inductive interference which is created in the neighboring telephone lines, and the measure of this objectionableness should be in terms of the amount of noise created. In this regard those harmonics of frequencies most nearly approximating that of the average human voice, to which the sensitiveness of the receiving apparatus has been adjusted, are most objectionable. The differential distortion-factor, which weights the amplitude of such harmonics in proportion to their frequencies, does not weight them heavily enough to meet this consideration.

It would consequently seem as if the allowable departure from a sine wave which is to be tolerated in any particular case should be specified in such a way as to most severely penalize those harmonics which are most objectionable under the given circumstances, rather than to attempt to frame a single rule which shall limit this departure in all cases. Some compromise, however, such as is represented by the differential distortion-factor would seem preferable to the present Institute rule.

ELECTRIC RATES.

The convention paper of Mr. Frank G. Baum proposes a system of rates which shall recognize the various classes of consumer now customary, but which shall make the charges for electric energy the same within the same class over large areas of territory regardless of whether such territory is served by a single company or by a number of them. Mr. Baum does not believe in following too closely the cost of service in determining rates. It is generally recognized that the basis of cost cannot be followed out to the extreme of determining costs exactly for each individual consumer or even for each class of consumer. Rates, too, are usually the same throughout a municipality or other geographical division served by a single company. They are not, however, at the present time always made the same in the different communities served by one corporation when transmission or other costs are different for the different communities. We are not prepared to agree with Mr. Baum that these should be the same, and indeed he himself admits that communities enjoying underground distribution should not receive service at the same rate applying to one which has overhead lines.

It is generally recognized that rates should be made up of elements depending upon the energy consumption and upon the maximum demand, at least so far as these refer to groups of customers in different classes. Mr. Baum shows the method of applying this principle to the different classes in a way to determine a price per kilowatt-hour which shall include the class load-factors, and perhaps the greatest value of this paper is in working out the details of this method of adjusting rates. One of the principal advantages claimed by Mr. Baum for his proposal is that the company which operates its system efficiently will be rewarded, whereas inefficient operation will be penalized. One of the objections to the ordinary methods of government regulation, in which income is equalized too closely to costs, is that incentive to good management and efficient operation is to some extent removed. We do not feel confident, however, that Mr. Baum's scheme will realize all the advantages which he claims for it, as costs of service depend in many cases upon natural advantages and disadvantages as well as upon skill and efficiency in management.

However, there is much to be said in favor of the proposal, although questions will naturally arise as to its application. The extent of territory over which rates would be made uniform is an important question and one regarding which there would no doubt be much difference of opinion. In many cases, no doubt, this territory would be restricted to units as small as those already existing. With regard to the classification of customers it is to be noted that no classification is made for residence loads other than lighting. It must be recognized that if domestic heating and cooking are to be developed they must be accorded all advantages in rates to which their load-factors and diversity-factors entitle them.

Digitized by Google

DIELECTRIC LOSSES.

One of the most interesting and valuable papers presented at the convention was that dealing with the examination of insulating materials by the use of the cathode-ray tube. This paper was presented by Mr. John P. Minton and represented the results of several years of work in perfecting the apparatus and carrying out the tests which were described. The great difficulty in measuring dielectric losses upon specimens of convenient size is that a small amount of energy must be measured under a condition of high voltage. This presents difficulties which are not conveniently met by ordinary measuring instruments. The cathode-ray tube, however, after its operating difficulties were overcome, proved a very suitable means for carrying out measurements of this kind. In using this tube the cathode rays are deflected by two electric fields, one of which is proportional to the voltage applied to the insulating material being tested, and the other proportional to the current which flows in the dielectric. As these two fields are at right angles, the cathode rays impinging upon a fluorescent screen describe an ellipse whose area is proportional to the amount of energy expended. This arrangement of the apparatus has been given the name of cyclograph.

This paper is valuable for two main reasons. One lies in the perfection of the technique of operating cathode-ray tubes, and the other lies in the results obtained with particular materials, not merely on account of the measured constants, but on account of showing the manner in which the energy loss varies with voltage, temperature, etc. Results were given for varnished cloth and oil-treated pressboard, the latter containing varying percentages of moisture. In both of these substances the energy loss was found to increase with the temperature, going up rather rapidly after the boiling point of water is reached. This is quite different from the behavior of gutta percha, which was referred to in these columns two weeks ago. It might be supposed that the energy losses would increase in proportion to the square of the voltage, as would be the case in an ordinary conducting material. This, however, is not borne out, probably for the reason that the energy expended is not merely due to leakage or conduction currents. In some cases the current which flows is not proportional to the voltage and even where it is, the power-factor will vary in such a way as to prevent the energy or power from being proportional to the square of the voltage. Ohm's law, which holds so generally in metallic conductors, is not always followed in insulating materials and this is particularly true in such as contain absorbed moisture. In such substances the current should increase more rapidly than the voltage, and this will naturally cause the power to increase more rapidly than as the square of the voltage. In some of the substances tested, however, the ratio of increase has been at a lesser rate than the square of the voltage. This comes about through a decreasing power-factor.

It is to be hoped that this method, which shows such great possibilities for investigation along this line, will be applied to a large variety of insulating materials, a more complete knowledge of which is greatly needed, especially by the designer of electrical apparatus.

ELECTRIC COOKING.

A considerable number of data have been published from time to time giving the cost and energy consumption involved in electric cooking for families of different sizes. In many cases this information has been in such form as to give only a rough idea of the figures which would apply in a different case, as details vary a great deal so far as the requirements of different families are concerned and conditions of operation are involved.

One of the papers at the convention of the American Institute of Electrical Engineers gave the results of some much needed tests upon the energy consumed and consequently the cost when various cooking operations are carried out under somewhat different conditions. Mr. Percy W. Gumaer has investigated the variation of energy consumption with the temperature at which cooking is done and the consequent variation in time necessary to complete the process. Several typical varieties of food were experimented with, such as roast beef, biscuits and sponge cake, for which the requirements were quite different. Different temperatures are necessary for the best results with different articles of food, and while cooks know in a general way the degree of heat necessary to get good results, it is very seldom that they are informed as to the most economical temperature of cooking. Since the loss of heat from a range will be greater the higher the temperature, it is most economical to cook at the lowest temperature at which good results can be obtained. This temperature will depend upon the particular article of food involved. Thus, while biscuits require a temperature of at least 200 degrees centigrade, beef can be satisfactorily roasted at 100 to 120 degrees, and vegetables also can be better handled at a low temperature. The time necessary to cook most articles varies inversely with the temperature, but in general the low temperature will give the most economical rate of cooking. Individual results should be consulted, however, before making any general conclusions in this connection.

Mr. Gumaer concludes that the art of cooking with electricity can be reduced to an exact science if the necessary investigation is made, and it is our purpose here to call attention to the value of these experiments and the necessity of further work along the same line in order that users of the electric oven may be informed as to how to most economically operate the apparatus. When such information is generally available, the electric stove will come into much more general use than has hitherto been the case.

Digitized by Google

United States Light and Heating Company Sold.

The assets of the United States Light and Heating Company have been sold in Buffalo, in compliance with the order of the United States District Court for the Western District of New York, to the purchasing committee, which is made up of practically the same interests as the stockholders protective committee. The order of the court specified that the amount at which the properties were to be taken over should be sufficient to pay off all obligations excepting obligations for patent infringements. The amount of the debts and expenses of the receivership was given at $860,000, the company having been operated by the receivers since July 13, 1914.

A motion was brought before the court on June 30 by the Safety Car Heating and Lighting Company to postpone the sale on the ground of infringement of patent rights owned by the Safety company, the validity of which had been upheld by the Court of Appeals recently. The District Court permitted the sale to proceed with the understanding that it be subject to this claim, which is to be paid as soon as the amount can be determined by a special master, who will be appointed for that purpose.

Under the order of the court the receivership is now terminated and the reorganization of the stockholders' committee will become effective and the operation of the company continued under the new management.

Convention of Telephone Pioneers.

The fifth annual meeting of the Telephone Pioneers of America will be held at San Francisco, Cal., September 21 to 23.

The Transportation Committee has arranged a special train for members and friends who attend the convention. This train will have exclusive Pullman equipment and will cover a tour of 23 days with all expenses included in the ticket. The train will start from New York City at 12:50 p. m. on Tuesday, September 14, and proceed by the New York Central Railroad to Chicago. Connections will be made from Boston, Pittsburgh, and other points. The train will leave Chicago at 11:50 a. m. on September 15 and the going route will include Omaha, Denver, Colorado Springs, and Salt Lake City, stops being made of a half day each in Denver and Colorado Springs. A day will be spent at Salt Lake City. The train will arrive at San Francisco on the evening of September 20.

The train will leave San Francisco on the morning of September 26 and proceed to San Diego, stops being made at Del Monte, Santa Barbara, and Los Angeles. Thursday, September 30, will be spent at San Diego, the return trip commencing at 2:00 a. m. on Friday, October 1. The Grand Canyon in Arizona will be visited and stops made at Kansas City and Chicago. The train will reach New York at 5:25 p. m. on Wednesday, October 6.

The total distance covered by this tour will be 7,746 miles. The expense from New York is from $202.60 to $263.05, depending upon the train accommodations desired.

If desired, the return trip may be made by other routes, using the direct line from Los Angeles to Salt Lake City or taking the northern route through Portland, Seattle and Minneapolis.

Electrical Progress at Leeds.

The electrical engineer of the city of Leeds, England, refers in his annual report to the continued growth in the popularity of electricity for private lighting purposes. The number of units sold was 11.1 per cent greater than in the preceding year, and the income 10.7 per cent better. As an illustration of the effect of the invention and adoption of more economical lamps aided by a fall in the price of current, it is mentioned that the income from sales of energy for private lighting is even now $15,325 smaller than it was in the year 1907-1908, although the number of such consumers has in the meantime grown from 5,504 to 10,759. In the power and heating department at Leeds last year there was again a great increase of business, the horsepower of motors connected up advancing by 15.9 per cent and the heating apparatus by 54.7 per cent; the units sold advanced by 16.4 per cent and the revenue by 14.2 per cent. Working expenses per unit sold fell from 0.84 cent to 0.76 cent. The profits at $121,120 were the biggest ever made by the undertaking.

Report on Electrical Vehicles at Birmingham.

James Jackson, superintendent of the refuse disposal department of the City of Birmingham, England, has reported to the city authorities on the experiments made there with electric vehicles. Two of these vehicles belonging to the electric supply department are hired out to the refuse department upon agreed terms, the object being to demonstrate to users of haulage vehicles their suitability for town work. These two electrics are replacing four horses drawing four-wheeled wagons, and one reserve horse, and they collect house refuse from portable ashbins. Three trials have all demonstrated that one electric can usefully replace two horses, and Mr. Jackson gives the following reasons as fully justifying an extended trial:

(1) The cost appears to justify an extended trial.

(2) In Birmingham there are 275 horses engaged in connection with refuse disposal work and if electrics were adopted the number would be reduced by one-half.

(3) All the refuse removed has to pass over a weighing machine so that the clerical labor would also be reduced to the same extent.

(4) The supervision by outside inspectors of half the number of vehicles should be either less expensively or more effectively performed.

(5) The expense of accidents resulting from horses getting out of control and moving on while the driver is at rear of premises, would be avoided.

(6) The litterings of streets with horse manure and the consequent expense of cleaning same would be considerably reduced while the improvements and benefits resulting in tidier streets, especially in areas where the dwellings of the poor are close to the roadway, would undoubtedly assist in a reduction of "filth" diseases.

(7) The electric vehicle can be lighted with metal-filament glow lamps by current contained in the storage battery and the superior light thus obtained would materially reduce the number of accidents which now occur in many cases through the badly lighted horse-drawn vehicles.

Two Mossay electrics ordered by Birmingham are to have ironclad Exide batteries and Mr. Jackson makes reference to the extensive use of this type in America. "They are as regards performance about half way between the ordinary lead battery and the Edison battery, and the advantage of them is that they can be charged at a constant voltage with a tapering current and consequently require no regulation and no attention when on charge, as is the case with the ordinary lead battery."

The Birmingham electric supply committee has decided to maintain the batteries in order to ascertain exactly the cost of upkeep; a reliable figure should be obtained at the end of two years, and the sinking fund to be set aside is estimated to be sufficient to renew the batteries. A cost system for all work in the refuse disposal department is in operation and a fair trial will be given to the electric to demonstrate its superiority over the horse.

Electric Club-Jovian League.

The last meeting of the Electric Club-Jovian League of Chicago, before the summer recess, was held on July 1, at which Charles S. Deneen, former governor of Illinois, delivered a stirring address on "Americanism." A. A. Gray introduced the speaker.

The picnic committee, headed by H. A. Mott, reported progress on arrangements for the event, which will be held at Ravinia Park on August 5. C. W. Forbrich, 608 South Dearborn Street, has charge of ticket disbursements.

Digitized by Google

Samuel A. Freshney.

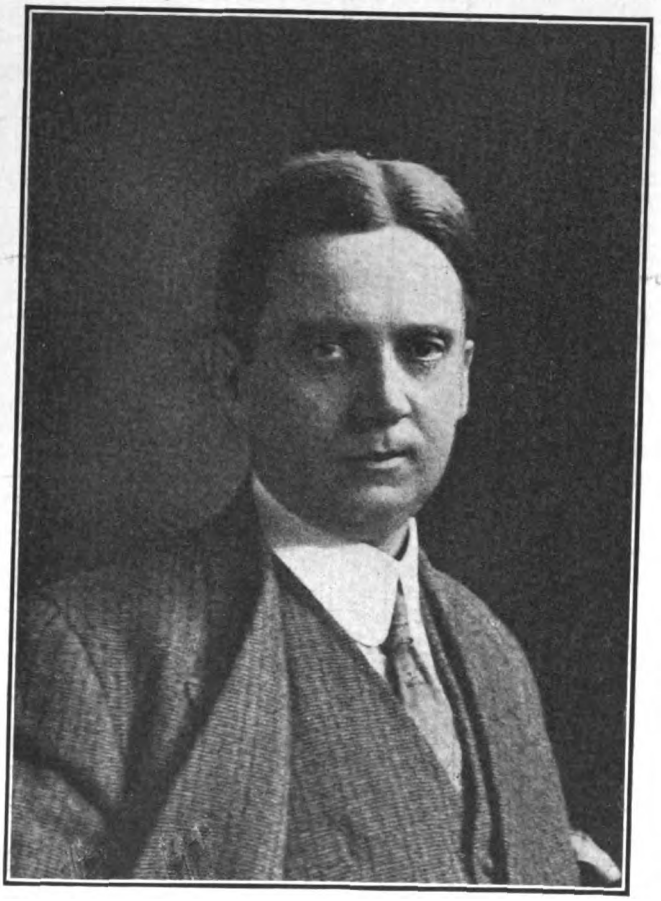
The requirements of the ideal manager of a large public utility are not easily fulfilled. On account of the many-sided interests of modern utility service he must be a man of not only broad technical and practical experience, but also of known sympathy with matters promoting the community and general public welfare. Such a man, if endowed with the trait of leadership, makes also an ideal head for an organization of utility interests.

These requirements were happily recognized last week in the election to the presidency of the Michigan Section, National Electrical Light Association, of Samuel A. Freshney. For over thirty years he has been closely identified with many branches of the electrical industry. Starting in 1884, when the industry was still in its infancy, he was connected with the old Brush Electric Company, of Cleveland, Ohio, one of the pioneer electrical manufacturers. He was employed in various electrical and mechanical departments of this historic firm, gathering a wealth of experience during the early development of arc lamps, arc-lighting generators, storage batteries and other electrical apparatus. Mr. Freshney can narrate many interesting anecdotes of those early days when the factory representative was called upon to exercise his ingenuity in selecting appropriate station and line equipment, install it and operate the plant until local operators could be trained to handle the apparatus.

After seven years' connection with the Brush organization, Mr. Freshney came to Muskegon, Mich., becoming manager of the Muskegon Electric Light & Power Company, whose plant he developed to a high state of efficiency. In 1900 he again associated himself with an electrical manufacturer, serving for two years as special sales engineer for the Fort Wayne Electric Works, Fort Wayne, Ind. In 1902 he returned to Muskegon to take the position of general manager of the Muskegon Traction & Lighting Company, which he held for three years.

The city of Grand Rapids, Mich., called for Mr. Freshney in 1905, when he was appointed secretary and general manager of the Grand Rapids Board of Public Works. He was particularly engaged in the management of the municipal electric light plant, which he built up to be one of the best handled public undertakings of the kind at that time. After seven years' service in the public interest he became associated for four months in 1912 with the Electric Bond & Share Company, of New York City.

On September 1, 1912, he was appointed general manager of the Grand Rapids-Muskegon Power Company, which position he has held to date; he is also general manager of the affiliated Grand Rapids Edison Company, the former supplying alternating current and the latter direct current. The Grand Rapids-Muskegon Power Company is noted for having been the first one to transmit hydroelectric energy at 110,000 volts and subsequently the first to raise this line voltage to 135,000 and even 140,000 volts. His long experience in so many branches of the electrical industry, his close acquaintance with both Grand Rapids and Muskegon from long residence and service in each, and his genial personal qualities make Mr. Freshney an admirable and highly esteemed incumbent in his present position.



Samuel A. Freshney,
President-elect, Michigan Section, National Electric Light Association.

Mr. Freshney is a member of the American Society of Mechanical Engineers, a life member of the National Association of Stationary Engineers, and a member of the National Electric Light Association.

Electric Motors on Dutch Farms.

"The idea of electric motors for general service in small industries and on farms," says Commercial Attache Erwin W. Thompson, The Hague, "is usually associated with cheap water power for generating the electricity. Cheap sources of power have been principally responsible for popularizing the use of small motors.

"Small motors having once been introduced soon demonstrated their advantages and conveniences and became increasingly popular. This demand has stimulated the electrician to further perfect the machinery for generating, distributing and applying the electricity and making it less difficult to control. The success of this work has reacted by extending the uses of the small motor among people having but little technical knowledge and skill.

"Coincident with electric improvements has come a great advance in the efficiency of steam-power machinery, especially for large units, and these have co-operated to greatly extend the use of small motors, even in districts where there is no water power. This development is becoming important in the Netherlands and is specially notable on the farms for such intermittent work as threshing, home grinding, feed cutting and churning. The country is thickly populated, the farms are small and intensive, and every possible acre is cultivated. Here is a set of conditions conducive to the establishment of a central power station. Here, where one is never out of sight of the drainage or navigation canal, with unlimited water all the year round, the problem of good feed water for boilers and cool condensation water for engines is solved and the question of high fuel cost is much counterbalanced.

"War conditions have much increased the cost of fuel because of the reduction of the imports of coal from Germany and England. The price of gasoline (used for small engines) has advanced in a greater degree than coal because of difficulties of importation, and because of the increased use of automobiles by the army; but these same conditions affect the cost of all power, great and small, and do not militate against the use of electricity, which, after all, is not a primary source of power, but only a convenient means of distribution.

"Germany previously furnished most of the electrical machinery and a large proportion of the steam engines and boilers used in the Netherlands. This source of supply is now practically unavailable and the field is inviting for American enterprise."

Digitized by Google

Electric Iron-Ore Smelting in Norway.

In Sweden the adoption of electric furnaces for the reduction of iron ore is apparently spreading, and the results obtained are encouraging, and likely to lead to further developments in this direction.

In Norway matters have not progressed quite so smoothly, owing to the different conditions prevailing in the two countries. In Sweden charcoal is used as the means of reduction, but in Norway charcoal is too expensive, and unless coke can be used the process cannot be worked with advantage, in spite of Norway's wealth of water power. The first attempt with coke at the Hardanger works proved so little encouraging that the whole works eventually stopped, although the ores used were rich in iron.

At Tinfos, however, the very opposite experience has been encountered.. A regular and remunerative manufacture of electric iron has now been going on for some time, and the production for the present year is estimated at 10,000 tons of electric pig iron. This satisfactory result is all the more noteworthy inasmuch as the ores used are rather poor so far as their percentage of iron goes, but otherwise what may be called good ore, hailing from three mines—Klodeberg, Grevinde Wedel, and Fon Anker—averaging some 45 per cent of magnetic iron ore.

The illustrations show the Tinfos electric furnace as used in the first three furnaces. It differs from the Swedish furnace used at Trollhättan by having a shaft on each side, so that the ore is led on to the two square electrodes. The upper electrodes each consist of three of four smaller electrodes. The electric current proceeds from the electrodes through the charge, the slag, and the liquid pig iron, down to the bottom electrode. This furnace, consequently, differs from the Swedish furnace, not only in having a bottom electrode, but, also, it has no gas circulation and requires very little water for cooling purposes. The fourth furnace differs from the three others by having three heavy round electrodes, with nipples. The question of a furnace with but one shaft is by no means excluded.

The charge consists of iron ore, coke, and, according to circumstances, limestone, the quantity of which depends upon the nature and blending of the ore, the quality of the coke, and the quality of pig iron wanted. Charcoal, as already mentioned, is not used.

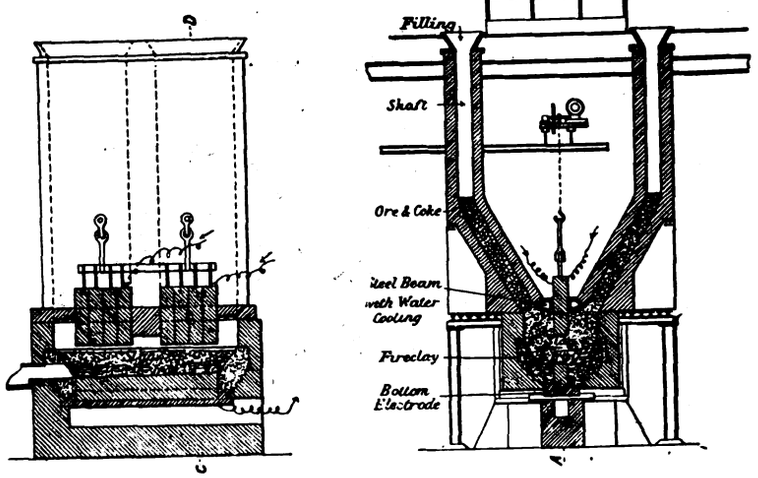
Patient experiment in different directions, and not always under the most favorable conditions, has led to the production of pig of high quality, strong and comparatively tough. Even at an early stage of the experiments it could be ascertained that the iron produced promised exceedingly well, thanks to certain good qualities in the ores which have been used.

When coke is used, the shafts of the furnace need not be very high, and, as a rule, the charge does not reach higher than a little beyond the bend in the shaft. The upper part of the shaft serves as a chimney, which produces the necessary draft in the furnace. To fill the shafts any higher with ore than shown in the illustration is not to be recommended when the ore contains zinc.

The Tinfos electric pig iron is close, being produced electrically, without any air being blown into the furnace. This pig can thus with advantage be used for all kinds of foundry goods which require much strength, such as cylinders, presses, pumps, propellers, etc., and it can with advantage be added to ordinary cheap and less strong pig, used in the foundries with or without addition of ferro-silicon.

The cost of production, including ore, coke, limestone, and electrodes, besides wages, crushing, weighing, and transport of materials, mounting of electrodes, repairs, storage of iron, the laboratory and electric energy, can, according to what so far has been experienced, be kept at from $17.75 to $18.35 per ton of pig iron when all three furnaces are kept going, exclusive of management, sinking fund, interest and taxes.

From the beginning of the present year all four furnaces have been worked regularly, one being always kept in reserve. Each furnace produces about 9 tons per day, or 27 tons for the three, making some 10,000 tons per annum. The percentage of pig iron from the ore varies from 44 to 47 per cent according to the quality of the ore. The power in the furnace may be as much as 1,200 kilowatts to 1,400 kilowatts.—*Engineering.*



Sectional Views of the Tinfos Electric Furnace for Iron-Ore Smelting.

English Electric Vehicle Committee.

At the meeting of this committee, held on June 11 in London, R. A. Chattock presiding, very satisfactory sales of the third number of the committee's organ, *The Electric Vehicle*, were reported.

Moreover, the special committee of the Local Government Board on Motor Traffic is being asked to hear evidence by the secretary on the effect of the use of electric vehicles. Everything is to be gained by bringing the actual facts of the case for electrics home to the mind of this particular government department which has it in its power to assist the municipal service branch of motor-vehicle business. Representative electrical institutions in the British colonies are being approached with the suggestion that they adopt the English committee's standards in regard to electric vehicles.

Examination for Apprentice Electrical Engineers.

The United States Civil Service Commission has announced an open competitive examination for apprentice electrical engineer to be held on August 4 at the usual places to fill vacancies in the Bureau of Mines at Pittsburgh, Pa., at salaries ranging from $720 to $960 per year and other vacancies as they may occur. The duties of this position will be to assist in experiments with electrical apparatus used in mining.

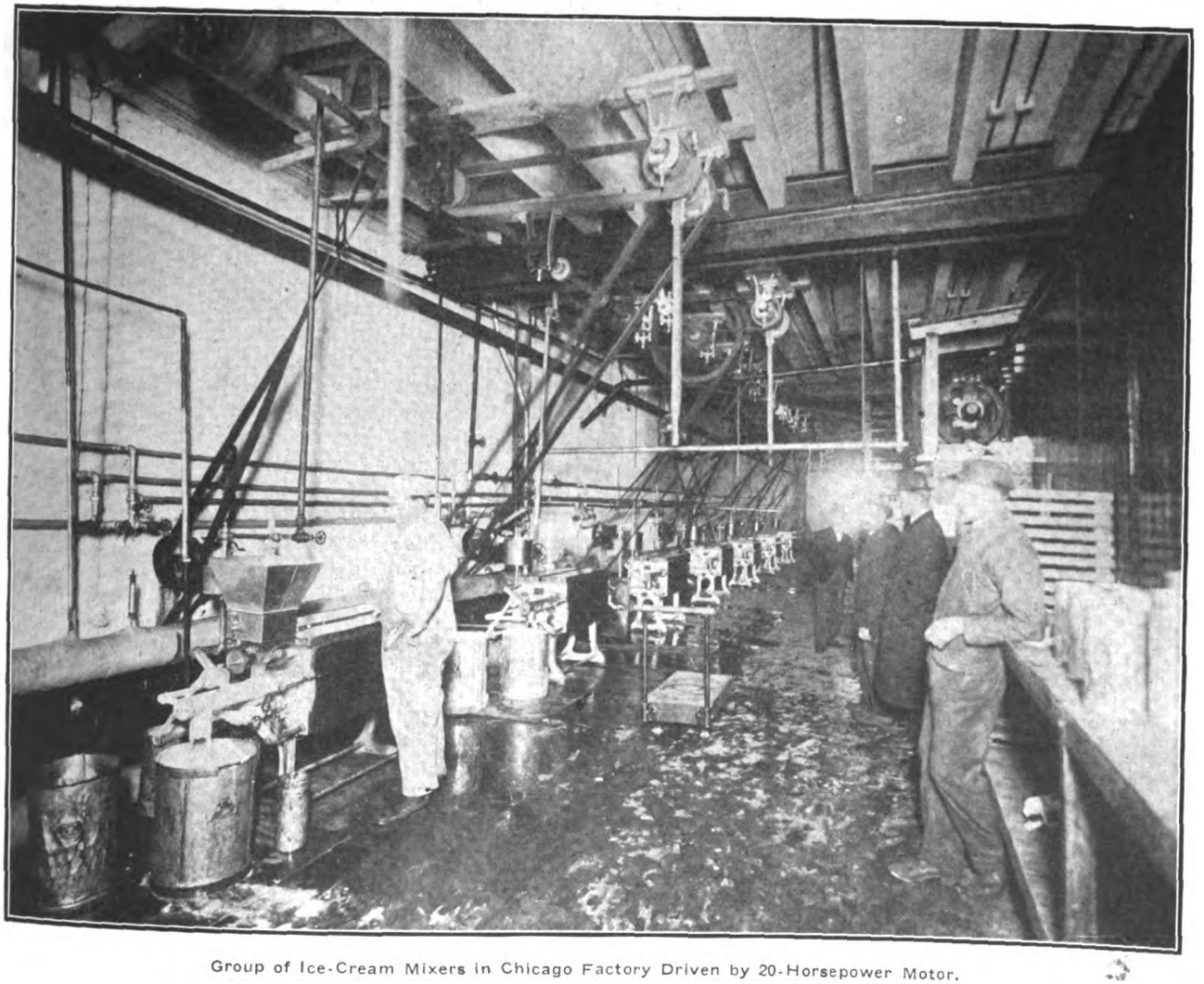
Competitors will be examined on electrical engineering, which will determine 70 per cent of their rating, the other 30 per cent being based upon education and experience. Graduation from a four-year course in electrical engineering is a necessary qualification. Applicants should secure Form 1312 from the United States Civil Service Commission, Washington, D. C.

Digitized by Google

Electricity in Ice-Cream Manufacturing.

The introduction of the motor-driven brine-cooled ice-cream freezer has practically revolutionized ice-cream making by eliminating excessive waste of ice and salt. The business from the central-station standpoint is particularly desirable, because of high load-factor and off-peak characteristics. This article discusses the processes of manufacture with relation to motor drive.

When it is considered that the annual consumption of ice cream in this country is about five quarts per capita, with a continual increasing demand, some idea of the extent of this industry and the extent of the field for central-station service may be had. Many ice-cream manufacturers have already modernized their establishments by the substitution of motor-driven refrigeration and mixers for the old wasteful methods, and practically all new plants convenient to central-station service are electrically driven, but there is still an appreciable number of smaller shops, such as combination ice cream and bakery, etc., which remain to be converted.



Group of Ice-Cream Mixers in Chicago Factory Driven by 20-Horsepower Motor.

Under the old conditions freezing was done with a mixture of ice and salt, usually about 1.5 tons of ice and 800 pounds of salt being required for every 100 gallons of ice cream frozen. In addition to this method being slow, and objectionable from the standpoint of cleanliness it was extremely wasteful because of the rapidity with which the ice melts and because of the fact that it is impossible to reclaim the salt.

In the modern ice-cream factory artificial refrigeration is used exclusively, motor-driven refrigerating machines being found entirely satisfactory. The most striking advantages of central-station service in this industry are lower investment for apparatus, lessened space required, absence of heat from the building, lessened chance of a breakdown, flexibility of operation and lower cost of operation.

The ice-cream industry is a very desirable load for the central station, since its daily load-factor is high, the period of greatest demand occurs in the summer months, and, as a rule, the business may be taken on off-peak schedules. The maximum load with reference to connected load is very high, as sometimes the total equipment, with the exception of the elevators, is operating at full load; the ratio of the half-hour demand to the connected load varying from 40 to 60 per cent.

The kilowatt-hours used per unit of product vary from 0.5 to 1.5 per gallon of ice cream, depending upon whether the plant buys ice or makes its own, and also upon the economy of operation.

The essential operations in the ice-cream industry are the receipt of the cream and milk, its pasteurization, cooling and storing. Afterwards the cream and milk, mixed in correct proportions, are sent to the mixers or freezers. When the mixing is completed the ice cream has a soft consistency such that it will flow and take the shape of its container. It is then set aside to hard-

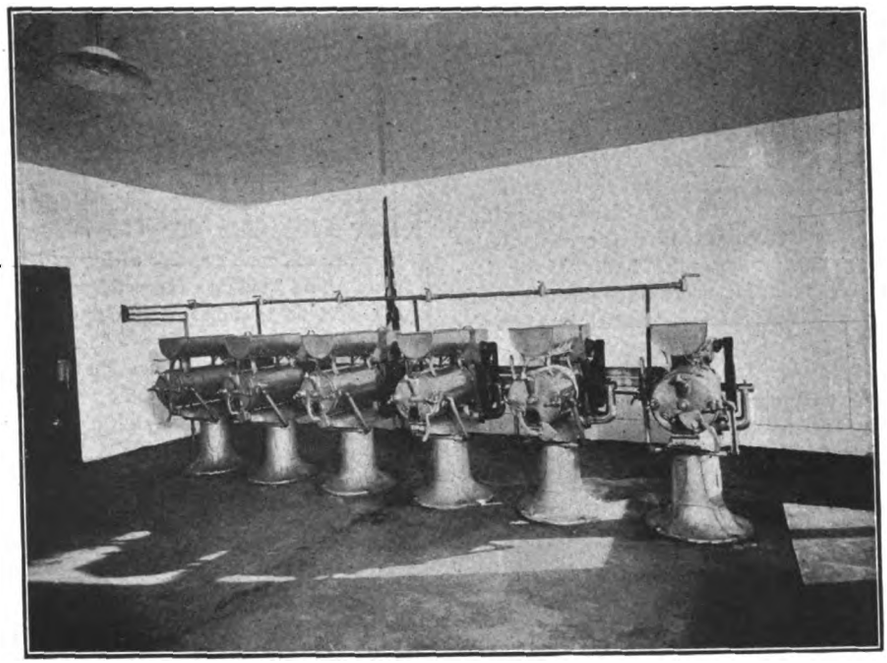
Digitized by Google

en and be cooled to about 8 or 10 degrees.

There are two methods in general use for hardening ice cream, the dry hardening system and by the use of a brine tank. In the former the cans of freshly made ice cream are set on racks or shelves in a room or refrigerator box in which cold air is circulated by means of fans. Occasionally the racks are formed of the cooling pipes themselves, but usually all the ammonia piping is in a loft or bunker and the air passed and repassed over it until at a very low temperature. As this circulates about the cans of ice cream they are rapidly cooled and the ice cream hardened in from four to eight hours. Because of the rapidity of the cooling this method is being generally adopted by the wholesale manufacturers, but is not well adapted to the retailer on account of the increased room and high cost.

In the brine-tank system the cooling pipes are immersed in brine contained in what is termed the hardening cabinet. This brine is generally still, and is maintained at a temperature approximately zero. The cabinet contains usually either a perforated false top or a series of perforated cylinders, into which the cans holding the freshly made ice cream are placed. They are thus surrounded by cold brine and the hardening effected usually in from 6 to 10 hours.

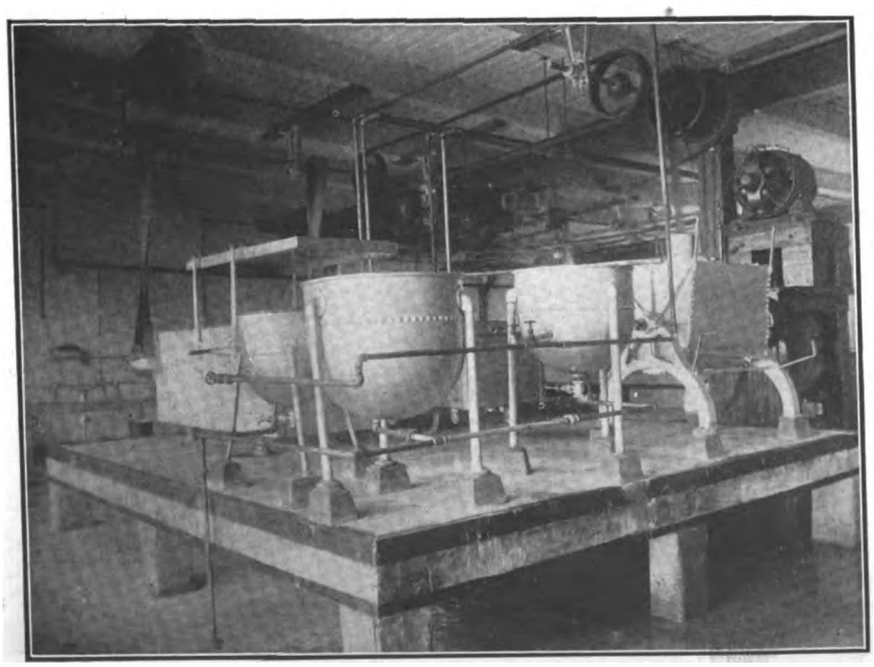
Practically all of the brine ice-cream freezers in use today are adaptations of the one principle of a jacketed can with a revolving paddle. Cold brine flows through the jacket and the ice-cream mixture is cooled in the inner compartment until it is viscous and just capable of flowing into the containers for hardening. Frequently the ice cream is placed for hardening into the cans intended for delivery, as the manufacturers claim that there is a noticeable shrinkage when ice cream is repacked.



Battery of Ice-Cream Mixers.

Each gallon of ice cream requires in the refrigeration machine a capacity equal to 800 British thermal units for the making and hardening. This heat is not all extracted from the ice cream, but allows for leakage and losses. If the ice cream is then to be kept for several days before being sold additional provision must be made.

While ice-cream manufacturing is now conducted almost entirely without the use of ice there is still a heavy demand for ice for packing and shipping and the large companies all manufacture this.



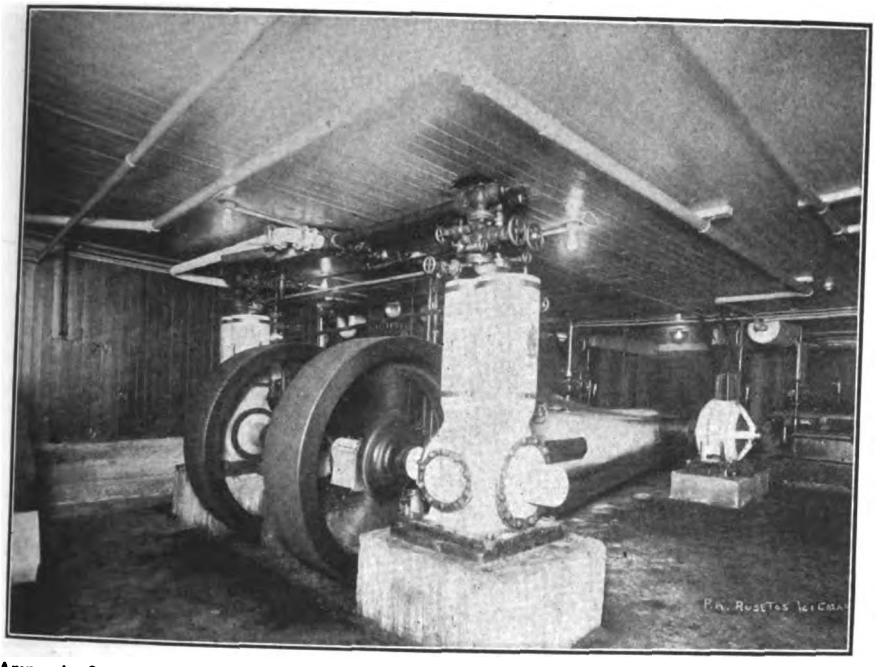
Brine-Jacketed Mixers, Motor-Driven.

Ice-making and refrigerating plants can be classified under two distinct headings: (1) Compression plants, in which the gas is drawn from the expansion side of the plant by the action of a compressor, then compressed to a liquefying pressure, and finally discharged into the condenser. (2) Absorption plants, in which the heat of the steam is used directly to expand the ammonia gas in the generator, producing in this way sufficient pressure to cause the gas to liquefy in the water-cooled condenser coils. Passing from these the ammonia liquor is then evaporated in the expansion coils, in contact with the brine or material to be chilled, taking up in the process heat which is delivered to the cooling water at the end of the cycle. The steam used to boil the ammonia gas can also be condensed and collected as distilled water.

With absorption plants for every three engine horsepower, one ton of ice can be made daily. If the engine horsepower is estimated and divided by three the number of tons of ice that can be made daily is found. In order to make use of the exhaust steam from engine it is necessary to have a good supply of cool water from a well or other source for condensing purposes and this water generally has to be pumped. Power must also be used for operating the ammonia pump, distilled-water pump and ice-tank agitators. The total amount of power for all auxiliaries ranges from one-half to three-fourths horsepower per ton of ice, depending upon the height the water has to be raised in the well.

In the compression system, which is much to be preferred, a motor-driven compressor is employed to produce the

Digitized by Google



Ammonia Compressor Driven by Motor in Plant of P. A. Rusetos Ice Cream Company, Chicago.

pressure at which the ammonia liquefies in the cooling coils. The remainder of the cycle is similar to the absorption process. With such a compressor motor load extremely favorable conditions for improving the central-station load-factor are established for the compressor runs long hours daily and can be slowed down or stopped during the time of the electric peak.

It is somewhat difficult to accurately estimate the kilowatt-hours required to produce a ton of ice. This figure will naturally vary in different plants, local conditions being largely responsible for the variations. Investigations which have been made, however, fix this figure at somewhere between 50 and 60 kilowatt-hours for plants working on the compression system.

The power required to drive an ice-making plant will vary from 2.8 to 3.0 horsepower per ton of ice in the larger plants, to four horsepower per ton of ice in the smaller plants.

The horsepower required to drive an ammonia compressor when the back pressure and condensing pressures are known can be determined by aid of the accompanying table:

	MEAN EFFECTIVE PRESSURE.					
Back Pressure.	Condenser Pressure.					
	150	160	170	180	190	200
5	51	52	54	56	58	60
10	56	58	60	62	64	66
15	62	64	66	68	70	72
20	65	67	69	72	74	76
25	67	69	72	76	78	80
30	68	71	74	78	80	83
40	69	73	76	80	82	86

It is necessary to multiply the area of the piston in inches by the mean effective pressure found in above table; then multiply by the speed of the piston in feet per minute and divide by 33,000. This gives the horsepower required.

To this result 20 per cent should be added to take care of friction losses in the machines.

For example, the horsepower required to drive an ammonia compressor having a double-acting compression cylinder 10 inches in diameter by 18 inches stroke, running at 80 revolutions per minute, with 20 pounds back pressure and 180 pounds condensing pressure would be as follows:

Area of cylinder 10-inch diameter= 78.54, therefore $78.54 \times 240 \times 72/33{,}000 = 41.15$ horsepower. Increasing this by 20 per cent gives 49.3 horsepower required to drive the compressor.

Ice Making.

There are two methods of making clear artificial ice:

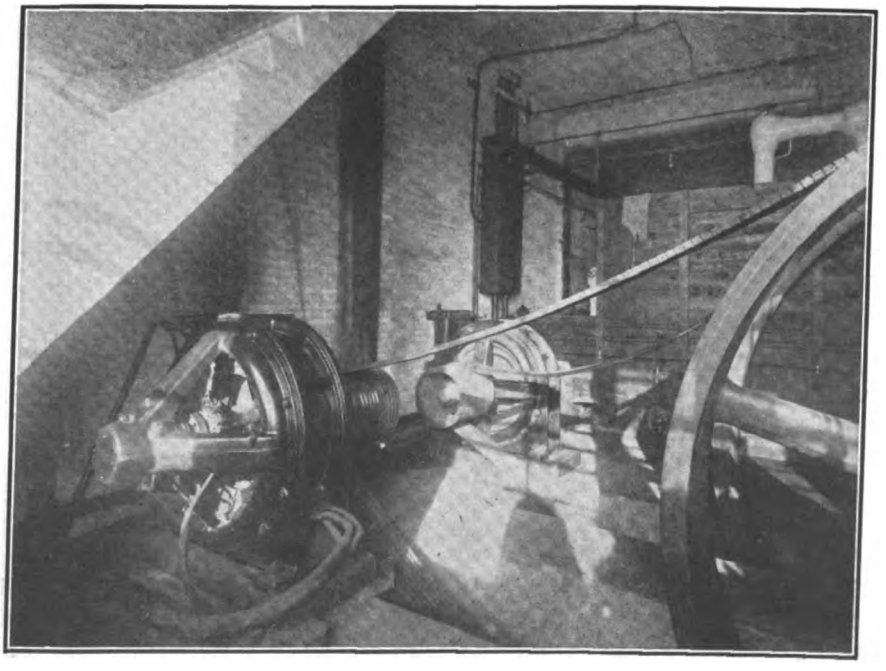
First. By agitating the water obtained from a drinking-water supply during the freezing process. This is known to the trade as "Raw-Water Ice."

Second. By condensing exhaust steam, and removing oil, gases, etc., from the distillate by means of oil separators, etc., and reboiling the distillate to remove the gases in solution, then freezing the distilled water, without any agitation. This is known as "Distilled-Water Ice."

Whether a raw-water or a distilled-water system be installed depends upon the chemical constituents of the local water supply. There are certain grades of water which will never furnish a clear cake of ice unless chemically treated, while other waters are of such condition that chemical treatment will cost too much. In such a case, a distilling system is necessary to furnish a clear cake of ice.

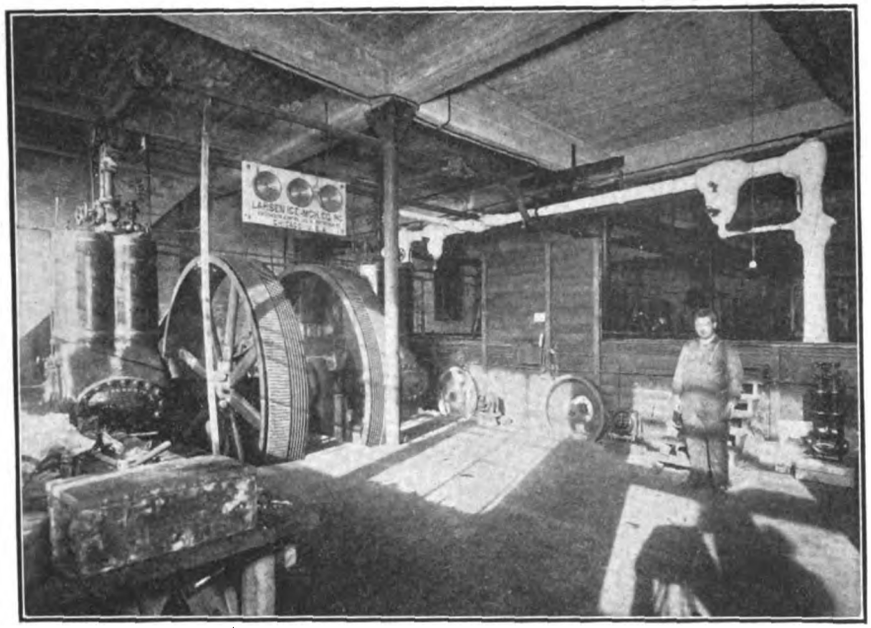
A thorough chemical analysis and report by those versed in the mysteries of raw-water ice-making should be obtained before an ice or ice-cream manufacturer decides upon a raw-water system. If the water is found to be satisfactory, it can be frozen into ice that is commercially perfect from all standpoints.

Ice making by the raw-water process is coming into extensive use and has opened up a desirable field for the utilization of electrical energy. To the ice manufacturer this process appeals in a very strong manner, as it removes the necessity of locating plants in such locations that permit of ready and convenient supplies of coal. By using the raw-water process an ice plant may be



Two 50-Horsepower Induction Motors Belted to Ice Machines in Ice-Cream Plant.

Digitized by Google



Motor-Driven Compressor in Ice-Cream Plant Where Steam Engine was Previously Used

situated in thickly populated sections of a city, near or in the heart of the distribution district for the product, thus eliminating the necessity for a great amount of cartage.

The raw-water process requires no steam and hence no coal, for electric power may be used throughout. The process consists of forcing air into the center of the ice tanks during the freezing process. All impurities pass to the center of the tank and when the main portion of the ice is frozen, the impure water in the center of the cake is pumped out, the hole refilled and the process continued.

The plant of the Lincoln Ice Company, Chicago, is a typical raw-water plant, making 200 tons of ice per day. It has one story, the atmospheric condensers and cooling towers being located on the roof.

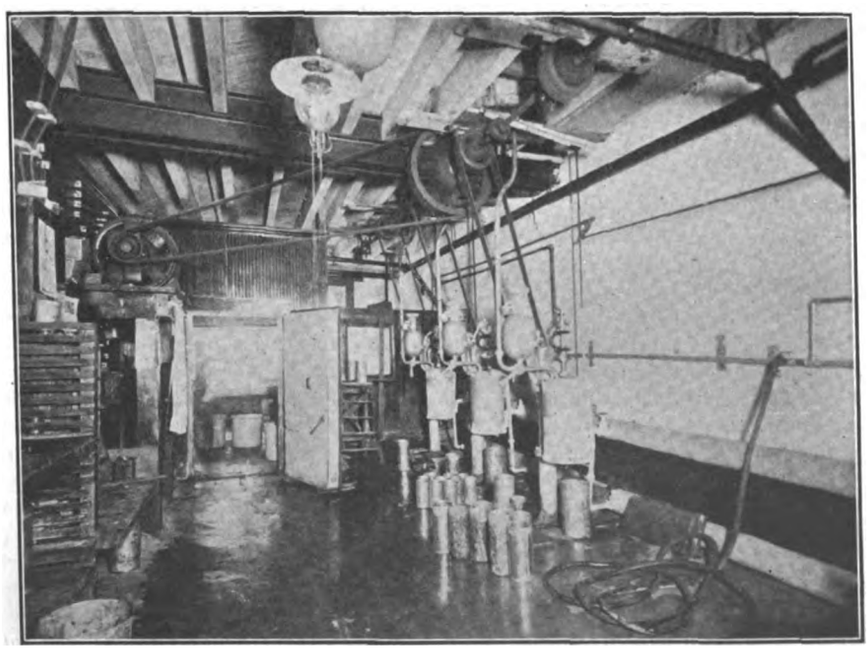
Power is obtained from the 4,400-volt 60-cycle line of the Commonwealth Edison Company and transformed to 220 volts by means of six single-phase transformers, two transformers being designed to operate in parallel across each of the three phases. These transformers are of the outdoor type and are installed on a pole structure reaching a few feet above the roof level, the poles being near enough to the building to permit of easy access to the transformers from the roof.

The ice-making capacity of any proposed plant should be sufficient to take care of the present maximum daily use and sales of ice in summer. Future growth of business can be taken care of by building an ice-storage house, storing up ice in the dull winter season and drawing from the store house in the busy summer season.

As an indication of the desirability of installing a small ice-making plant and operating 24 hours daily, rather than installing a large capacity plant and operating 10 or 12 hours daily, it may be stated that to manufacture five tons of ice in 24 hours, would require a total consumption of 250 to 300 kilowatt-hours, depending upon the season of the year and temperature of water required to serve the ice-making machinery, or in other words 50 to 60 kilowatt-hours for every ton of ice made. The maximum demand for power at any one period would be about 18 kilowatts for a five-ton plant or about 3.5 kilowatts for every ton of ice made, if the ice plant is operated 24 hours daily. If it is desired to operate ice machinery only 12 hours daily, the maximum demand would be double the above, although the total consumption would be about the same.

A plant built to make a certain quantity of ice to operate 12 hours daily will cost considerable more than a plant built to make the same quantity of ice, but operating 24 hours daily.

Aside from refrigerating and ice-making machines no special problems are presented in the application of electric motors to the various machines employed. Ice-cream mixers, pumps, can washers, ice crushers, conveyors, etc., all operate at constant speed, and where alternating-current service is available are best driven by the induction motor with squirrel-cage windings.



Motor Driving Group of Ice-Cream Freezers and Can Washers in Chicago Plant.

A "Made in Little Rock" Display.

The commercial department of the Little Rock Railway & Electric Company arranged a "Made in Little Rock" display recently in which was featured a large variety of articles manufactured in Little Rock by the use of electric power. About 25 manufacturers took advantage of the opportunity and one of the exhibitors, a manufacturer of ice cream and dairy products, gave away butter-milk and ice cream for two days. The display itself was exceedingly interesting and created much comment which was the means of bringing a large number of people to the Electric Shop.

Twenty-four house-wiring contracts were secured during the month, the work being aided materially by the fact that the city gas was turned off for three weeks.

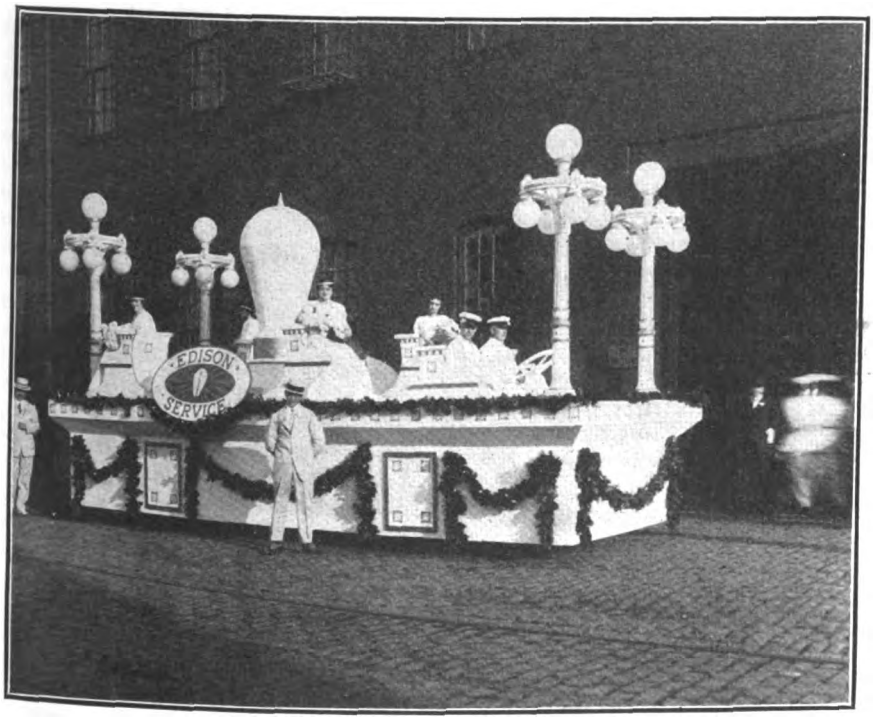
The Birmingham Railway, Light & Power Company, Birmingham, Ala., has recently closed a contract with the Hillman Hotel calling for an installation aggregating 160 kilowatts. The isolated plant will be abandoned.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Central Station Participates in Parade.

The eleventh annual convention of the Associated Advertising Clubs of the World was held in Chicago, June 20 to 24 inclusive, 1915. This was one of the largest conventions of Ad Men ever held. Monday evening, June 21, the convention was opened by an elaborate night pageant participated in by advertisers in all lines of business whose products were visualized in floats, trademarks, uniformed horsemen, pretty girls, etc. The parade was one of the greatest night pageants that Chicago has ever seen, requiring about two hours to pass a given point.



Float of Commonwealth Edison Company in Recent Advertising Parade in Chicago.

Electricity played a prominent part in this pageant and a number of electrical firms were participants. In addition to being illuminated by means of storage batteries, these various floats were also lighted at given points by means of batteries of huge searchlights installed on the roofs of buildings along the line of march.

The Commonwealth Edison Company entered two floats, one of which is here shown. This float was mounted on an electric truck; the decorations were classic in design and the float carried a group of girls in classic costume. Four ornamental street posts, each containing five Mazda lamps, 60 watts each, occupied the corners of the float. Garlands of green foliage placed on the sides of the float were illuminated with strings of miniature Christmas tree lighting outfits. There was a huge lamp in the center and an oval trademark of "Edison Service" on either side of the float. White carnations were thrown among the spectators during the entire line of march by the girls on the float.

The Chicago Telephone Company displayed one illuminated float showing a huge model of the telephone directory and another illuminated telephone instrument on a truck loaded with "Hello" girls.

The Edison Lamp Works also had an illuminated float. The Thomas Cusack Company made a very elaborate display consisting of five electrically illuminated floats and illuminated banners. The American Express Company was represented by means of a beautifully illuminated float. The Lindstrom-Smith Company had an electrical float depicting the use of electric vibrators.

Starting at eight o'clock from Michigan Avenue at Twelfth Street the line of march was north to Randolph Street, west to State Street, south to Jackson Boulevard and west to Market Street.

Concord Advertises Advantages of House Wiring.

The Concord Electric Company, Concord, N. H., is offering the following suggestions with reference to the wiring of houses for electricity, in advertisements in the local newspapers:

"Consider the advantages of an electrically lighted home:

"1. It is lighted at less expense than it could be by candles or kerosene.

"2. It is most attractive.

"3. It is easiest to sell or to rent.

"The man who has his home wired has invested his money profitably. Isn't it about time your family enjoyed the advantages of an electrically lighted home?"

Lighting Installation to Aid Real-Estate Sales.

The first step electrically in the improvement of a 1,000-acre city addition—one of three or four of equal size in the country—is a contract just placed by the King Thompson Company, of Columbus, O., for 68 light standards. These are to be erected on the portion of its Upper Arlington suburb of Columbus, Ohio, that marks the beginning of its development. The standards are to be of marble dust and crushed granite, 11 feet high above the foundation. Current supplied by the Columbus Railway, Power and Light Company will be carried to the standards by an underground cable.

Flat Rate Abandoned by Municipal Plant.

The municipal plant of Brigham City, Utah, has recently passed a regulation requiring all customers to install meters. The municipal electric plant has been operating for several years on a flat-rate basis, but it was found that the plant's transmission and distribution lines were kept loaded by the extravagant and needless use of current by the patrons, which rendered it difficult if not impossible to give good service. The installation of meters is being done under the supervision of the city electrician, Julius Wright, and will require about two months, after which time all flat-rate service will be discontinued.

Digitized by Google

New Offices of Utah Power & Light Company.

The Utah Power & Light Company has consolidated all of the offices in its Salt Lake Division in its new office, which occupies the north half of the ground floor of the Kearns Building at 132 Main Street. Heretofore the commercial office and electric shop have been located at 154 Main Street, and the lines and service department, and other operation departments in the old office building at 133 South West Temple Street. The new arrangement will enable the company to render much more prompt and efficient service to its patrons. The new quarters occupy a floor space of 40 feet by 180 feet with balconies on the front and rear end of the room. The front part of the main floor is given over to an electric shop and display room, the principal feature of which is a complete line of electric ranges of the principal range manufacturers. The main office is reached through a commodious entrance on either side of which are capacious display windows. The rear portion of the main floor is given over to the commercial office and accounting department. It is separated from the electric shop by a mahogany screen with bronze trimmings, behind which are located the receiving tellers' cages, the information and application clerk, duplicate bill clerk, and other employees who have occasion to wait on the public.

A commodious room in the front basement has been fitted up as a demonstration room. An elevated platform in one corner equipped with a hood for carrying away the cooking fumes, sink, refrigerator, etc., supplies all the facilities of a modern kitchen. Special cooking demonstrations may be given there, or an interested prospect may be taken down there by the company's regular demonstrator, where the efficiency of electric ranges may be shown the prospect, or where she may prepare food on the range herself should she be interested in doing so.

The company's general offices are located on the fifth floor of the Kearns Building, and this recent move places all of the general and local offices in close contact.

Vacuum-Cleaner Campaign in St. Louis.

A vacuum-cleaner campaign being conducted by the Union Electric Light & Power Company, St. Louis, Mo., is resulting in numerous sales. The company is using considerable newspaper space, announcing that it will allow a 15 days' free trial and if purchased, the cleaner can be paid for in monthly installments. A special price is made during the campaign.

Street-Lighting System in Hartford.

The Board of Street Commissioners of Hartford, Conn., in its annual report, describes the contracts under which the Hartford Electric Light Company is providing for the lighting of the streets for a five-year term.

One contract is for ornamental lighting, which is by means of 300-candlepower nitrogen-filled units on single and double poles 15 feet high, furnished by the city. There are now 183 double and 80 single lights, the lamps being installed in acorn-shaped diffusing globes. Poles are 60 to 100 feet apart. The rate for the double lights is $80 a year, and for the single $55 a year, the lamps burning all night.

General lighting is covered by the second contract, which is for 700-candlepower nitrogen-filled lamps in Holophane refractors and plain glass globes, 23 feet above the street. Secondary lamps, of 125 candlepower, are installed on 15-foot posts. There are 576 of the 700-candlepower units and 1,705 of 125 candlepower. The city pays $55 and $60, respectively, for supplying the larger units for overhead and underground supply, and $17 and $22, respectively, for the smaller lights. The company provides and maintains all equipment except the standards.

During the coming year about 48 300-candlepower lights will be added to the system.

Electric Vehicle Parade at British Municipal Electricians Meeting.

For the parade of electrics on the Victoria Embankment on June 17 there were 17 vehicles entered, the demonstration being arranged by Mr. Ayton's committee. They included a 1,000-pound Walker covered delivery van (Edison battery); a 2,000-pound open-body wagon (Edison battery) by the West Ham corporation; a 1,000-pound Opel covered delivery van, by Marylebone council; a 900-pound covered delivery van by the General Vehicle Company, Limited; a 4,000-pound automatic tipping refuse van (Edison battery); a 2,000 or 4,000-pound Edison chassis; a 2,000-pound delivery van (Edison battery) by Pullors of Perth; a 2,000-pound Baker chassis with box van body (Ironclad-Exide battery) and a 4,000-pound Baker chassis, both by Wolseley Motors, Limited; a three-people passenger roadster by Croydon corporation; a 1,000-pound Opel covered delivery van (E. P. S. battery) by Poplar borough council; a four-people electric landaulette (lead-plate battery) by Hertford Street Motor Company; a 1,500-pound Opel light delivery van (Hart battery) by Heston and Isleworth council; a four-people electric landaulette by Krieger Electric Carriage Syndicate (Naylor lead battery); a four-people Milburn coupé (Philadelphia lead battery), by Heath's Garage; a four-people Lang coupé (Ironclad-Exide battery) by Heath's Garage; a 7,000-pound Baker electric lorry by Wolseley Motors, Limited.

Panel-Board Campaign Successful in Louisville.

The July bills of the Louisville Gas & Electric Company carry on their backs a drawing showing a typical use of the new electric panel board, installed for $2.99 cash by the company and co-operating contractor, and a statement as to the service. In the display room at the company's offices a similar idea has been worked out with an actual panel, a fan and pedestal and an ironing board, with a dummy, borrowed from a ready-to-wear store doing a good day's work with an electric iron. Both are attracting a good deal of attention.

Use of the bills of the company for advertising special points of service is proving exceedingly effective and results are being gained constantly.

Demonstrating on Dead Signs.

During the month of May the Colorado Springs Light, Heat and Power Company conceived the idea of utilizing several dead signs for the purpose of demonstrating the value of Mazda sign lamps, as a source of more effective illumination. Two of these signs have been dead for several years, but were revitalized by the installation of 10-watt Mazda lamps, and so good a showing was made that the owners gladly purchased lamps, signed up contracts and resumed the use of the signs. Three flat-rate signs were added to the circuits during the month with an estimated annual revenue amounting to $174.00.

Extension of White Way in Lowell.

Fifty new 6.6-ampere magnetite arc lamps, forming an extension of Lowell's White Way, described in the issue of June 12, have been provided as the result of activities of business men's organizations, on upper Merrimack and Middlesex Streets. The openings were celebrated by band concerts and red-fire displays. The Lowell Electric Light Corporation furnished the apparatus and energy.

Seasonable Advertising in Brockton.

The Edison Electric Illuminating Company of Brockton, Mass., taking advantage of the season's suggestions, is pointing out in its advertisements the suitability of electrical apparatus such as coffee percolators, toasters, water heaters, chafing dishes, etc., as gifts for brides. Such appliances, it says, are bound to be welcome in the new home.

Digitized by Google

Efficiency Meeting in Louisville.

At a recent meeting of the Employees Club of the Louisville Gas & Electric Company three of the department heads were on the program for reports of their trip to northern city plants, just completed, and during which they were shown the inner workings of the plants they visited. They went in search of ideas, and reported various kinks and efficient points they picked up. They stated also that they were able to return well pleased with the efficient organization of the Louisville company.

L. S. Streng, superintendent of the electric department; W. A. Cowherd, general storekeeper, and McKay Reed, manager of the work order and voucher department, were the three who made the trip, visiting St. Louis, Minneapolis, Chicago, Indianapolis and other cities, as well as the big plant at Keokuk, Iowa.

The Louisville company is using small blueprints for the announcements of these regular Employees Club meetings.

Domestic Science Lectures to Give Impetus to Electric Range Sales.

The Utah Power & Light Company has engaged the services of Miss Mary Gray Marston, an electric range expert of New York City who is giving a series of exhibitions throughout the various divisions and districts served by the company. Miss Marston's talks are purely educational in their nature, the company believing that if the housewives can be educated to appreciate the simplicity, quality and economy of electric cooking, that they will not be slow to take it up. The women, and many of their husbands, are evincing a keen interest in these exhibitions wherever they are given, and there is every indication that the development of the electric cooking field in the company's territory will be a rapid one.

Attractive Show Window Aids in Iron Sale.

The usual summer campaign for the sale of electric irons was begun July 1 by the Kansas City (Mo.) Electric Light Company. An incident of the advertising is the display in the company's show window on Grand Avenue, comprising a miniature ironing board on which one of the irons offered is seen ironing a piece of cloth, with no visible means of propulsion. An elaborate equipment was necessary to attain the effect. The heavy iron required a strong magnet, and special means of moving the magnet. The devices were made in the company's shops, parts of equipment from street cars being used.

SUCCESSFUL COMMERCIAL MANAGERS.

H. N. McConnell.

"I have been through the mill in the central-station selling game, as salesman and department manager in several cities; and of recent years, as general commercial manager of a holding company, have aided in the reorganization of other properties in cities widely different in size, location and character. I have found, almost without exception, that the selling end of the business is not only the most neglected, but the most profitable for the company to improve. I have found that the old cry of 'Our conditions are different,' is just the cry of inexperience from the man in the rut; for the model selling system that we have worked out as our standard has proved a correct fit under every condition where it has been installed; and that means some 20 cities, scattered through seven states, from Colorado to Connecticut and from Texas to the Lakes." These are the words of H. N. McConnell, commercial manager of the United Gas & Electric Engineering Corporation of New York, controlling utility properties in 21 cities of the country, and in a measure they indicate the reason for the almost unparalleled commercial growth of the companies under his management. Mr. McConnell believes in a definite selling system for central stations. He has made this his hobby and throughout the central-station industry is considered as an authority on commercial department organization. There is nothing radical in Mr. McConnell's code for new business operation. His ideas are based on sound business principles, but attention to details is the secret of his success. In his own words, "there are a dozen things, most of them mere details in the day's work, and yet details that make all the difference between a well-built, smooth-running machine and a bunch of overbusy parts."

H. N. McConnell, General Commercial Manager, United Gas & Electric Engineering Corporation.

Coming from the New York Edison Company in 1907 as power salesman, Mr. McConnell associated himself with the Elmira Water, Light & Railroad Company in the same capacity, later being made commercial manager of that company and from there transferred in 1909 to the same position with the Colorado Springs Light, Heat & Power Company.

His successful management of these local commercial departments led to his promotion in 1910 to the post of general commercial manager of all the properties, which he now holds. Mr. McConnell now supervises the commercial activities of 21 public utility companies in cities serving a total population of over two million.

Mr. McConnell has served on the Board of Directors of the National Commercial Gas Association, and is a member of the Executive Committee of the Commercial Section of the National Electric Light Association.

It is safe to say that much of the company's commercial growth may be directly attributed to his early adoption of modern practices and placing the commercial department of each company in a position which has enabled it to be of the utmost value to the company as well as to the public served.

Minneapolis Company Presents Fountain to Public.

When the Minneapolis General Electric Company constructed its new substation at Thirty-ninth Street an artesian well shaft was sunk inside the building. The water from this well became famous in the neighborhood and in order to accommodate the public the company erected a white-tile fountain outside the sub-station. On a plate appears the following inscription.

"Presented to the citizens of Minneapolis by the Minneapolis General Electric Company."

Brooklyn Company Discontinues Prepayment Meters.

The Edison Electric Illuminating Company of Brooklyn proposes to remove all prepayment meters which it has in service. This move has been opposed by consumers, one of whom has taken the matter before the Public Service Commission for decision. In this case the yearly revenue is about $10 per year. With the ordinary meter there is a minimum charge of $1.00 per month.

Digitized by Google

Electrical Construction

CONTRACTORS' OFFICE FORMS AND SYSTEMS.[1]

By M. J. Lavalle.

Recently I talked with a manager of one of the large wholesale concerns on office systems, and asked him how he succeeded in establishing an efficient system in his office. He quietly answered: "I haven't succeeded." No concern ever succeeds in establishing a perfect system in its establishment.

While we try and have at all times an efficient and as near perfect system as possible, there is always a larger goal ahead, making it necessary to alter our systems accordingly.

Efficiency, in my estimation, is the first step towards system in the offices throughout any organization. Look back ten years. Think what we had paid for experience. If we had known then what we know today how much time, health, money, faith and energy we could have saved. Efficiency offers the only short cut to success.

The American slogan is efficiency. We aim at world supremacy and the world master must be, first, a self-master. The difference between a hod carrier and the head of a large concern is that the hod carrier works his hod instead of his head. For the hod he has trained his muscle; to the hod he is bound. To get ahead one must have a head. How many of us work the hod instead of our head? I simply bring out one of the essential parts of any working force, co-operation and efficiency, to show that no matter how good or practical our forms and systems may be, we must have co-operation, efficiency and competent help to carry them out, and we ourselves must be efficient. What is efficiency? Efficiency is the power of doing one's most and best in the shortest time and easiest way to the satisfaction of all concerned. What is co-operation? Co-operation is a term in social economics, implying the association of any number of individuals or societies for mutual profits.

But I am getting away from the subject of job estimating and the value of comparing same with completed jobs.

A reference of some kind is necessary for estimators and electrical contractors, as well as for lawyers and doctors. It is impossible to remember everything. It is hard to keep many figures in the mind without an occasional reference to tabulated results gained from experience and comparison with completed jobs. If we keep a complete record of all actual cost of labor and material on finished jobs and compare same with estimates made on such work, it saves time and guess work, for what has once been done can be done again. It preserves the old and gathers the new.

There are many new things for each succeeding generation. It is better to keep a record than to lose the old that is useful or the new that is continually met with and welcomed.

Doctors and bricklayers are not the only ones that disagree. Some years ago, while the Leamington Hotel was being built in Minneapolis, after we had signed up the contract, a certain electrical contractor of another city said to me: "You got a good job. I had a cost of $18,000 on that job, and if I could have got my bid in in time would have received the contract." He was probably honest in his statement, but did not figure conditions as they actually were, but simply as it showed on paper. I would like to get acquainted with his system of figuring. Now, my cost on this job was $26,000. When the job was completed the cost ran up to $28,000. The specifications called for all conduits to run over the tile, and it also stated that the building ordinance should form part of the contract, and should be adhered to in every detail. Of course, I figured to run over the tile, but after the building was started we found that the amount of concrete on top of the tile was not sufficient, according to our building ordinance, to allow running our conduits as specified, but we had to run all conduits at right angles in concrete beams, thus increasing the quantities of conduits, wires and labor considerably on the entire installation on which we did not figure. Where would that $18,000 cost be, I should like to know? Some of the contractors here in this room probably remember the circumstance I refer to.

When a friend asked Dr. Johnson how he came to define "pastern" a wrong way, he bravely answered: "Sheer ignorance, sir." I am convinced that as many low bids arise from "sheer ignorance," as from any desire to prove in the face of common experience that two and two equal five.

The astounding developments in methods of electrical construction made necessary by the development in the general building lines and the changes in rules and ordinances in different localities have upset and turned all our figures upside down. It is time for us to recognize the necessity of checking our estimating with the completed jobs and regulate our units accordingly, thus making some kind of a standard to go by, and those who refer to these acquired standards, will not, of course, bring in bids varying over 2.5 to 5 per cent, but the present differences ought not to exist. They are sometimes large enough to make one wonder if all electrical contractors use the same addition and multiplication tables. Occasionally, however, there are factors that enter into a bid that make a larger difference than seems warranted by price of labor and material. There are often cases where "B" is sure that "C" the successful bidder is going to lose money, while "C" has special or favorable prices on material that keeps him safe; or, again, "C" may know a better way of doing the work.

There are many differences as to the proper percentage to add and how to do it, but the cost plus a fixed sum overhead (whatever that may be) and at least 10 per cent profit is a good system. And as a final word, on uniform bids, estimates, etc., I will say that it is well and often necessary to look at the dates when they were made. Prices advance or fall in a month or even less. An architect or contractor cannot control markets, monopolies or unions.

Perhaps I should say a few words as to how the estimating is done and trouable avoided. It might be as well to pass on without doing so, as experience is the best teacher, but something may be said. In the first place, there is no such thing as time in proportion to cost in estimating; $100 worth of one item may not take as long as the same amount of another item. Examine the plan carefully, before you promise your architect to take it back in a half hour.

1 Paper presented at meeting of Minnesota Electrical Contractors' Association.

Digitized by Google

In making an estimate I find it better and safer to keep each factor of a complete bid separate, to finish and double line it, and to make a summary of all the items at the end. By this method any error or change in plan (in fixtures suppose) can be added under its proper heading without affecting feeders or switchboard and panels; while if the total is carried from page to page it is impossible to change a figure wthout making a risky change necessary all the way through. This policy is almost necessary in making separations in case of change or alternate bids, and does not necessitate going all over your bid a second time. Get the exact cost and add whatever overhead and profit you think possible. You will not get anything extra in these later days. Some contractors add the profit on each item as they go along and can never tell exactly what they have apart from the cost. I do not think this a good practice.

"Order is heaven's first law." As far as possible make out an estimate in its natural order. Some specifications put the fixtures on before the wiring is in. Your service generally comes first, especially in larger installations. Have a definite system and follow it. We generally start with the feeders down to the distribution cabinets and risers for light, power, telephone, telegraph, and whatever other systems are specified. Then to the basement circuits, and outlets to first, second and whatever floors are specified. I think every estimator should first study his specifications and plan thoroughly and proceed as though he were actually doing the work, starting from the foundation up, taking in every detail, being sure to not miss one thing, from a service condulet to the installing of the lamp in the fixture.

Make out an estimate on a form so that it can be kept for record. If you land the job you want to check up, and if it is kept for five years you are sure to find use for it. Our estimates, plans and specifications are all kept intact for at least five years, and we always find them valuable. Keep a close record on time and material consumed on different jobs for future comparison. Why should the labor on one building cost more than on another under the same conditions?

It is, of course, a matter of choice, but I never like to hear a bid read out $5,000.21. I always think for mere good luck, the few cents ought to be given to the owner. Estimating is not an exact science like mathematics. I prefer to either add or deduct a few cents and make the bid even. It is easier to add, and in the end a fair average can be made.

In making an approximate bid to the owner or architect, be liberal. It is easier to deduct (or leave out) than to add. (Do not be afraid of an extra; it has its advantages.) Architects, as a rule, do not like extras, and the owner who orders them groans when the bill is presented. But why should they? The proper way to settle for an extra is before the tool is lifted, and the bill rendered at the end of each month. Short accounts make "long friends." Any architect that is worth house room will give a written order for an extra so that the contractor can go ahead. If he insists that it belongs to the original contract the time to settle it is while both parties have it fresh in their minds (the present).

I think it is but right that we should be paid for material delivered on the ground. Many states do this, and so does the United States. Finally, if you really put your foot into it, *"back out"* is rather an unpleasant thing to do, but it is sometimes better to sacrifice pride than dollars. The best of us will make mistakes, but do not get the "back-out" habit.

We all have heard tales of woe without number, too low prices, something forgotten, something left out, and so on to a dismal chapter. Add a fair percentage. It is unsafe to be without it. A percentage to our credit is a fine thing to have around a finished job. They all say so, but the trouble is that when one forgets it he generally gets the contract.

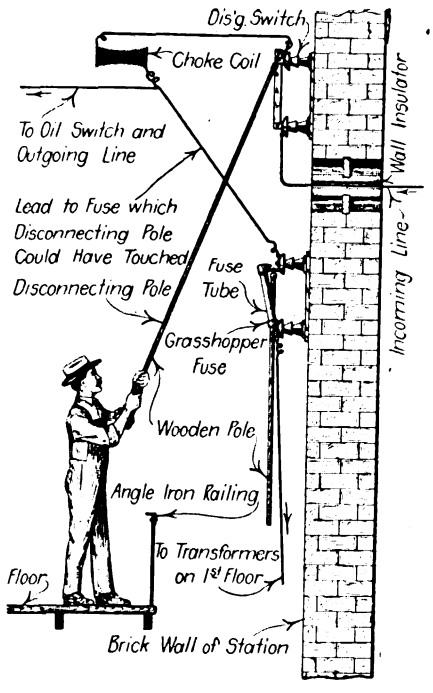
A contractor must have a fair acquaintance with every branch of his work. There seems to be enough in this field to engage the attention of one man. How much will it cost? is an important question that has to be decided before the final word is given to go ahead, and herein lies the responsibility of the estimator and contractor. He must do his work carefully enough to keep himself or firm out of the bankruptcy courts.

Unusual Accidents in Substation.

One of the most curious and unexplained accidents which has ever come to my notice occurred a little less than a year ago in the Hudson substation of the Bloomington & Normal Railway & Light Company, which operates a 33,000-volt transmission line of about 45 miles, supplying current to towns and villages in the west and north of McLean County, Ill.

This substation is a two-story structure, three 25-kilowatt, 33,000/2,300-volt transformers being located on the ground floor with the three-panel switchboard, and the lightning arresters, oil switch and choke coils on the top floor; the disconnecting switches and high-tension ("grasshopper") fuses for the primary circuit of the transformers being located on the wall and operated from the second floor.

During a thunder storm one afternoon, lightning came in on the 2,300-volt line and burned out one of the 2,300-volt circuit-breakers. The resulting short-circuit caused a rush of current which blew one of the grasshopper fuses in the primary, thus leaving only one phase in operation. In order to get the system in operation again, the substation attendant (who operates a telephone exchange in the front room of the station), called in a wireman who was doing some wiring in town. This wireman was better acquainted with the operation of the station than the attendant. He removed the fuse which was blown and renewed the fuse element, while the attendant and a man called from Bloomington transferred the secondary circuit to another switch. The



Arrangement of Apparatus.

wireman, having completed the repair on the fuse, proceeded to put it in circuit, this being accomplished by hooking it on the top terminal and letting it swing down in contact with the lower terminal of its own weight.

He had no sooner touched it to the top terminal, when current jumped down the wooden pole to his hands, knocking him at full length on the floor and setting fire to his shirt. The men below heard him cry, "Take it off! Take it off!" Rushing to his assistance they found him unconscious, and despite all efforts made to save him he died in a short time.

It now being about dark, the workers wanted to get things in operation as soon as possible, so the attendant thought by cutting off current at the disconnects, he could then insert the grasshopper fuse with safety. He

Digitized by Google

pulled off the two left-hand disconnects with the pole provided for that purpose, but the instant he touched the third and last one, current jumped down the pole to his hands, severely burning him and throwing him with considerable force on the concrete floor. Helpers were called in, who let him down, and after a short time he regained consciousness and was operating his telephone switchboard the next day. He had on common rubber boots at the time, but where he leaned against the iron railing a half-dozen holes were burned through his clothing, burning him considerably.

The attendant had repeatedly operated both fuses and disconnects and had never noticed any irregularity in their actions, but on this particular occasion things seemed to be beyond control, for current had to be shut off at the power house before anything could be accomplished.

Now, the question is, What caused the current to jump down the poles, which were both dry and perfectly clean, and had been used to handle full voltage many times before? It is possible that the disconnecting pole touched the conductor leading to the top terminal of the grasshopper fuse as the attendant reached for the disconnecting switch, as to operate the last one he would have to get rather close to it on account of it being close to the wall. However, the next day an electrician from the Bloomington & Normal Company tested the pole and found only slight leakage when a ground wire was wrapped around the pole only 18 inches from the upper end, when the end was brought in contact with a live wire; while the shortest distance over which current could have reached the operator, even by touching the lead to the fuse, would be at least five feet.

It could hardly be possible that there was a heavy charge of static on the line in the vicinity of the station, for by all laws of nature it should have passed off through the electrolytic lightning arresters provided for that purpose, which surely could have taken care of it so long as one of the disconnects was closed. Neither was there any lightning present at the time of the accident, as this was about three hours after the storm which burned out the 2,300-volt circuit breaker.

Paul M. Blough.

Among the Contractors.

The F. M. Grant Electric Company, Cleveland, O., has moved its office to 1518 Prospect Avenue. In addition to its improved construction and repairing facilities, the company announces it will carry a high grade of electrical merchandise, including Mazda lamps, fans, irons and heating devices.

HANDLING OUT-OF-TOWN WORK.[1]

By A. W. Lindgren.

Of course, the most important part of out-of-town work is to get the jobs first—but I will not disclose the secret of how to do this, as it is too valuable a secret to let go of. We will pass that part of it, and suppose that we have just received an $8,000 school job, about 100 miles from our place of business.

After having secured the job the first thing to do is to visit the job, familiarize oneself thoroughly with local conditions and ordinances, get acquainted with the architect, superintendent of schools, general contractor, members of the Board of Education, inspectors, and all of those people with whom one is liable to come in contact during the progress of the work. Right here is where the element of salesmanship enters in, and naturally the more agreeable one can make himself to the various people interested, the smoother the work will be carried on, and the better chance one has for securing extra work at satisfactory figures.

Our firm has never been so fortunate as to get a foreman for an out-of-town job who would pay his own board and room, so while you are on the job the thing to do is to secure for him a boarding place and a room, making the necessary arrangements for him. For helpers we generally pick up local men or send single men out of our own crew who are willing to pay for their own board and room, as this they would have to do in any event wherever they are. I might say right here, that quite frequently, we encounter competitors who apparently are able to secure foremen who are perfectly willing to pay their own expenses while out-of-town. In my estimation for a married man this is impossible.

Assuming that the job is about ready to start, the next thing we do is to thoroughly familiarize ourselves with details of plans and specifications, and then we go over these with the man selected as foreman for the job.

Before sending the man out, however, the necessary material which we have in stock is requisitioned and sent out, in order that it may be on the job when the man gets there, so that there will be no unnecessary loss of time. After this, at the proper time, the man is supplied with stationery, tools, expense money, etc., and sent out, after having received the proper instructions.

I might say here, in passing, that we aim never to substitute or deviate from plans or specifications without written consent of owner or architect.

On special items or supplies, where no specific make is called for, we, of course, do a little shopping around, after having secured the job, and if we have time, in order to see whether or not we can better the estimated price. However, one of the most important features in out-of-town work is to see that the men always have the necessary supplies and tools to work with, since if they are hampered by lack of these loss of time and money and unsatisfactory results in other ways are bound to occur.

During the progress of the work the foreman is required to send in time cards weekly for himself and men. He is also encouraged to write letters to the house regarding the progress of the work, extras which might come up, etc. He is also requested to anticipate his wants, so that he will not be held up for lack of material.

About once per month, or as often as necessity requires, the superintendent of construction visits the job—the better foreman you have the less times you need to visit the job.

Just before the end of each month we ask for an estimate on account from the architect basing our request on the amount of labor and material furnished to date. The usual terms of payment specified in the contract are, of course, 85 per cent of the value of labor and material gone in to date. If, however, you have a fairly lenient architect to deal with, it is quite possible to keep ahead of the game all the time; that is, to receive more money than the customary 85 per cent.

In completing a contract we try to finish the work just as quickly as possible, as it is generally here that a great deal of time is wasted. When the job is completed we try to have it accepted as quickly as possible, in order that we may get our money and make a quick get-away. After all, getting the money, is, of course, really the most important feature of all, since very often a contractor by not getting the money places himself in a position of being unable to even take any more contracts.

On time-and-material work we invariably try to have some one in authority approve the men's time before it comes to us, in this way eliminating chances for disputes.

In fact, as much as possible, we try to eliminate all causes for misunderstandings and disputes, as this is one of the disagreeable features of the contracting business.

1 Paper presented at meeting of Minnesota Electrical Contractors' Association.

New Mexico Coal Output.

The production of coal in New Mexico in 1914 was 3,877,689 short tons, valued at $6,230,871. This was the greatest coal output in the history of the state.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

The Pacific Gas and Electric Company has put in effect a combination rate for street lighting for blocks of 125 kilowatts or over, and for pumping to be supplied only from March to October, inclusive, in blocks of 75 kilowatts or over, at 2.5 cents per kilowatt-hour for such service in Phoenix. The company applied to the Commission for authority to put the rates in effect, but the Commission dismissed the application on the ground that their approval of the proposed rates was not necessary, as the laws of the state provide that all changes in rates, unless they are increases, may be placed in effect without the approval of the Commission.

NEW HAMPSHIRE.

Grafton County Electric Light and Power Company. In the decision of the Supreme Court of New Hampshire, which held, contrary to the finding of the Public Service Commission, that the consolidation to be brought about through purchase of the properties of the Mascoma Electric Light and Gas Company and the Lebanon Electric Light and Power Company by the Grafton County Electric Light and Power Company is for the public good (noted in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, May 15, 1915, p. 906), the court says: "It is not for the public good that public utilities be unreasonably restrained of liberty of action, or unreasonably denied the rights as corporations which are given to corporations not engaged in the public service. The public utilities statute includes individuals as well as corporations in the category of those subject to supervision and regulation. Id. Section 1. This act is primarily one to regulate public utilities rather than corporations. The regulation of corporate activities is undertaken solely from a public service standpoint, and the powers conferred are to be administered accordingly. There is nothing in the statutes relating to public service corporations which in any way tends to contradict or limit this theory. Ample provision is made for supervision, to the end that unreasonable conduct may be restrained, but there is no suggestion that the affairs of public service corporations are to be treated on any but a sound business basis." (94 Atlantic 193.)

After considering the objections to the consolidation raised by the Commission, the court held that the transfer is lawful and reasonable, and, therefore, under the holding quoted above, for the public good. The case was remanded to the Commission with the instruction to proceed exactly as though the Commission had found that the transfer would be for the public good.

NEW YORK.

Supervision of Refunding Bonds. The New York Supreme Court, Appellate Division, First Department, issued an opinion in People ex rel. Dry Dock, East Broadway and Battery Railroad et al. vs. Public Service Commission for the First District, which holds that the Commission has supervision over the issue of refunding bonds, even though the original bonds to be refunded were issued prior to the enactment of the Public Service Commissions Law. The majority opinion of the Commission, prepared by Commissioner Maltbie, refused to approve the issue, for the reason that the company failed to furnish proof that the new or old debts represented property of equal value or cost, or that the obligations to be refunded were for capital purposes. The company contended in the proceedings before the Commission and before the court that where a public service corporation has valid outstanding obligations issued before the Public Service Commissions Laws took effect, it is entitled, as a matter of course, to obtain the consent of the Commission to issue new securities to refund them. This latter view of the case was also presented in a minority opinion written by Commissioner Williams.

The court discusses the Commissions Law relative to the issue of securities, and court cases bearing on the matter at issue, and upholds the majority opinion of the Commission. The opinion of the court, written by Judge J. Dowling, says that the settled policy of the state, as interpreted by the court (People ex rel. Binghamton Light, Heat & Power Company vs. Stevens, 203 N. Y. 7, 96, N. E. 114; People ex rel. Delaware & Hudson Company vs. Stevens et al., 197 N. Y. 1, 90 N. E. 60) requires that the commissioners, in their duty of protecting the public, determine, before they give their consent to the issue of refunding securities, that the purposes for which the original securities were to be issued were strictly capital purposes, and not expense or operating purposes.

"The fact that the effect of such a refusal to a refunding plan in a single case may be disastrous, as it is very apt to prove in the present one, is not the controlling consideration, but rather that, under the settled policy of the law as now determined by the Legislature, and interpreted by the courts, the approval of the Commission to the issue of new securities, whether it be for refunding or other purposes, is notice to the public that the securities so authorized by it represent at least investments made by the company for capital account and not disbursements for mere temporary purposes.

"While, therefore, the Commission was wrong in applying the test of the actual value of the company's property and its earning capacity as a criterion for its approval of the issue of these new securities, it was right in refusing to approve their issue until the relator had proven that the securities sought to be refunded represented actual investments for the company's capital account. . . . Nor does the fact that these obligations were incurred, in large part, before the Public Service Commission Law went into effect, determine the question, for the essential feature of the situation is the approval of the Public Service Commission now sought to be obtained for the refunding bonds, and the representation thereby made to the public as an accompaniment of such approval that they represent actual investments in the company's capital account.

"I, therefore, reach the conclusion that in a refunding case the inquiry of the Commission is properly directed to the following considerations, the evidence requisite to reach a determination whereupon should be furnished by the petitioner: (1) Whether the proposed issue is reasonably required for the refunding purpose. (2) Whether the expenditure to be refunded is a capital, as distinct from an operating or income charge. (3) If the expenditure to be refunded is an operating or

Digitized by Google

income charge, whether such refunding should nevertheless be permitted under the exception clause of the statute, which reads, 'Except as otherwise permitted in the order in the case of bonds.'" (153 N. Y. Supp. 344.)

WISCONSIN.

Madison Gas and Electric Company. The Commission has approved a contract whereby the Madison Gas and Electric Company will purchase energy from the Wisconsin River Power Company. The energy from the dam erected at Prairie du Sac will be brought 33 miles over transmission lines to the Madison distributing station. Under the contract the price for the power purchased is $7.50 per year per kilowatt of maximum demand up to, and inclusive of, a demand of 7,500 kilowatts, and an energy charge of $0.004 per kilowatt-hour. The contract covers a period of 25 years.

The Ettrick Telephone Company applied for authority to put in effect a rate to non-stockholders of $12 per year, alleging that its present rate of $8 per year is to stockholders who have invested $40 for a share of stock. The Commission states that in a previous decision the company was notified that a distinction in rates or charges between stockholders and non-stockholders was illegal; and that the application in this case is virtually an application for the Commission to authorize the company to charge an illegal rate. The application is dismissed, but if the company chooses to file with the Commission a rate of $12 per telephone per year, with a discount of $1.00 in cases where payment is made within the first quarter, applicable to stockholders and non-stockholders alike, such rate will be approved by the Commission.

In the opinion in this case, the Commission again calls attention to the proper and legal method of maintaining equality between stockholders and non-stockholders.

"In dismissing this application in the form in which it has been presented to the Commisson, we should perhaps draw attenton again to the proper method of handling such situations as this. The Public Utilities Law is very specific in its requirements that no discrimination can be made based either on the ownership of stock in the utility concerned or on the ownership of part of the equipment used to furnish the service. Where consumers furnish part of the equipment utilities are authorized to pay them a reasonable rental for such equipment as is furnished by consumers which is ordinarily furnished by the utility, or which the law contemplates should be furnished by the utility. The term 'reasonable rental' would seem to mean that the rental to be paid to consumers should not be more than a fair payment for the use of the consumer's equipment by the company. Where the company furnishes all equipment to both stockholders and non-stockholders or regardless of whether the company furnishes equipment in all cases or not, the law forbids a discrimination between stockholders and non-stockholders. If a stockholder has furnished part of the equipment and a non-stockholder has not furnished part of the equipment, the company can pay a reasonable rental to the stockholder for the use of equipment furnished by him, but this rental is paid because he furnishes the equipment, and not because he is a stockholder. In short, such a rental, if paid at all, must be paid alike to stockholders and non-stockholders if similar equipment is furnished by both.

"The fact that a stockholder has purchased a share of stock in the company, however, does not authorize the utility to supply him at a lower rate than non-stockholders are supplied. In purchasing a share of stock in the company the stockholder receives the right to share in the net earnings of that company if there are any. He does not, however, receive the right to receive service from that company at a less rate than service is furnished to parties who have not purchased stock. In other words, there must be no confusion between the relations which exist between the individual and the company because of the fact that the individual owns part of the company's stock and the relations which exist between them because the individual is a patron of the company. The same service is furnished by the company to the non-stockholder and to the stockholder. Their relations to the company as far as concerns the matter of service rendered and paid for should be identical. The non-stockholder, of course, bears no such relation to the company as the stockholder bears because of his ownership of stock, and consequently the non-stockholder is not entitled to share in the profits of the business.

"This, of course, raises the question of what method should be followed to secure equity in dealing with both stockholders and non-stockholders, in the matter of service. Many of the telephone companies in this state were originally organized primarily to furnish service to stockholders. With the development of the telephone business, however, the public nature of this business has become more fully recognized, and companies which originally were strictly mutual have found themselves under obligation to furnish service to the public without discrimination. As long as only stockholders were served it made little or no difference in the long run whether the definite annual rates were large enough to meet the expenses of the company and pay a fair return on the investment or not. As soon as the public nature of the business resulted in the furnishing of service to non-stockholders, however, the matter of annual rates became one of vital importance to those in whom the ownership of the company vested. If rates were less than the cost of conducting the business, including in this amount the cost of securing the use of the capital invested, the loss incurred in serving all patrons, including both stockholders and non-stockholders, must, of course, fall upon the stockholders who had invested their money in the business. The result has been a more or less natural conclusion on the part of the owners of these companies that non-stockholders should be charged more than stockholders are charged, and if the law permitted such a procedure it would not be impossible to fix the level of rates which the company ought to charge to all patrons in order to cover all expenses of the business and then provide a resonable reduction from this level for those who had their money invested in the business. This reasonable reduction, of course, would be equivalent to the fair return which stockholders ought to be entitled to earn upon the value of their holdings.

"The law, however, does not permit this course to be followed. All patrons must be charged the same rate, and the distribution of profits to stockholders must be determined by the condition of the utility resulting from its operations during the fiscal period under consideration. In the long run, it should make no difference to stockholders whether they pay in the first instance a somewhat lower rate than is paid by non-stockholders, or whether they pay the same rate and receive in the form of dividends a share in the profits of the business.

"In practical operation, of course, there will probably be a tendency in the case of a growing business to retain these profits in the business for the purpose of making extensions and improvements, so that there may not be an actual dividend payment in all instances. However, the retention of these profits in the business increases the value of stock holdings, and consequently results in the stockholders receiving a return on their capital in the form of increased worth of their investments instead of in the form of a cash distribution of profits. The fact that a company has not been on a dividend-paying basis means that some readjustment must be made if equitable relations as regards stockholders and non-

Digitized by Google

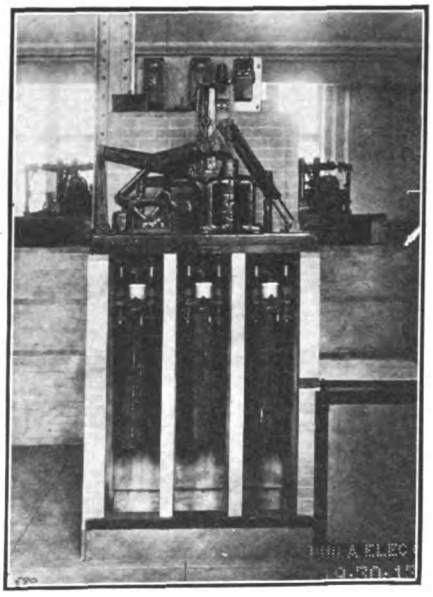
stockholders are to be established. It is unfair that non-stockholders should receive service without paying the full cost of that service under normal conditions.

To do this and comply with the law the company should establish a rate for all parties concerned sufficient to meet its full expenses, including a fair return upon the value of the property. With a rate fixed at this point there will be nothing to prevent the corporation from distributing in the form of dividends the amount available for return upon the investment, which is the greatest amount by which it would be reasonable to discriminate in favor of stockholders in the absence of a statutory provision forbidding such discrimination. If the company does not pay a dividend, but instead retains the money for improvement or extensions, it does so because it considers that a more satisfactory method of financing improvements and extensions than the borrowing of money to handle such extensions would be.

"Under the provisions of the Stock and Bond law of this state money may be borrowed to finance actual extensions chargeable to the capital account, or additional stock may be sold to secure the money for such purposes. There is, therefore, nothing in the law to prevent the stockholders of a telephone company from sharing in the profits of the business by receiving actual dividend payments, assuming, of course, that the rate to all parties has been fixed at what under normal conditions would be a reasonable point, that is, a point at which the rate will produce enough to cover operation expenses, expenses of current maintenance, expense of proper provisions for depreciation, and the expense of the use of capital which has come into the business and is represented in its property. If the company chooses to finance extensions and improvements by foregoing dividend payments, that is a matter for which no one but those who own the stock of the company can be held responsible. Consequently, if stockholders under normal conditions fail to receive in the form of dividends the full amount to which their ownership of stock might entitle them or an amount equal to the greatest discrimination which might reasonably be made in their favor, they have none but themselves to hold responsible. Of course, if conditions are such that the company is unable to earn a fair return on its property with rates at a reasonable point, stockholders cannot secure a full return upon their investment, but neither could they do so in the long run by any method of discrimination in rates between stockholders and non-stockholders. . . ."

New Combination Substation of the Philadelphia Electric Company.

Substation "E," recently put in operation by the Philadelphia Electric Company, is a concrete illustration of the spirit of co-operation now generally existing between the street railways and central stations. This building has the unique feature of housing two distinct substations, one a railway converter station, operated by the Philadelphia Rapid Transit Company and supplied from the Philadelphia Electric Company lines; the other an Edison substation, to handle the local power and light load. Located at Twentieth and Ludlow Streets, Philadelphia, it is close to an extensive residential section and in the center



Concrete Switch Compartment in Philadelphia Substation.

of a rapidly growing business section.

The building is of the most modern fireproof construction, embodying a steel skeleton with brick walls and concrete floors and roof. In the external architectural treatment the building conforms to the standard already adopted for the more recent substation buildings of the company. In the treatment of the interior an excellent effect has been secured by the use of white-enameled brick for wainscoting and panel, in a background of buff vitrified brick. A general interior view in shown in one of the accompanying illustrations which indicates clearly the interior construction, the trusses which support the concrete roof, the ventilating louvre, crane runway, and the line of supporting columns which marks the division between the railway and Edison substations. Ample light and ventilation are provided by the many wall openings and the louvre in the roof.

The Edison station is a combination alternating-current and direct-current substation, and the equipment comprises synchronous converter and static-transformer apparatus. The station delivers direct current at 110-220 volts to the Edison three-wire system, and alternating current at 2,400 volts to the two-phase 60-cycle distribution lines.

At the present time energy is received at 6,000 volts from a two-phase, 60-cycle transmission system. Ultimately this transmission system will be changed to 13,200 volts three phase, and an interesting feature of the high-voltage apparatus in the station is the fact that it is designed so that it may operate either system. Provision has been made for transformer equipment which will continue the supply of 6,000-volt two-phase energy to the Brush-arc motor-generator sets in the adjacent station "F" when the transmission system has been changed to 13,200 volts.

The electrical layout of the station provides for nine incoming feeders connected through circuit-breakers and selector switches to duplicate sets of unsectionalized high-tension alternating-current busbars, inclosed in concrete compartments. Circuits lead from these busbars to four booster converters, to the three-unit synchronous motor-generator set and to four step-down transformer banks. The converters and the motor generator supply duplicate sets of direct-current busbars, which may be tied together by bus-tie switches. The motor-generator can select either set of direct-current busbars; the converters cannot. The outgoing direct-current feeders are taken directly off the bus.

In the design of any power plant, the greatest efficiency can only be obtained when the physical arrangement of the apparatus is such that the energy enters at one end of the building, and passing directly through the various steps of transformation is delivered at the opposite end. This principle has been rigidly followed in the design of Station "E." Entering the basement through underground ducts, the incoming high-tension feeder is brought directly through the disconnecting switches and instrument transformers to the main oil switch.

The instrument for each incoming feeder consists of one ammeter connected permanently to a current transformer in the "A" phase wire, polyphase inverse-time-limit overload-relay equipment, and a pilot lamp connected to the voltage-transformer on the feeder. The pilot lamp is used to indicate that the feeder is alive. It is mounted on the switchboard in a specially designed hood with ground-glass face on which is painted the feeder designation.

Digitized by Google

On the same switchboard are mounted the necessary switches for operating the remote-controlled oil circuit-breakers. The control switches are of the twin-pull-button type, with the usual red and green indicating lamps to show whether the oil switch is closed or open. To actuate the control circuits, direct current is used at 125 volts, which is taken from two sets of three-wire control buses.

The main feeder oil switches are automatic circuit-breakers of 300 amperes, 15,000 volts capacity. The main oil switches are placed in separate concrete cells on the first floor of the station. Each of the three poles is entirely inclosed in a separate compartment with a removable asbestos-lumber door. A solenoid is used to actuate the operating mechanism of each switch.

After passing through the main oil switch the feeder returns to the basement and is connected by means of non-automatic selector oil switches to the bus-disconnecting switches on which the high-tension busbars are mounted. By means of similar selector switches each of the rotary converters may be connected through air-blast transformers to the busbars.

The energy flows from the 13,200-volt busbars to air-blast transformers and thence to the rotary converters. It is metered by the necessary number of alternating-current single-phase watt-hour meters connected on the high-tension side of the transformers, and by direct-current meters connected ahead of the direct-current busbars.

The present installation of conversion apparatus comprises two 1,500-kilowatt and one 1,000-kilowatt 60-cycle Westinghouse synchronous booster converters, one 500-kilowatt three-unit motor-generator set, two 4,000-kilowatt and two 6,000-kilowatt banks of air-blast transformers, making a total capacity of 24,500 kilowatts. In order to maintain a constant potential in the direct-current network, it is necessary to vary the voltage at the substation over a considerable range. Hence the rotary converters in this station are of the synchronous booster type, which allows a variation in voltage of about 30 per cent.

All of the converters now installed in this station are two-phase, 60-cycle machines. The 1,500-kilowatt units are operated as two-wire converters, whereas the 1,000-kilowatt unit is a three-wire machine, and with the 500-kilowatt motor-generator set takes care of the unbalanced load on the station. All three converters are arranged to start from the direct-current side, and apparatus is provided for synchronizing any machine with either set of high-tension busbars. The 1,000-kilowatt and one 1,500-kilowatt rotary converters are also furnished with equipment for starting from the alternating-current busbars.

The rotaries are protected on the direct-current side by means of solenoid-operated circuit-breakers of 10,000-ampere capacity which are mounted on the main floor by the side of the machine to which they are connected. The safety interlock on the direct-current starting switch, the use of which has been of value in connection with the speed-limit device on the converter, and the safety tap on the two-way field switch are interesting features of the installation.

In addition to the transformers stepping down the feeder voltage to the potential required by the converters, there are two banks of Westinghouse air-blast transformers for supplying the 2,400-volt alternating-current distribution lines. Each transformer bank comprises two 2,000-kilovolt-ampere and two 3,000-kilovolt-ampere single-phase air-blast transformers, which in the ultimate installation will be connected according to the Scott method of transformation, and will step down from the three-phase transmission voltage to the lower potential of two two-phase systems.

Special attention was paid, in the design of these transformers, to protection against short-circuits. The coils are strongly braced at the top and bottom by clamps, which hold the coils in place in case of short-circuit or sudden heavy load on the transformer. The coils are of pancake form and are wound with a single turn per layer. The complete coils are heavily taped and impregnated with a moisture-proof compound.

The ultimate capacity for which the station is designed is 6,000 kilowatts in direct-current, and 20,000 kilowatts in alternating-current apparatus.

Interior of Philadelphia Substation.

Increasing Use of Aluminum.

The quantity of aluminum consumed in the United States in 1914 was 79,129,000 pounds, against 72,379,000 pounds in 1913 and 65,607,000 pounds in 1912. The growth of the industry is shown by the fact that the production was 150 pounds in 1884, 550,000 pounds in 1894, and 8,600,000 pounds in 1904.

The value of the exports of aluminum and of manufactures of aluminum amounted to $1,546,510 in 1914, as compared with $966,094 in 1913.

Aluminum is the most abundant of metals and ranks third among the elements which compose the crust of the earth, being exceeded only by oxygen and silicon. It is never found native, or in elementary form, but occurs as an oxide, hydrous oxide, fluoride, phosphate, sulphate, silicate, or other compound. The only source of the metal so far commercially utilized is bauxite, an ore that contains 50 to 60 per cent of alumina (the common oxide), which corresponds to a metallic content of 26.5 to 31.8 per cent of aluminum.

The consumption of aluminum is constantly expanding, and aside from its use in the manufacture of cooking utensils, it is being employed in the construction of automobile castings and for wire for power-transmission lines.

The Board of Public Utilities Commissioners of the Philippine Islands has held that a telephone company may not cut out a subscriber's telephone to force the payment of a disputed bill. In a recent case the point was raised, and the board held that a disputed bill must be taken to court or otherwise settled without discontinuing the service.

Digitized by Google

American Institute of Electrical Engineers.

Annual Convention Held at Deer Park, Md., June 29 to July 2.

The thirty-second annual convention of the American Institute of Electrical Engineers was held at the Deer Park Hotel, Deer Park, Md., June 29 to July 2. The total registration was 204. The location of the hotel among the mountains was a delightful one, and the grounds afforded ample opportunity for outdoor games, had the weather permitted. Two rainy days, however, necessitated the abandonment of the tennis tournament, and lessened other outdoor activities. The golf match was completed nevertheless, E. W. Allen getting his name inscribed on the Mershon cup, while John R. Hewett carried off the cup for the runner up. The baseball game, played on Thursday afternoon, resulted in a victory for Captain Hall's team by a score of 13-11 in a five-inning game. Mr. Hall also carried off the prize for the longest tour by automobile, he and Mrs. Hall successfully negotiating the trip from Lynn, Mass. Prizes were also awarded in the contests for bowling, swimming, putting, cards, etc.

A feature of the convention was the attendance of Honorary Vice-President Harris J. Ryan as delegate of the San Francisco Section, an ovation being tendered him when he took a seat on the platform at the opening session.

The usual reception was held on Tuesday evening by President and Mrs. Lincoln, assisted by Honorary Secretary Ralph W. Pope, Past-President Dugald C. Jackson and other officers and ladies. This was followed by dancing.

A meeting of the Board of Directors was held during the convention, at which final action was taken in paying off the debt of over $50,000 which the Institute contracted in connection with the acquisition of the Engineering Societies Building. A report of the Standards Committee was adopted, making some changes in the present Standardization Rules.

The first session was called to order at 10:15 a. m. on Tuesday by President Paul M. Lincoln, who proceeded to deliver his presidential address. This was devoted to a consideration of the means of production and application of power, and a comparison of the progress made since 1898, when President Kennelly considered the subject, with the progress before that time.

A high efficiency of conversion between mechanical and electrical energy has been attained, efficiencies running above 97 per cent in some instances, and averaging probably 90 per cent. The conversion is somewhat more efficient in general from the mechanical to the electrical form, on account of the use of larger units and loading more nearly to capacity. With a margin of only 10 per cent, there is not much opportunity for improvement in this regard.

Prime movers have undergone great changes, and hydraulic motors now attain efficiencies close to 90 per cent. The thermodynamic engine has shown a remarkable development. Reciprocating engines have been largely displaced by turbines, the best of the latter attaining an efficiency of 75 per cent of that of a heat engine utilizing the Rankine cycle, which represents the best attainable. The average efficiency of turbines is not nearly so high, however. Since central stations use larger units and are more fully loaded, their better efficiency must cause them to prevail over isolated plants. The practical limitations to the best range in steam turbines can be met by increasing superheat or pressure; the latter seems more promising. The limit to size lies not in materials or design, but in possibility of application. The cost per watt of capacity has steadily gone down, reaching a value as low as 0.5 cent. Of the necessary costs involved in manufacture, that for labor is likely to increase, and that for materials is not likely to permit of much reduction. The limitation of heating sets the limit to the capacity of electrical machinery, and if insulating materials which will stand a higher operating temperature can be used, the cost per unit of capacity may be reduced. We cannot expect any radical change in power cost so long as the sources are water falls or coal. A more direct utilization of the sun's heat may eventually bring some improvement.

There may be a revolution, however, in the application of electric power, the importance of which is indicated by the wealth of material appearing in the *Proceedings* on this subject. There has been a vast improvement in lighting efficiency. Transmission lines have now been built up to a length of 245 miles and up to 150,000 volts. The use of direct current for transmitting energy brings some simplifications, but these are overbalanced by complications in generation and utilization. Testing voltages are now available over 1,000,000 volts.

While the developments in progress are not nearly so rapid as formerly, there is a consequent greater stability in the industry.

The first paper to be presented was one by J. B. Whitehead, entitled "The Electric Strength of Air."

Electric Strength of Air.

Some of the simpler fundamental experiments on the electrical conductivity of the air are described. The theory of ionization in gases is outlined in non-technical language. Townsend's proof that the law of corona-forming intensity $E = 32 + 13.4/\sqrt{d}$ is in accord with the theory of ionization by collision, is explained.

This paper was discussed by P. H. Thomas, F. W. Peek, Jr., E. E. F. Creighton, Harris J. Ryan, and L. W. Chubb. Mr. Peek explained the considerations, such as the requirement of a definite space in which to accumulate energy, and a time element, which led him to choose the form of equation finally adopted for the law of corona. He stated that coronas lasting only 0.5 microsecond were visible, and that discharges between needle points with alternating current sometimes seem continuous when they really consist of separate discharges from the terminal which is positive, extending only part way across the gap. As much as 10 kilowatts has been rectified by utilizing this property.

Professor Creighton spoke of the importance of the subject in lightning-arrester work, where the occurrence of a discharge depends upon an electron getting between the points.

Professor Ryan said that the theory of ionization should not be considered a failure because it does not explain much beyond the corona—it is still an infant theory. He referred to the importance of the time element, stating that only one-third as much voltage at 90,000 cycles is needed as at 60 cycles to discharge over a gap of 15 inches between a point and a plate. This is apparently because at the higher frequency ionization persists from one cycle to the next. The heating of the air at high frequencies at voltages too small to produce corona is not appreciable. Tests made in connection with this subject should include a variety of conditions, such as impulses, direct voltages, different frequencies of alternating voltage, etc.

In closing the discussion, Professor Whitehead said that the normal ionization of the air varied through a range of about one to four. Collisions are not the only source of ionization, which is produced by ultra-violet light, radioactive emanations from the earth, etc. In gaps shorter than the mean free path of a molecule, air appears to have a much larger disruptive strength.

Digitized by Google

A paper by John F. H. Douglas, entitled "The Reluctance of Some Irregular Magnetic Felds," was then presented in abstract by P. H. Thomas.

Reluctance of Magnetic Fields.

The historical development of the idea of magnetic reluctance is sketched, and the mathematical and experimental methods of determining it are first discussed. The magnetic field of an electric generator is next analyzed and made to depend approximately upon the reluctance of two-dimensional magnetic fields. The reluctance of these various magnetic fields is determined by experiments on the electrical conductivity of sheets of high-resistance metal cut in suitable forms, and by mathematical computation. These results are put into charts and formulas convenient for the use of those interested in electrical design. The results of the tests are proved to be more accurate than most of those already published. In particular, present leakage-flux calculations are most in error. There are two appendices giving some mathematical details, for reference purposes.

This paper was discussed by C. R. Underhill, J. B. Whitehead, Comfort A. Adams, F. W. Peek, Jr., J. D. Ball, L. W. Chubb and F. W. Carter. Mr. Peek pointed out the application of the method to dielectrics. Mr. Ball stated that magnetic measurements can be made more accurately than formerly, and the variation in material has been reduced to one-fourth what it was a short time ago. Accurate design of magnetic circuits is consequently more important. Mr. Chubb said that only a start had been made in solving magnetic problems on account of the complications arising from saturation, pulsation of flux, etc. He considered the pantagraph method of plotting flux more satisfactory than computation, and it could be applied in three dimensions rather than two. Water made a good conducting medium.

Frederick Bedell then presented a paper on "Irregular Wave Forms" consisting of three parts: "Form-Factor and Its Significance" prepared with the assistance of R. Bown and H. A. Pidgeon; "Distortion-Factors" prepared with the assistance of R. Bown and C. L. Swisher; "An Analytical and Graphical Solution for Non-Sinusoidal Alternating Currents," by F. M. Mizushi.

Form-Factor.

Form-factor is significant in the study of transformer losses; as is well known, hysteresis loss is small when the form-factor is large and *vice versa*. Every wave shape has a definite value of form-factor; but the converse is not true, for a particular value of form-factor does not indicate a particular wave shape. Form-factor, therefore, has no general significance as an indicator of wave distortion. A general expression for form-factor is derived in terms of the relative amplitudes and phase positions of harmonic components; curves are drawn showing the variation of form-factor with the amplitude and phase of the third harmonic.

Distortion-Factors.

A discussion of the significance and usefulness of deviation, peak-factor, harmonic-factor and curve-factor, is followed by a similar discussion of the differential distortion-factor, δ (which is the distortion-factor of the Standardization Rules), and a corresponding integral distortion-factor, σ, defined in this paper. Each factor has its own significance as a numerical measure of the departure of an irregular wave from a pure sine wave and hence has a special usefulness for special purposes, as well as a general usefulness as an indicator of wave distortion. A possible factor combining δ and σ is suggested. The variation of different factors with the phase, amplitude and frequency of harmonics is given. All the factors vary with the amplitudes of the harmonics; some factors are independent of their phase positions, while other factors are independent of their frequencies. Each factor has, therefore, its own characteristics. The importance of δ and σ and their combination is enhanced by the possibility of their use in alternating-current theory and calculation.

Non-Sinusoidal Alternating Currents.

The solution which is usual in case of sinusoidal currents for series circuits containing R, L and C may be modified by the introduction of current distortion-factors δ' and σ' so as to hold for non-sinusoidal currents. The usual solution for parallel circuits may likewise be modified by similar voltage distortion-factors, δ and σ. The general analytical solution for series and parallel circuits is followed by a corresponding graphical solution and a discussion of special cases. Not only are the effects of L and of C changed in value by distortion, but these effects are changed relatively in phase and are no longer in exact phase opposition as in case of sinusoidal currents and voltages. The mathematical transformations on which the solutions are based are given in an appendix.

The discussion of this paper, which was concluded at the session on Wednesday morning, opened with the reading of a telegram from the California Committee on Inductive Interference.

This pointed out that the work of the committee was necessitated by the occurrence of irregular wave-forms upon power lines, since the inductive interference was due to harmonics, mainly of the frequencies in the neighborhood of 800 cycles, to which receiving instruments are most sensitive. For that reason it is important to secure rotating machinery with a sine wave of the fundamental frequency. The Railroad Commission of California adopted a rule specifying that the wave forms used by the power companies should not deviate from a sine wave more than allowed by the Standardization Rules of the Institute. The rule adopted by the Institute covering this subject is therefore of great importance in this connection. The present rule is a poor one, especially as it does not penalize the higher harmonics sufficiently. The present papers show the limitations of the various criteria for departure from a sine wave. The most suitable, from the standpoint of inductive interference, is the differential distortion-factor. Tests made by the American Telephone and Telegraph Company show that the decrease in intelligibility is proportional to the strength of the harmonic, and proportional to the frequency up to a certain point. It then increases more nearly in proportion to the square of the frequency. A maximum is reached, however, at about 800 cycles, and the effect then decreases up to 1,500 cycles. Noise is usually due to a complex current of several frequencies. The effects of these several components are now being investigated. It is not considered necessary to investigate the effect of phase, on account of the work of Lloyd and Agnew. The requirements of a definition and measurement of departure from sine wave were then considered, and the various factors of the paper discussed from this standpoint. The differential distortion-factor most nearly fulfills these requirements, but certain harmonics should be weighted even more heavily. This might be accomplished by using a second derivative, although this would have no advantage over empirical weighting. The Standardization Rules do not now specify the condition of the machine as to load when the wave is determined. It is usually taken at no load, whereas the wave at full load is the important thing. It is very important to reduce wave distortion in power lines and approximate more closely to a sine wave.

L. W. Chubb considered the case of waves so much distorted that subsidiary hysteresis loops would be produced when used for magnetization. In these cases the form-factor cannot be used in the ordinary way for determining iron losses. The presence of harmonics of an even order makes it impossible to consider a single half wave. He pointed out errors in the work of the author due to not performing an integration from the zero point of the wave.

H. S. Osborne discussed interference in telephone circuits and exhibited curves giving the effect of different frequencies upon a telephone receiver and in causing interference. The interference co-efficient is a maximum at 1,600 cycles, where it has a value 80,000 times as great as at 60 cycles. Noise usually arises from those frequencies which are due to the presence of teeth and slots in the generators. It is sometimes caused by the high-frequency ripples from a direct-current machine.

Chester L. Dawes said that the capacity of a cable accentuates the distortion of the generator wave. He exhibited lantern slides illustrating this point. In cable testing, the peak-factor and measurement of peak voltage are important, and this is measured by a modification of the oscillograph to give an indicating instrument. He re-

Digitized by Google

ferred to a machine designed by Professor Adams to give a sine wave.

C. A. Adams discussed some of the features entering into the problem of securing a machine which would give a sine wave. He also presented a written discussion by W. V. Lyon, in which it was pointed out that the inconstancy of capacity, inductance, resistance and leakage complicate the problem and make Mr. Mizushi's solution inapplicable.

E. E. F. Creighton said that the use of an armature with a smooth core was the only way to get rid of harmonics. If there are teeth, there are some values of capacity and inductance which will bring out the harmonics.

W. J. Foster said that great improvements had been made in generators in the last five years with respect to wave shape. Generators of large size have larger air gaps, which tends to minimize the harmonics. A suitable standard is needed to test the wave. He considered the present deviation test the best which had been proposed and suggested that it be limited to three per cent on no load, five per cent at full load and unity power-factor, and seven per cent at full load and low power-factor. The sine-wave machines that have been mentioned have a low armature reaction, and are hence hardly commercial machines. In the latter a high armature reaction is required. This gives greater immunity from such troubles as short-circuiting. High armature reaction means large distortion. In large machines it will be hard to meet the requirements of the telephone company.

J. B. Whitehead also discussed this paper, and Professor Bedell then closed the discussion.

Tuesday Afternoon Session.

The session on Tuesday afternoon opened with a symposium on "Foundations for Transmission Line Towers and Tower Erection." This subject was discussed in papers by J. A. Walls, J. B. Leeper, W. E. Mitchell, P. M. Downing and F. C. Connery. Mr. Leeper presented his own paper and the others were abstracted by P. H. Thomas.

Foundations for Transmission Line Towers and Tower Erection.

BY J. A. WALLS.

Concrete tower foundations of mushroom type, requiring no forms or back filling, as used in recent Baltimore-Holtwood transmission line, are found to be cheaper and stronger than steel tripod foundations previously used in a similar line alongside. It was found that mushroom-type concrete foundations could be built with a smaller construction force and at lower cost and more rapidly, than certain types of concrete foundations requiring forms and back filling. The procedure of digging holes and concreting of mushroom-type foundations is described. Method of erecting transmission towers by the use of a shear leg is described in some detail.

BY J. B. LEEPER.

As tower anchors have been somewhat overlooked, causing in some instances much loss, these notes are written to call attention to the importance of properly designing them so that the maximum strength of tower may be obtained with the most economical outlay. The notes show: (1) a method of figuring the loads to be resisted by the anchors; (2) the importance of resisting the horizontal as well as the vertical loads; (3) the effect of the shape of the anchor on strength of tower; (4) various types commonly used; (5) the economy of the use of an all-steel anchor.

BY W. E. MITCHELL.

The development of the type of all-steel tower footing used by the Alabama Power Company for its 110,000-volt double-circuit steel-tower transmission lines is outlined, with a summary of the conditions influencing the designs finally arrived at.

BY P. M. DOWNING.

The author briefly emphasizes the fact that the weakest link of any transmission system is the line, and that this part of the plant has never been given the consideration it deserves. Towers are strongly advocated for important trunk lines, and certain conditions to be met in the design of same are given. The use of concrete footings is recommended in preference to those of metal set directly in the ground.

BY F. C. CONNERY.

There is a broad field open for designing and construction engineers in the design and construction of transmission towers and foundations. The purpose of the paper is to present a brief explanation of the types of towers, tower foundations, etc., along with a few details of field practice used in connection with the construction of two lines of towers carrying six 190,000-circular-mil, seven-strand copper conductors between Niagara Falls and Toronto. The question of dispensing with massive concrete foundations for towers is dealt with, and a number of alternatives are presented for consideration.

The discussion was opened by the presentation of written comment by R. S. McClelland. This was accompanied by charts giving a summary of tests.

A paper by A. Bang, entitled "Four Years' Operating Experience on a High-Tension Transmission Line," which was presented at a meeting of the Baltimore Section on February 26, was also included in the discussion. This paper gave a record of the operating events on the line of the Pennsylvania Water and Power Company between Holtwood and Baltimore. It includes observations on lightning flash-overs, deterioration of insulators, sleet on cables, and the means adopted to prevent disturbances to operation from these causes.

A. S. McAllister told of experience by a Japanese company which found insulators to deteriorate as rapidly in storage as in use. The deterioration was overcome by putting a thin layer of cement between the sections of the insulator.

E. E. F. Creighton complimented Mr. Bang's paper and said that a great deal of experience showed the deterioration to be mainly mechanical, such as different expansions of iron and porcelain.

E. A. Lof referred to a Swedish line of 70,000 volts now being constructed on which six graded insulators were used; with six equal insulators the voltage steps would be 11, 11, 13, 15, 20 and 30 per cent. With the thickness varied, the distribution of voltage is 15, 15, 16, 15, 17 and 20 per cent. This company also found the deterioration in storage as great as in use. This was considered to be due to the cement and the newer units have an air space left at the top of both inner and outer layer of cement, and a layer of graphite is placed on the porcelain next to the cement for electrical reasons.

Professor Creighton said that an insulator had been made without using cement. This type is more expensive, but may solve the problem.

H. V. Bozell suggested constructing a tower of hollow concrete poles.

L. C. Nicholson told of the results of using a megger to measure the insulation resistance on a line containing 40,000 insulators which had been in use for twelve months. Over two per cent of these showed zero resistance. This was mostly due to cracks in the porcelain at the base of the cap, presumably due to the pressure of the cap on the porcelain.

Mr. Leeper disagreed with Mr. Downing on one point; he said it was entirely possible to accurately compute the stresses produced by any assumed load.

The remainder of the session was devoted to a topical discussion on "Fields of Motor Application," which was introduced by David B. Rushmore. Mr. Rushmore presented an outline classifying the various industries and the points of interest in industrial operations. He gave statistics taken from the Census Bureau's report on manufactures in the United States. These showed the magnitude of each industry and the rate of increase. The items involved in the total cost of a finished product were tabulated.

The discussion was participated in by William M. Hoen, who considered motor drive in the oil flotation process for ore separation; H. D. James, who considered elevators; E. A. Lof, who considered the rubber industry; H. F. Boe, who discussed the applications of fractional-horsepower motors; William C. Yates, who discussed applications to printing presses; Thomas E. Simpers, who discussed applications to brick manufacturing. Other written discussions were contributed by C. A. Kelsey, on sugar mills; W. L. Merrill, on cement works; H. W. Rogers, on dredging; C. C. Batchelder, on pulp and paper mills. A printed paper by H. E.

Digitized by Google

Stafford on "Electricity in Grain Elevators," was also presented.

The general discussion was participated in by L. L. Tatum, J. C. Lincoln, J. H. Davis and M. G. Lloyd. Mr. Tatum said that it was not sufficient to determine the proper motor for any application, but that the installation should be followed through to see that it was done properly. Mr. Lincoln described a printing installation in Cleveland where the speed of the press was indicated on the meters in the office. Mr. Davis discussed the use of the vacuum system in grain elevators. This has great advantages over the old methods, but was not considered in Mr. Stafford's paper. Dr. Lloyd pointed out that two of the main items of manufacturing expense, the rent of land and interest on the investment in manufacturing equipment, were not included in the list of costs.

At the session on Wednesday morning, following the conclusion of the discussion of Professor Bedell's papers, two papers which had been requested by the Standards Committee to assist in the problems of nomenclature were presented, after some introductory remarks by C. A. Adams. The first paper was by Val A. Fynn, entitled "Classification of Alternating-Current Motors." The second was by Frederick Creedy, entitled "The Classification of Electromagnetic Machinery." In the author's absence the latter paper was abstracted by C. A. Adams. The two papers were discussed together.

Classification of Alternating-Current Motors.

This paper points out that in order to arrive at a rational classification of alternating-current motors it is necessary to base all suggestions on one and the same theory. The author thinks that the component-field theory is best suited to this purpose, and urges that it be always so applied as to bring out the very great similarity between the alternating and the well understood direct-current machines. Descriptive names are suggested for 44 alternating-current motors, including the principal forms of single-phase, polyphase, commutator and commutatorless machines now known. These names are such as to positively identify each of these machines. The rules followed in preparing the diagrams illustrating the various forms of motors and in selecting the proposed names, are given. In order to enable the reader to quickly judge of the aptness of these names, the theory of each of the motors dealt with is briefly outlined. It is thought that the information given will make it easy to correctly represent, describe and classify any motor which may have been omitted. It is further pointed out that the term "repulsion," as applied to motors, has never been defined, that no practical motors operate on what has been known as the repulsion principle ever since 1820, and that there is no justification whatsoever for the use of this term in connection with alternating-current motors. Such an indefinite term leads merely to endless confusion and should be abandoned. If it is not abandoned, it should be given a rational and definite meaning.

The Classification of Electromagnetic Machinery.

The author proposes to classify all dynamo-electric machinery according to five sets of characteristics, as follows: (1) Type of field, as constant-intensity, variable-intensity, multiple-polarity and homopolar. (2) Method of disposal of secondary power, which may be zero wattless, utilized in separate apparatus or transformed and returned to the line. (3) Use of commutators, which may be on either the primary or the secondary, or may be absent. (4) Method of magnetization, namely, high-frequency magnetization as the ordinary induction motor and low-frequency magnetization as in synchronous and compensated motors. (5) Method of connection. Many types may be connected either in series or shunt. A tabulation of these characteristics is given, by reference to which any dynamo-electric machine can be classified.

These papers were discussed by A. S. McAllister, H. M. Hobart, C. R. Underhill, C. A. Adams and Val A. Fynn.

Street Lighting.

The session on Wednesday evening was a joint meeting with the Illuminating Engineering Society. It was called to order by President Lincoln, who first introduced President-elect J. J. Carty. Mr. Carty responded by calling attention to the work accomplished by the Institute during the present year, which included paying off the Institute's debt for the Engineering Societies Building. He promised to continue the work for the welfare of the engineer.

Harris J. Ryan, honorary vice-president, was then introduced. He referred to the isolation of the Pacific Coast, and how it had been relieved by the opening of the Panama Canal and the transcontinental telephone line.

Farley Osgood then presented to Mr. Lincoln the past-president's badge with a suitable speech, to which Mr. Lincoln responded.

A. S. McAllister, president of the Illuminating Engineering Society, was then called to occupy the chair while Preston S. Millar presented a paper entitled "The Effective Illumination of Streets." This was accompanied with lantern slides and with demonstrations, utilizing an elaborate model set up in the room.

This paper mentions the dependence of effectiveness in street lighting upon municipal appropriations and efficient lamps, but discusses more particularly those aspects of effectiveness which are dependent upon skillful utilization of the light to produce the most effective illumination. There are included a classification of streets, a statement of the objects of street lighting (discernment of large objects in the street and on the sidewalks; discernment of surface irregularities in the street and on the sidewalks; good general appearance of the lighted street) and the elements of vision under street-lighting conditions. The paper emphasizes three considerations which are sometimes neglected in street-lighting discussions; namely, the silhouette effect, specular reflection from street pavements, and glare. The effect of glare in street illumination is dependent primarily upon (1) the extremes of contrast within view; that is, contrast in brightness between the light source and the illuminated surfaces; (2) the visual angles separating the glaring source from the observed surfaces; (3) the portion of the field of view which is illuminated. Glare militates against good street illumination in decreasing ability to see and in rendering unpleasant the appearance of the installation and the street. The remainder of the paper is given over to a presentation of the variables upon which the effectiveness of street illumination depends, and the influence which each feature of the installation exercises through these several variables. These variables are intensity of light upon the street, brightness of street surface, visual angle between lamps and street surface, contrasts produced on street surface and on objects, portion of total field of view which is illuminated, and appearance of installation and street by day and by night. As a part of this discussion illuminating-efficiency values for several modern street illuminants are given. The appendix includes statistics and photographs of some very recent installations which illustrate the latest trend in street lighting.

The paper was discussed by H. W. Fisher, C. R. Underhill, G. H. Stickney, D. C. Jackson, H. L. Wallau, W. R. Moulton, H. H. Magdsick, W. H. Pratt, J. B. Whitehead, Peter Junkersfeld, C. L. Dawes, A. T. Baldwin, L. D. Nordstrum, and H. V. Bozell.

Mr. Stickney referred to the lack of agreement on street-lighting problems, as to both ends and means. Mr. Millar had called attention to certain points, and added an important step to the ultimate solution. He referred to the competition between large and small units and said that intermediate sizes are often preferable. Different portions of the same street sometimes need different treatment. Undue weight has been given to efficiency because it is easy of measurement, but other elements, such as appearance, are entitled to consideration.

Professor Jackson said that the inclosed arc lamp was one of the mistakes of electrical engineers and he was glad to see other types supplanting it.

Mr. Moulton showed lantern slides of street lighting in Baltimore, substantiating some of the author's points. He emphasized the advertising value of profuse illumination. He also showed views of monuments lighted by concealed lamps.

Mr. Magdsick displayed lantern slides of street lighting in Cleveland.

Dr. Whitehead referred to the discomfort of exposed high-intensity sources, even where diffusing globes are used, and made a plea for concealed sources.

Mr. Junkersfeld referred to the complaints made in Chicago by residents who had powerful units placed in front of their houses, and the provisions made for shading the lamps on the

Digitized by Google

house side. These lamps are 25 feet high. Small units at lower mounting heights are often more satisfactory. Many compromises are necessary in street lighting, because considerations other than the best illumination are involved.

Mr. Baldwin referred to the change in candlepower of flame arc lamps due to etching of the globe and the deposit from fumes. The latter tends to give a better distribution of light. The effect of etching is not over 10 per cent. White flame carbons show a slight increase of candlepower with age, but not enough to counterbalance the decreases from other causes.

Railway Session.

At the session on Thursday morning six papers were presented dealing with contact systems of electric railways and all were discussed together. These were: "Unprotected Top-Contact Rail for 600-Volt Traction System," by Charles H. Jones, presented by D. C. Jackson; "Third-Rail and Trolley System of the West Jersey and Seashore Railroad," by J. V. B. Duer; "Contact System of the Southern Pacific Company—Portland Division," by Paul Lebenbaum, presented by R. F. Monges; "Construction and Maintenance Costs of Overhead Contact Systems," by E. J. Amberg and Ferdinand Zogbaum, presented by Mr. Zogbaum; "Contact System of the Butte, Anaconda and Pacific Railway," by J. B. Cox; "Contact Conductors and Collectors for Electric Railways," by C. J. Hixson.

Top-Contact Unprotected Rail.

The paper treats of the various factors which enter into consideration in the design of a 600-volt contact-rail system. The weight of rail to be used depends upon conditions met with in each case, but in general, a heavy rail is preferable from all points of view. The question of quality is rather indeterminate, but in general, it is not advisable to use soft steel until the weight has been brought up to at least 80 pounds per yard. Consideration should be given to it above this weight. Insulating and supporting is a mechanical problem which must be decided upon local conditions. The method of bonding and jointing to be used depends upon size and section of rail used. Provision must be made to control the expansion and contraction of rail by cutting it into sections and anchoring each of these sections. Various methods of connecting rails are described. The costs of constructing a single track mile of contact rail using 50-pound rail is $3,284, while the cost of the same amount of 80-pound rail is $4,028. The average maintenance cost per mile of rail, exclusive of entire renewal, is $80 per mile per year.

System of the West Jersey and Seashore Railroad.

The paper recites the details and cost of construction of the contact systems as originally installed and subsequently modified and extended, including third rail, third-rail insulators, protection, joint and cross bonding, track bonding and trolley structure. Operating experiences, as creepage of third rail, sleet formation on third rail, deterioration of rail bonds and detentions to train movements chargeable to failure of these structures, are related. The cost of maintaining the various contact structures for seven consecutive years, in cost per single track-mile per year, is presented. Results of actual measurement of third-rail and track resistances are also given.

Contact System of the Portland Division.

The paper describes in detail the overhead contact system of the electrified lines of the Southern Pacific Company, Portland Division, which operates at a potential of 1,550 volts. The design and materials of construction are given in considerable detail, and the cost per mile, of material and labor, is tabulated in very complete form.

Construction, Maintenance and Cost of Overhead Contact Systems.

The first part of this paper, written with special reference to the New Haven electrification, gives a brief analysis of the system and points to be considered in equipping trunk lines with overhead catenary construction. A short description is given of the various catenary types used on the New Haven, stating the conditions for which each is best adapted. The same applies to the supporting structures and sectionalization. The cross-overs and river crossings have been considered more fully.

With reference to the cost data: It should be borne in mind that the figures given apply to the New Haven construction which was installed in the section with greatest traffic density, also through thickly settled communities. Therefore, the figures given will be of little value for comparison or estimating unless these conditions are equated.

A general review of the problems involved in the maintenance and the cost of an overhead contact system of the catenary type, carrying high-voltage currents, is given in the second part. The paper includes not only the contact system itself, but the transmission lines which form an integral part of the same. The subject treated is the catenary construction on the New York, Westchester & Boston Railway which is purely an electrical line, having no steam whatever. The method of maintenance, the organization of the maintenance forces, the efficiency of insulation and other points which may be used in comparison and in discussion are brought out.

Contact System of Butte, Anaconda and Pacific.

A careful study of the general conditions existing on the railroad indicated that an overhead contact system was advisable. The relatively large amount of energy required per locomotive unit made the adoption of the roller pantagraph desirable. The weight of this type of collector demanded that the trolley line be made as flexible as possible. Special hangers, pulloffs, etc., were designed to accomplish this result. The cost of the contact system was relatively high because of the unusual conditions. The operation is quite successful, though some minor troubles were experienced in the beginning.

Contact Conductors and Collectors.

A general classification of collecting devices is given corresponding to the existing Institute classification of contact conductors. Contact rail systems and contact wire systems are considered along with their corresponding collectors. Many data derived from measurements made upon different types of overhead and collecting devices are arranged in the form of curves. The applications of these are discussed and the possibilities indicated for selecting other curves to still further express the factors essential to proper collection. This method of attacking the problem is a novel one and it is hoped that those interested in furthering the cause of better collection will be encouraged to assist in making further measurements. Examples are given of constructions where consideration has been given to the factors discussed. Suggestions are made as to profitable subjects for discussion.

These papers were discussed by L. D. Nordstrum, G. H. Hill, H. M. Hobart, R. L. Allen, D. D. Ewing and D. C. Jackson, as well as the authors of the papers. Mr. Hobart described the form of protected third rail and contact shoe being installed on the Lancashire and Yorkshire Railway in England, by J. A. F. Aspinall, the engineer.

On Thursday evening there was an illustrated lecture on the Baltimore and Ohio Railroad, by W. E. Lowes, assistant passenger agent, followed by an experience meeting of the Section delegates, presided over by H. A. Hornor. Before the latter was started, the services of Farley Osgood in staging the entertainment features were recognized, the presentation being made by H. W. Flashman. On behalf of the men a (china) home plate and fly swatter were presented and on behalf of the ladies a watch (alarm clock) and chain (dog leash).

Electrical Measurements.

At the session on Friday morning the first two papers were presented and then discussed together. These were "The Phase Angle of Current Transformers," by Chester L. Dawes, and "The Calibration of Current Transformers by Means of Mutual Inductances," by Charles L. Fortescue.

The Phase Angle of Current Transformers.

A method of testing the phase angle of current transformers by comparing readings obtained on a wattmeter whose current circuit is first connected to receive a part of the primary current (the remainder of the primary current passing in shunt through resistance) and then connected to the secondary circuit; the potential circuit is supplied from the primary voltage, and capacity or inductance is used to give the effect of a low power-factor in the wattmeter. Corrections are applied for the error of phase of the part of the primary current which passes through the wattmeter, and separately for the error of phase in the primary caused by the fact that the primary current is not exactly in phase with the voltage used to supply the wattmeter. A second method of connection is suggested which avoids the latter correction, and other methods including the use of a three-phase circuit are discussed. Results of tests are given, and also check obtained by the use of an alternating-current potentiometer. The method requires only portable instruments.

Digitized by Google

The Calibration of Current Transformers by Means of Mutual Inductances.

Reasons are given for the selection of mutual inductances as a means for calibrating current transformers, the most important of which is the wide use to which they may be put besides the calibration of current transformers. The design and manufacture of the apparatus is described, reason being given for the choice of the form of the secondary coils of the mutual inductances, which is a uniformly wound ring, and of the material used for the core, namely marble. The formula used in calculating the values of mutual inductance is given and its limitations stated. Variations in physical dimensions are given and errors in calculated values discussed. The method of calibrating the mutual inductances is described, which illustrates also one method of using the apparatus for measuring mutual inductance. The method of measuring ratios and phase-displacements by means of the apparatus, and the merits of various instruments for obtaining a balance are described and discussed. An artificial method of loading the transformers under test is proposed. Its advantages are pointed out. The use of the apparatus for measuring mutual inductance, self-inductance and alternating-current resistance is described. In conclusion it is stated that the apparatus has been satisfactory, and has given little difficulty in manufacture.

The discussion was opened by G. A. Campbell, who referred to the wide applicability of Mr. Fortescue's method, which has the desirable quality of being a zero method. He had tried the method, and at telephone frequencies the measurements can be quickly and easily made. For ordinary frequencies he suggested the use of two dynamometers, with the current in the fixed coil of one in phase and of other in quadrature with the test current. This would shorten the time required for a balance. The primary windings of the inductance coils should consist of two layers wound oppositely or other means taken to make them completely free from outside influence.

L. W. Chubb pointed out that the apparatus proposed is suitable for the shop and is used regularly in the transformer test department. Its usefulness is not confined to the laboratory.

C. H. Sharp praised the paper, but questioned the need of mutual inductances whose values can be calculated. The use of the synchronous reversing key made the apparatus suitable for the shop. The vibration galvanometer is not suitable for such work. Referring to the paper of Mr. Dawes, he said the method was a good one, but limited in its application.

J. R. Craighead said that a means of testing transformers in place was needed, and the method of Mr. Dawes permits it with the same instruments in the secondary circuit. The necessary corrections, however, would not always be easily applied. It requires careful handling, but is a good and practical method. Referring to the paper of Mr. Fortescue, he compared the two methods, using shunts and mutual inductances. The latter had the difficulties of a large number of contacts to be kept in order, and the danger of interference from stray fields. The author had eliminated the second difficulty, making the method much more desirable. The effect of varying wave form is different in the two methods, the shunt method being preferable in this regard, although this point is not important. The mutual-inductance method is better suited to the shop. He suggested the use of a separately excited dynamometer.

L. T. Robinson suggested a practical way of handling wattmeter corrections so as to avoid any confusion between positive and negative corrections.

C. W. Bates did not consider the method of Mr. Dawes as accurate as the agreement of results would indicate.

In closing, Mr. Dawes stated that the current in the secondary need never exceed five amperes, so that instruments of large capacity are not needed. The loading of transformers is not changed during a measurement. He uses a Sumpner dynamometer, which is sensitive, yet rugged.

Mr. Fortescue agreed that the use of two dynamometers would be an improvement. The errors with distorted waves are very small. If a separately excited dynamometer be used, one must be careful to avoid a distorted wave; using current from the same source where possible. One application of the mutual inductances is to measure the losses in power-limiting reactances.

A paper by V. L. Hollister, entitled "The Induction Watt-Hour Meter," was then, in the absence of the author, presented by M. G. Lloyd.

The Induction Watt-Hour Meter.

This paper discusses the principles and theory of operation of the induction watt-hour meter. It is claimed that the action is not due to a rotating magnetic field, as in the ordinary induction motor, and experiments are cited to prove this, among which is the fact that synchronous speed is not obtained. The need of compensation and its attainment are considered and an analysis made of the effects of frequency, temperature and wave shape upon the performance. Only temperature is found to have an effect and this is partly neutralized.

This paper was discussed by W. H. Pratt, A. S. McAllister, Chester L. Dawes, D. D. Ewing, C. W. Bates and M. G. Lloyd. Mr. Pratt maintained that there was no essential difference between a revolving magnetic field and the waves of flux passing over the surface of the disk, and others spoke to the same effect. In considering the effect of temperature, the element which is most important, because unbalanced, was not considered. Similarly with frequency and wave form, the analysis was incomplete the factors which really determine behavior not being considered. Tests on these effects show results differing with different types of meters. The author's assumptions are not even approximately correct. Mr. Dawes explained the meter action on the induction-motor principle, and showed why synchronous speed is not attained.

John P. Minton then presented a paper entitled "An Investigation of Dielectric Losses With the Cathode-Ray Tube," the discussion being carried over to the afternoon session.

Dielectric Losses With Cathode-Ray Tube.

This paper discusses the theory of the cathode-ray-tube wattmeter and shows how it can be used to determine directly the power-factors of insulations. The current and voltage are measured independently so that the dielectric losses in insulation can be calculated. Such measurements can be made up to the breakdown voltage of the material being tested. The development of the cathode-ray tube and its auxiliary apparatus is discussed. Measurements of dielectric losses, power-factors and currents, for varnished cloths and oil-treated pressboard, are given. The measurements have been made at 60 cycles at different voltages, temperatures, and moisture contents in the case of pressboard. Curves are given showing the losses, power-factors, and currents plotted against voltage, temperature, and per cent absorbed moisture. Empirical equations are derived for all the curves. It is shown that watt losses may vary from the 1.32 to the 2.52 power of the voltage. The losses and currents can be expressed by an equation of the form; $K_1 + K_2 V^n$, where V may be temperature in degrees centigrade or per cent absorbed moisture. The same form of equation holds for the power-factors up to about 85 per cent. The equations given show that the exponent n may vary from about four to seven, depending on the conditions of the tests and on the nature of the insulations. The large and harmful effects of moisture are clearly shown by the results, and the weakening effects due to high temperature are of much importance.

H. W. Fisher opened the discussion with a consideration of the losses in cables and the results he had obtained in testing them. He made use of a vibration galvanometer in this work and had found power-factors varying from 4 to 20 per cent. The sensibility was sufficient for a single thickness of insulation. Later a Rowland dynamometer was used for power measurements at high voltages. His tests on varnished cloth agreed with those of the author. With paper-insulated telephone cables, the results were quite similar to those obtained by the author on oil-treated pressboard.

C. L. Dawes presented written discussion prepared jointly with W. I. Middleton. He thought the author had underestimated the value of direct-current measurements. The resistance of cables drops with contined application of voltage, but the capacity does not change much. A wattmeter with

Digitized by Google

potential transformer was used by him, and results were considered accurate to 5 per cent, but the method was not applicable to such small specimens as used by the author.

F. W. Peek, Jr., discussed the mechanism of the losses in solid liquid and gaseous dielectric. Taking $p=afc^a$ as the expression for the power loss, either a or the exponent of e might be regarded as the variable. He gave values which he had obtained for the coefficients of loss at ordinary frequencies and said they agreed with values obtained by Alexanderson at high frequencies, up to 100,000 cycles. The loss in varnished cambric increases as the tenth power of the absolute temperature.

William C. Arsem pointed out the cumulative effect of heating in a dielectric, and the desirability of securing results with different thicknesses of pure materials, such as mica and glass. He then discussed the different theories of dielectric energy loss, giving preference to the ionic theory. He disapproved of the term "dielectric hysteresis" as a synonym for the energy loss. Both theory and experiment indicate that the loss is not exactly proportional to the theory.

Harris J. Ryan referred to the development of electrical measurements in general, and considered the present paper notable. He pointed out the advantages of the cyclograph, and its applicability to a wide range of frequencies. He had used it in corona measurements at 60 cycles and 180,000 cycles without any change of apparatus. There has been great improvement in the technique of the cathode-ray tube, and there is no longer any difficulty in insulating for any voltage, using the Fortescue-Farnsworth principle.

The paper was also discussed by A. S. McAllister, C. L. Fortescue, C. H. Sharp and C. W. Davis. In closing Mr. Minton said he preferred the mechanical commutator to excite the cathode-ray tube, although he had not had much experience with Dushman's kenotron.

After the conclusion of this discussion at the afternoon session, Professor Ryan was called to the chair and a paper was presented by Percy W. Gumaer entitled "Economic Operation of Electric Ovens."

Electric Ovens.

The energy losses in an electric oven may be divided into radiation and convection loss, preheating loss and the loss due to opening the oven door. Each of these losses was determined for several electric ovens and their effect on the cost of the cooking of various articles of food is discussed. With cheap fuels and inefficient stoves it matters little at what temperature a particular article of food is cooked if the results are satisfactory. With electric cooking, however, it is often several cents cheaper to cook an article of food at a particular temperature; for instance, with electricity at five cents per kilowatt-hour it is at least two cents cheaper to roast beef at 120 degrees centigrade than at 180 degrees. The results of the experiments performed indicate that for each article of food there is a particular time and temperature for which the cooking can be satisfactorily performed with a minimum amount of energy. The problem of the engineer in the further development of electric cooking is to design practical cooking devices in which the temperature can be accurately regulated with a minimum of attention on the part of the housewife and thus co-operate with the domestic scientist in the inauguration of truly scientific cooking.

The discussion was opened by D. F. Henderson, who said that the manufacturers had given careful study to the construction of electric ovens, but little attention had been given to the best conditions of operation. The cost is not excessive when properly used. He had used one for three years and found the cost for a small family not much different from the cost when using gas. The great drawback is in heating water, if this is not done in a systematic matter. A flat-rate water heater consuming 600 watts is now used. This is automatically disconnected when the range is switched on, so it operates about 18 hours per day and gives a continuous supply of hot water. Spokane has a block rate providing for three cents per kilowatt-hour for all energy above 30 kilowatt-hours, so that energy for cooking is obtained at three cents. There are about 100 installations in that city.

S. N. Clarkson said that a number of electric ranges had been installed in St. Louis, and they showed a good diversity-factor. The cost depends upon the individual operating the range, but is comparable with that for gas. A fair average is one kilowatt-hour per day per person.

H. L. Wallau said that in Cleveland, with energy at five cents, the average cost per month per person is between $1.50 and $2.00.

Ralph W. Pope, H. W. Flashman and M. G. Lloyd also joined in the discussion.

A paper by Frank G. Baum, entitled "Class Rates for Electric Light and Power Systems or Territories," was, in the absence of the author, abstracted by H. M. Hobart.

Class Rates for Light and Power.

The author offers arguments in support of the principle of establishing uniform rates throughout a system or territory for different classes of service. In establishing the rates he segregates the services into eight different classes and divides the rates into energy and demand charges; the energy charges being those charges which increase with the kilowatt-hours supplied and the demand charges being proportional to the peak loads of the different classes. By establishing similar rates for similar services throughout a territory any appearance of discrimination is avoided and a sliding scale of rates will take care of quantity consumption. The advantages are summarized as follows. Average class rates for the entire system (1) will tend to have "value of service" and "reasonableness of rate" given consideration when fixing rates; (2) will make one rate for entire district for one class and hence give advantage to company having the lowest cost; (3) will tend to reward the efficient company and hence tend to reduce costs of service; (4) will tend to allow constant service value of the property of the system as a whole; (5) will very much simplify rate-making; (6) will remove the differences in rates which cause most dissatisfaction and cause most rate inquiries; (7) will tend to make rates stable over a period of years.

This paper was discussed by William J. Norton, H. L. Wallau, M. G. Lloyd, S. N. Clarkson, W. H. Pratt, E. L. Wilder, J. W. Welsh, H. M. Hobart, and Ralph W. Pope. Mr. Norton said that an intense study of rate-making had been going on in California during the past year, and the state commission there was finding its theoretical basis of rates impracticable. Rates cannot be made on a pure cost basis. Rate-making is an art and not a theory, and rates should be simplified as much as possible.

Mr. Wallau took issue against a straight energy rate for each class. He believed in a quantity discount within the class. There are three general rates in Cleveland, the residence and general commercial schedules being based on the Wright demand system, while large power users came under the Hopkinson system, with discounts for quantity. This is satisfactory, but it is hoped some day to frame a single schedule which will cover all users by properly considering load-factor and other elements. He cited an example where a customer with poor load-factor earned a better rate on account of large consumption than when his load-factor was better.

Mr. Clarkson said that the paper seemed to apply particularly to California conditions. Certainly charges should not be the same at the two ends of a transmission line, and local costs should be considered, as the author admitted. Small differences in generating cost are unimportant, as this is a small item in the total charge. It should be emphasized that the central station is selling service.

Mr. Wilder thought there should be some incentive in the rate for the consumer to improve his load-factor.

Mr. Welsh said that the class load-factor is taken care of in the author's scheme, the principal feature of which was to prorate the demand charge.

Mr. Hobart agreed in the main with the author, but thought that such elements as power-factor should be considered.

The convention then adjourned.

Digitized by Google

Electricity in the War.

Electricity plays quite an important part in the present war operations, in the fields of electric lighting, especially for searchlight use, electric motors, telegraphy and telephony, and wireless telegraphy.

One important use is seen in the numerous types of automobiles or other portable plants containing gasoline motors and dynamos, and in this way there are now on the field many such outfits which serve for the uses of electric lighting, wireless telegraphy, portable repair shops for aeroplanes, water-purifying plants, and other purposes. Electric apparatus is mounted upon aircraft in the way of searchlights, wireless-telegraphy outfits, and the like.

The use of the electric motor in connection with a large power van of the gasoline type allows of designing a well organized traveling tool shop in which the van contains motor-driven machine tools. The French army makes use of an automobile repair shop for aeroplanes which is shown in one of the photographs. According to the method used by the army in the period preceding the war, aeroplanes are grouped in sections or fleets containing six or eight aeroplanes each, together with automobile convoy wagons for transporting them upon the road. The electric-motor-driven tool-shop van is a very necessary feature of the fleet and accompanies it along the road. The fleet proceeds over the routes, preferably at night, and is then stationed at its camp which serves as headquarters for making the flights for reconnoitering the enemy's lines or for other operations. Each camp thus has its repair shop, and this is most useful in keeping the aeroplanes in active service and preventing them from being laid up through accidents which may happen to them when on flights. Even though an aeroplane is considerably damaged, it can be put into shape within reasonable time; motors can be replaced, etc., from the stock of material which is carried upon power wagons along with the fleet. It will be seen that the present method is most effective in keeping the aeroplane fleet in good working order, and the electric motor is largely responsible for this, owing to the readiness with which the machine tools can be driven, and the work can be well lighted with electric lamps at the same time.

Fig. 1 shows a repair outfit which is built by one of the principal Paris automobile works, the De Dion Company. Although closed tightly when on the road, the van opens up by letting down a large flap door at each side, and this being held horizontally upon props, serves to greatly increase the floor

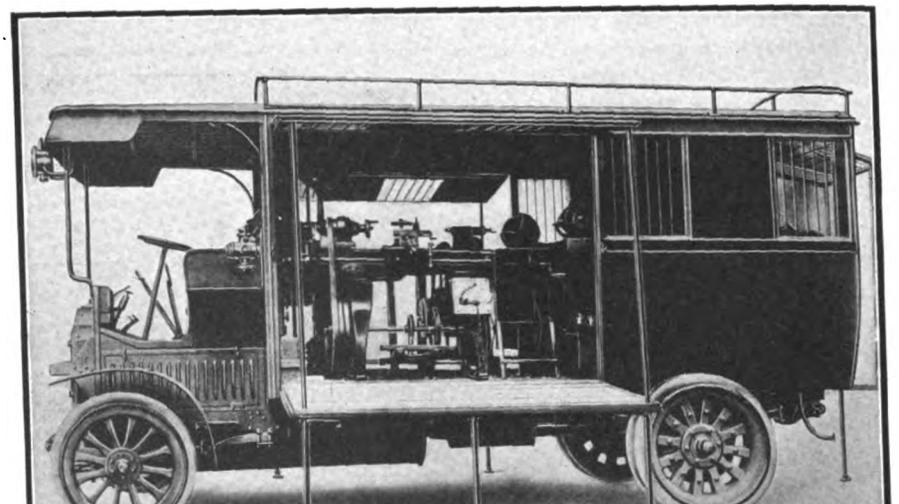


Fig. 1.—Auto Repair Car.

surface of the repair shop. There is also a double door for entering the car at the back end. Inside the shop are installed various tools, such as lathes, emery grinder, etc., which are driven by small electric motors. Good-sized work benches are provided, and a good set of metal-working and wood-working tools for making all kinds of aeroplane repairs. The stock of material and spare parts is carried for the most part upon special supply automobiles.

A 25-horsepower motor of the usual gasoline type serves not only to propel the car but also to drive a good-sized dynamo. This latter gives what current is needed for the various electric motors and also for the electric lighting, so that repairs can be carried out night and day. Electric lamps are mounted inside the car on the ceiling or elsewhere, and extension cords can be used outside, for a number of the appliances, such as a forge, are set up on the ground as being most convenient. When thus organized, the aeroplane fleet with its various power cars accompanied by the automobile repair shop, is quite independent, and can start out at all times to follow the troops on the march. It is able to camp at any chosen spot, and no sheds of any kind are needed.

Fig. 2 shows an automobile repair shop which is similar to the above in its general lines and conforms to the army standard, but it has a number of differences in detail, such as the disposition of the machine tools inside the van. The automobile is built by the Paris Crochat-Colardeau works, and the chassis is here operated on the gasoline-electric drive. In this type a

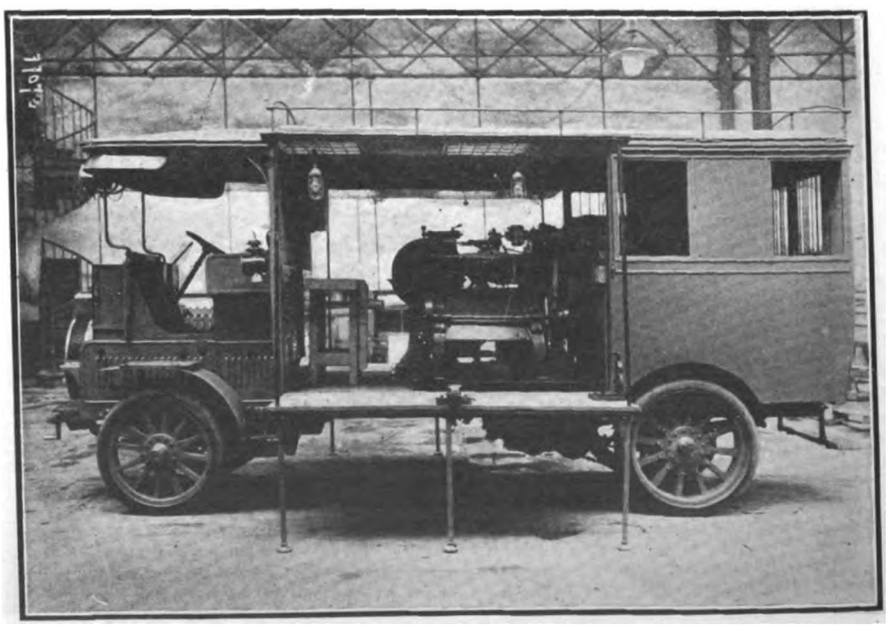


Fig. 2.—Auto Repair Car.

Digitized by Google

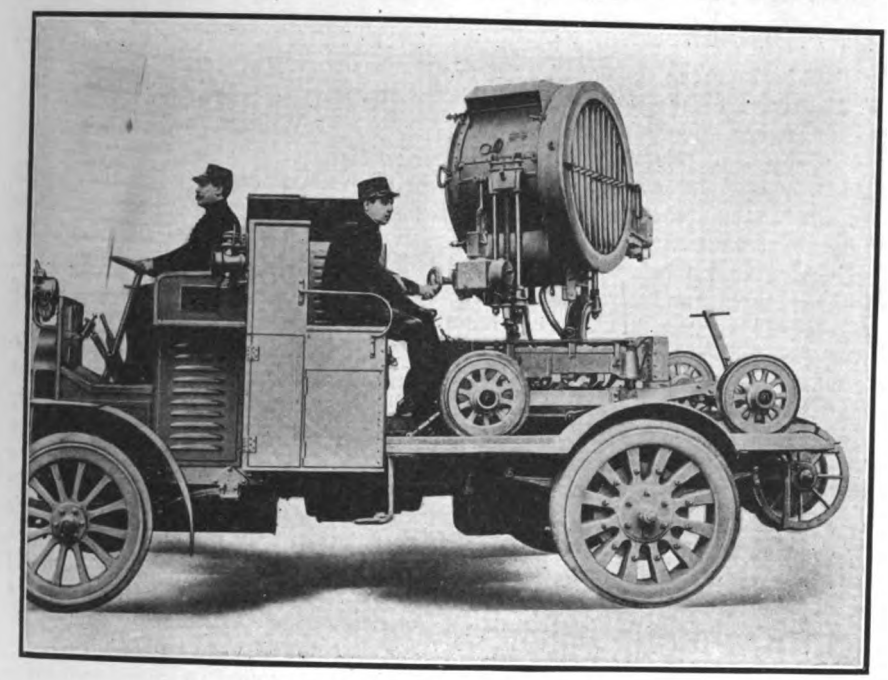


Fig. 3.—De Dion Auto Searchlight.

24-horsepower gasoline engine on the front of the truck is coupled to the shaft of a generator on the usual plan, and the current goes through a controller to two electric motors in the rear. Each motor drives one of the back wheels by reduction gearing, speeds being changed as usual by the controller. Four controller positions are used, allowing for motors in series, in parallel, electric brake and back drive. Speed changes for closer working are secured by operating a pedal which regulates the gas inlet to the engine, and the car can also be started and stopped by the same pedal.

The French army is making use of an automobile searchlight outfit which is the joint product of electrical engineers and the De Dion automobile works. The back part of the power-wagon chassis is laid out so as to allow of mounting the electric searchlight in a suitable manner, this being a separate and complete makeup which consists of a small truck with rubber-tired wheels and holding the searchlight, this being of the usual arc projector type. Placed upon a pair of side rails when on the automobile, the searchlight truck can be readily unloaded off the back end of the car, as shown in Fig. 4. The object of this design is to be able to use the searchlight upon the car itself when this is running on the road or stationed at any suitable point, and to allow the projector apparatus to be removed and run out several hundred feet from the car, should this be necessary. It may often happen that the automobile is to be stationed on the road, while the searchlight is taken over ground where the car could not follow and there set up for projection work in lighting up the enemy's positions. A dynamo is operated by the car engine in order to furnish the current.

Fig. 4.—Battery of Portable Searchlights.

In the base of the searchlight is placed an elaborate apparatus, including small motors and sets of relays, in order to operate all the movements of the projector by electric control. This is especially valuable where the searchlight is removed to a distance from the car, being connected with the automobile by a cable. The operator holds a small controller in his hand, which connects, by separate wires within the same cable, to the electric mechanism within the base of the searchlight, and in this way he can remain on the car and direct the searchlight's movements from a distance, or can be stationed at other points. This is desirable, because the operator could be blinded by the light if he stood too near the beam in order to direct it, and it is preferable that he should be placed at some distance away.

Electric searchlights are now coming into use in aviation grounds, and are likely to prove very valuable for use with aircraft. The apparatus is often mounted on the roof of the building or in other cases at different places on the grounds, and it seems to indicate to aeroplanes or airships the position of the grounds and the best point for making the landing, as well as showing the name of the station. For this latter use an eclipse device is provided so as to make the required Morse signals. The searchlight is also very useful in making night ascensions by aircraft. In some cases it is preferable to to have a wide angle or diffused beam which spreads out considerably, but for other purposes a narrow and concentrated beam is wanted. For instance, when it is required to explore the horizon in order to show up airships or aeroplanes of friend or foe. Here the optical devices give the greatest possible concentration to the beam, so as to have it carry to its farthest limit. At the same time the apparatus is easy to work so as to direct the light by a rapid sweep all around the sky. Again, such a projector is excellent for showing up the premises of the station in a strong light so as to allow aeroplanes to make a landing at night under the best conditions. Usually such apparatus is kept in a horizontal position, and a large mirror in front serves to reflect the beam upwards or in various directions. It is not advisable to turn the searchlight itself up to the sky, for particles of incandescent carbon would thus fall on the surface of the mirror and cause damage.

Searchlights for vessels are, of course,

Digitized by Google

largely used in the present operations. In this class there is a somewhat unique type of German searchlight, which has a single projector, but is designed to throw a double beam of considerable power. The object of this makeup is to provide an apparatus which is more suitable for use on ship canals than the more common single-beam projector, for under such conditions it is found that the beam which one vessel may throw onto a second vessel has the effect of a blinding light upon the crew, and this is a drawback for obvious reasons. The use of a double beam is found to give a great advantage for canal work, for in this case both banks of the canal are lighted at once without having to shift the apparatus, and at the same time the beam does not strike other vessels in the line of the canal.

Among the numerous types of electric searchlight equipment which are in use in the war may be noted a very useful one which is brought out by a Berlin establishment. It consists of two separate parts, first a portable electric plant with gasoline engine, which can be used for various purposes either for field searchlights of various kinds, or again for any purpose where current may be needed. The second part of the outfit consists of a searchlight mounted on tripod base, this being well adapted for campaign work for lighting under various circumstances. One very efficient use for this type of searchlight is for optical signaling by means of flash signals.

On the light two-wheeled truck is mounted the electric plant in the shape of a gasoline engine direct-coupled to a small generator. The engine is water-cooled, and the radiator is mounted on the front end. Flaps can be let down all around, so as to protect the apparatus against dust or rain. Two men can readily handle the present apparatus, and it can be quickly transported over the road.

Electric methods are being applied with success for purifying water for the troops, both for antiseptic surgical work and for supplying drinking water to the soldiers. Such outfits are very valuable for use in the field in regions containing polluted water, and often prevent typhus and cholera, as well as other diseases due to such sources. The electric method is a most efficacious one from the fact that by its use the most polluted water can be treated so as to be made quite pure and free from disease germs. Two widely differing methods are employed for sterilizing, one of these being by the action of ozone in the Schneider automobile apparatus which we recently described. A second apparatus, also of French make, is used in which the water is sterilized by the action of ultra-violet rays from a quartz mercury lamp, this method having been developed by Prof. V. Henri's researches at Paris. It has the advantage of great simplicity, and an apparatus of this kind can be contained in a small road wagon. The present makeup consists of a double train of artillery type having a front two-wheel wagon box for holding various material, and drawing a rear wagon. This latter holds a complete small gasoline engine and dynamo plant by which current is sent through cable to the separate water-treating tank mounted on a tripod. Together with the motor group there is a water pump and a filter. A hose of 20 feet or more length takes up water from the source at hand, sends it through the rapid filter and into the white enameled tank of the sterilizer, where it is brought under the action of the powerful rays from the mercury-vapor lamp. This is mounted in the upper part of the tank and just above the level of the water. Means are provided so as to make the water circulate actively within the tank, so as to bring all its parts under the influence of the rays, and it is found in practice that all disease microbes are very effectively killed in this way. Around the base of the tank are placed numerous taps for taking off the water by the soldiers.

A very efficient wireless telegraphy outfit for use in field work is the new Marconi cavalry pack. The outfit is made up in several parts of comparatively light weight, so as to be readily transported on horse or mule-back. On one side is the portable electric plant with gasoline engine and generator, which can be set up in running order in a very short time. An ingenious method is here used to allow of carrying the group and at the same time of coupling up engine and generator, employing a short section of coupling shaft which is fitted in when on the ground. This coupling piece is afterwards removed when the apparatus is to be transported, so that the saddle can fit upon the horse.

Production of Mica in 1914.

The value of the mica produced in the United States in 1914 was $328,746, a decrease of $107,314 from 1913, according to a statement of Douglas B. Sterrett, of the United States Geological Survey. The production came from 13 states. The output of sheet mica amounted to 556,933 pounds, valued at $277,330, as compared with 1,700,677 pounds, valued at $353,517 in 1913, and the production of scrap mica in 1914 amounted to 3,730 short tons, valued at $51,416, as compared with 5,322 short tons, valued at $82,543 in 1913.

There was also a decline in imports of unmanufactured and trimmed mica.

THE ILLUMINATION OF GLASS FACTORIES.

By William A. D. Evans.

The glass industry in the United States produces yearly products valued roughly at $100,000,000. This is divided almost evenly between building glass, pressed and plate glass, and bottles and jars.

Of the building glass the major portion now made is known as plate glass, which embraces all of the ordinary glass used for window work, store fronts, etc. Glass made under the trade name of "window glass", however, is not used for windows but is used principally for mirrors and the covering of pictures. This form of glass is blown in cylinders and then cut open and flattened, while plate glass is flowed onto tables of the proper size and rolled to the desired thickness, then annealed, ground and polished.

Due to the fact that this glass when finished must be free from air bubbles and be highly polished, it is most essential that during the entire process of manufacture the different operations be adequately and properly lighted. The different steps in the manufacture of plate glass and the method of lighting them in a modern plant will be described.

The first operation is the melting down of the raw materials, or the "batch", as it is called. In the modern plant here described this is done in a furnace room where there are nine furnaces, each furnace containing 16 pots. It requires about 14 to 15 hours to heat the pots for casting. Each pot has a capacity of 285 square feet of glass or approximately 2 to 25 tons. After the batch has been properly melted, the pots are lifted from the furnace by means of cranes and the molten glass is flowed onto casting tables. These casting tables are about 16 feet wide by 30 feet long. The edges are built up so as to keep the molten glass from running over and to flow the glass to the desired thickness. As soon as the glass is flowed onto the tables it is formed into shape by rollers which run back and forth until the glass becomes hard. The lighting of each of these tables is accomplished by means of two mercury-vapor lamps.

From the casting tables the glass goes to the tempering lehr where it is put through the annealing process. The lehr in this plant is 190 feet long and the glass plates are taken from the casting tables and put in at one end of the lehr, where the temperature is maintained extremely high and the glass travels through at a very slow rate of speed, the temperature of the lehr gradually lessening as the glass

Digitized by Google

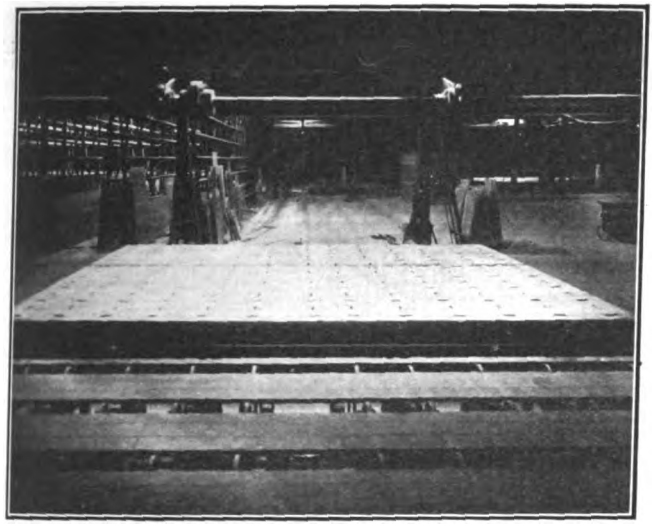


Fig. 1.—Cutting Table at End of Lehr.

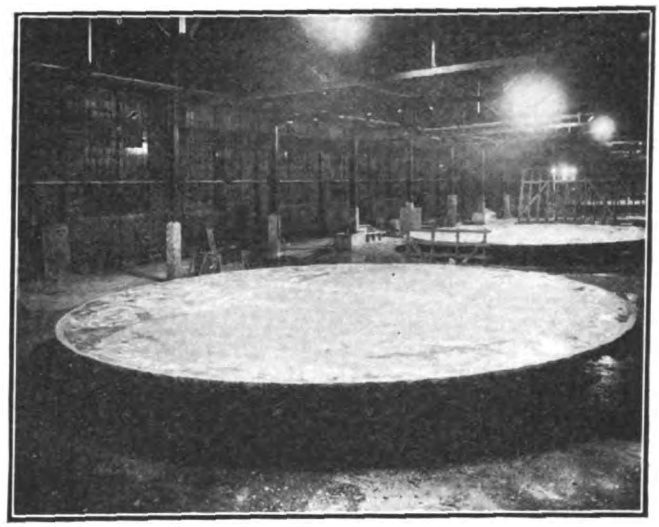


Fig. 3.—Tables in Laying Yard.

passes along. At the other end of the lehr from where the plates enter is the cutting table, which is about 16 feet wide by 24 feet long. Fig. 1 shows a typical cutting table, which is lighted by two lamps similar to those used over the casting tables.

It is very essential at this part of the process that the men who handle the glass be able to detect all bubbles, checks, vents and defects, as the glass is now cut to eliminate all flaws. It is most important to see the vents around the edges of the plates. If the vents are not seen before the glass is removed from the table to an upright position, the strain started by the vent usually breaks the glass.

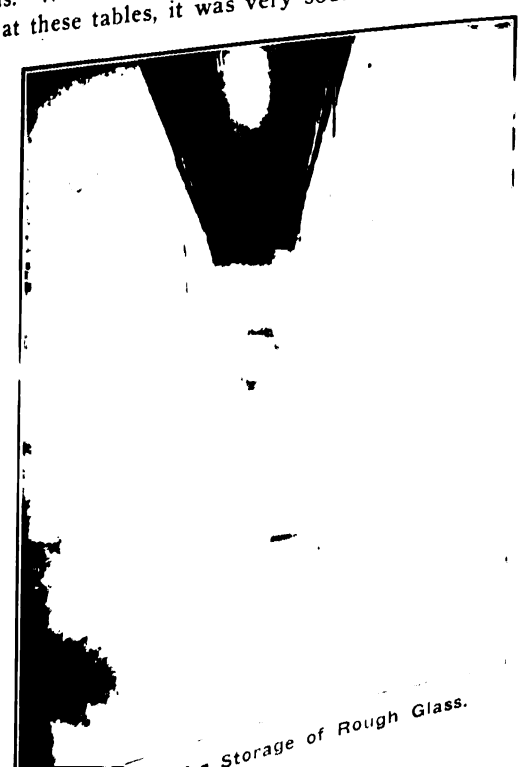
Before the use of mercury-vapor lamps the cutters at the lehr were unable to see many flaws which should have been cut out and which were not detected until the final inspection. This glass then finally had to be graded as seconds. With the use of the mercury lamps at these tables, it was very soon noticed that the seconds had decreased materially. This is due to the peculiar color of the mercury-vapor lamp, which enables the eye to focus for one color of light and thus make detail stand out more sharply. In other words, the men could see the scratches more clearly, as by this light they were seemingly magnified, thus providing for an easy detection of all flaws. It is essential that the glass be cut to as large plates as possible, naturally eliminating the flaws. In this plant the largest plates which have been made are 175 by 286 inches.

After the glass has been cut, it is taken to the rough racks. There are 28 racks similar to those shown in Fig. 2, each of which is 50 feet long and lighted by one mercury-vapor lamp. From the rough racks the glass is moved to the laying, calking and joining yard where the plates are laid on the tables similar to those shown in Fig. 3. These tables are mounted on wheels. The tables are about 36 feet in diameter, weigh about 75 tons and each one holds approximately 900 to 950 square feet of saleable glass.

In laying the plates on the tables, they are fastened by means of plaster of Paris and the edges joined together. All of this work is done in the left-hand side of what is known as the main building of the plant, which is 192 feet by 975 feet long of monitor construction. The center bay is 45 feet wide and is equipped with a track for transferring the tables. Fig. 4 shows a view of this building.

On the right-hand side of the building are built in five grinding machines and six polishing machines. Each of the grinders is operated by a 500-horse power motor and run at a speed of about 21 revolutions per minute. The tables with the glass on them are run from the laying yard and transferred to the grinding machines where the grinding is accomplished by disks which rub off the surface of the glass by means of sand. The process first starts with course sand which is gradually reduced, finally being finished with very fine sand. This process requires about one hour.

After grinding, the glass is taken to the middle yard where it is inspected and joined again. After this it is sent back to be polished.



Storage of Rough Glass.

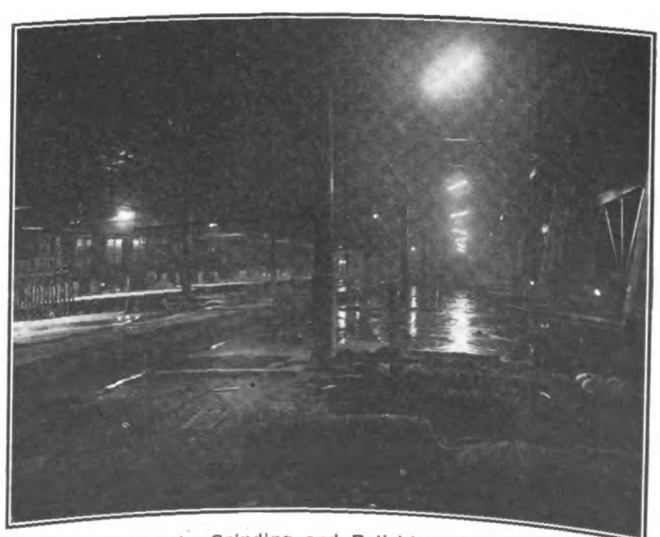


Fig. 4.—Grinding and Polishing Tables.

Digitized by Google

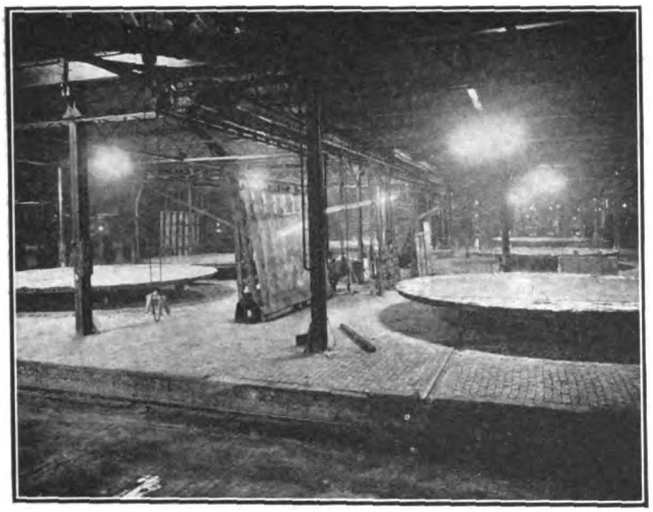


Fig. 5.—Tables in Stripping Yard.

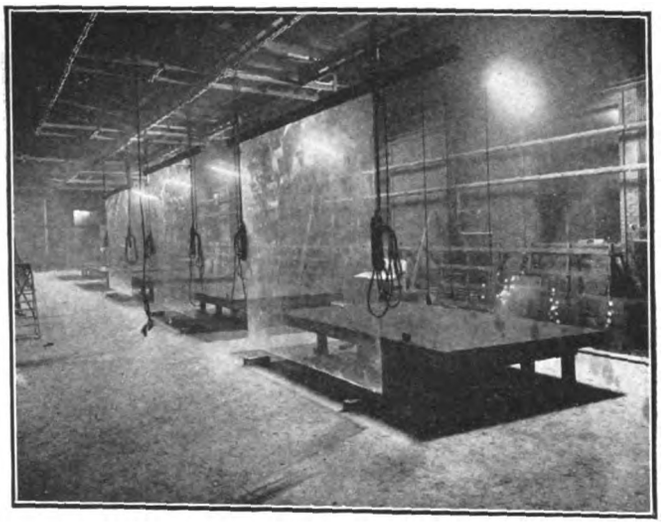


Fig. 6.—Manner of Inspecting Plates.

The polishers are operated by 600-horsepower motors and the table speed in this case is about 16 revolutions per minute. It requires about two hours to polish the glass properly. The disks on the polishers are covered with felt about one inch thick and rouge is applied automatically. The lighting of the grinding and polishing tables is accomplished by mercury-vapor lamps placed about 22 feet from the floor, approximately one to a table. The lamps are placed high as in the grinding a great deal of wet sand is thrown up by the spray from the machines.

After the glass has been ground and polished, it is transferred back to the opposite side of the building or to the laying yard where the sheets are taken off and turned for the grinding and polishing of the opposite side and the same process is followed out.

After the final polishing, the glass goes back to the stripping yard. A portion of this yard is shown in Fig. 5. Here the glass is removed from the tables, washed and placed on tables for moving to another building for inspection, which consists of grading according to size and quality. The inspection and cutting is all done in the warehouse building, where the glass is also packed and shipped. The inspection is carried on by hanging the plate glass in a vertical position and looking through same carefully for flaws. In this case a mercury-vapor lamp is placed behind the glass on 25-foot centers. The walls and tables are all blackened and the windows are covered with black shades to keep out strong sunlight, the entire light for the inspection being furnished by the lamps. Fig. 6 shows the manner of inspection.

It was a frequent occurrence before these lamps were installed that a table would be taken from the polisher after it had been running for two hours, the glass on which had not been sufficiently ground and then had to be joined again and reground before it could be polished. This was due entirely to the inability of the inspectors to see scratches, owing to the poor quality of the old lighting system. An inspector who had twenty years' experience at the work said there is no doubt that for this class of work the mercury-vapor light is much better than daylight. This is due to the high acuity of vision under the monochromatic light of the mercury arc.

The increased saving effected by these lamps throughout the different processes can readily be imagined. The cutters at the lehr use the lamps day and night and are able to cut the plates to eliminate all flaws, but before these lamps were used many defects were not found until after 10 operations, including the washing. They were then discovered after final inspection and it was necessary to grade and sell the glass as seconds. The time, labor and power that is saved by the inspectors being able to tell without much effort or eye strain that the glass has been properly ground or polished is enormous. Many extra operations are eliminated and many serious accidents prevented due to this system of lighting.

Besides the ability of the inspectors to see scratches owing to the acuity value of the light, another marked advantage noticeable is that on account of the low intrinsic brilliancy of the

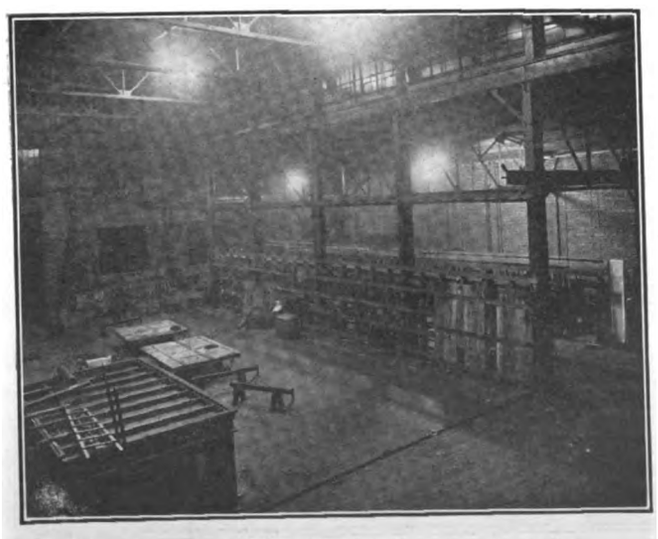


Fig. 7.—Packing and Shipping Department.

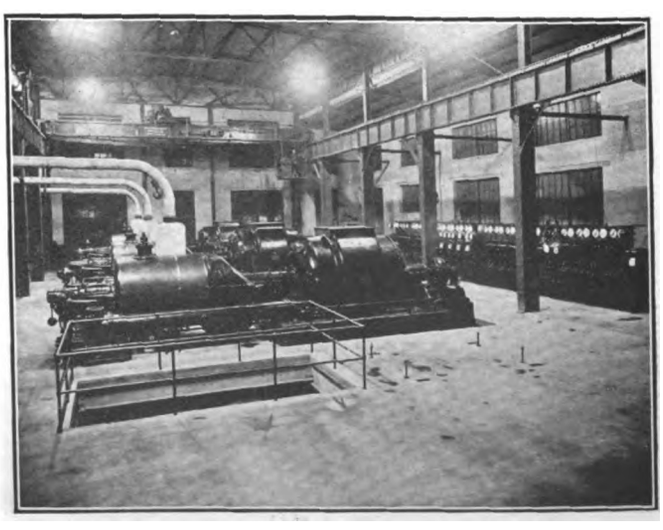


Fig. 8.—Power House.

Digitized by Google

lamp, the glare from the polished glass is markedly reduced; in other words, the reflection of brilliant light back into the eyes of the workmen, which occurs when a unit of high intrinsic brilliancy is used, is almost eliminated. This helps materially in increasing the speed with which the work can be accomplished.

From the point of view of the management, it is also worth a great deal to know that when a very large shipment of glass is to be made to a particular customer that they are going to be able to get the shipment out satisfactorily without any waste of time, due to not being able to eliminate flaws.

The packing and shipping department is shown in Fig. 7. This room is 60 by 130 feet and is lighted with 10 mercury-vapor lamps at a little less than 0.5 watt per square foot. The entire lighting load for this large pllant is extremely small.

A view of the power house is shown in Fig. 8. It is 77 feet wide by 136 feet long and is lighted by six mercury-vapor lamps suspended 32 feet from the floor. The equipment of this department consists of three 2,000-kilowatt turbines and one 200-kilowatt motor-generator set. The boiler house is 45 feet wide by 157 feet long and is lighted by means of five mercury lamps. It is equipped with eight 500-horsepower boilers.

The first lamps were installed in this plant about four years ago and there are now in service about 170 type P Cooper Hewitt mercury-vapor lamps in both the old and the new sections of the plant, which are in operation on an average of 4,000 hours per year.

Another interesting installation, using mercury-vapor lamps for manufacturing plate glass, is by the use of the type Z or quartz-tube lamps. Ten of these lamps are installed in a building 100 feet wide by 420 feet long suspended about 36 feet from the floor. Four of these lamps are used to light five 24-foot tables in the laying, joining and stripping yards. The cutting table at the end of the lehr is lighted with one lamp; one is placed over the rough racks, and the remaining four are used for lighting one end of the pressing, cutting, inspecting, packing and shipping departments and also the finished racks. These lamps are equipped with opalescent globes and the quality of light meets the requirements perfectly for this work. In this case the work is being done with an expenditure of energy of a little less than 0.2 watt per square foot.

Besides plate-glass manufacturing mercury-vapor lamps have been used in number of bottle manufacturing they are placed at the inspection. The lamps are also used in the cut-glass departments of some of the largest cut-glass factories, where they are lighting the cutting-wheel frames. The lamps used in this case are the alternating-current type lamps.

The experience of all these glass plants, that is, those for plate-glass, bottle and cut-glass manufacturing, has been that the mercury-vapor lamp, on account of its peculiar color value, which gives its particular seeing quality, and its low intrinsic brilliancy, which reduces the glare, proves better for these classes of work not only than any other form of artificial illumination, but also better than daylight.

LETTER TO THE EDITOR.

Exaggerating an Ordinary Electric Vehicle Performance.

To the Editor:

It is a matter of constant surprise to me that there appear so frequently in the newspapers, statements which although evidently inspired by the manufacturers of electric motor cars, nevertheless tend to belittle the possibilities of their own product. This is most frequently seen in accounts of runs made by electrics covering a very few miles at a very slow speed and yet heralded as wonderful performances.

One of the worst examples of this sort of thing is to be found in your issue of June 5, 1915, in an account of a "sociability run," covering the paltry distance of 40 miles, at the low speed of 15 miles per hour. This run is referred to as something that "may seem incredible," and as an "unheard of expedition."

To one who appreciates what the electric motor car really can do, and who has himself made time and time again much longer runs at very much higher speed, the account of the run seems to be the very worst possible form of publicity.

JOHN S. CODMAN.

Boston, Mass.

Wireless Receiving Devices Patented by Greenleaf W. Pickard.

Four patents for an oscillation-receiving device for wireless telegraphy have been issued to Greenleaf W. Pickard, of Amesbury, Mass. In the first patent, the receiving device has a member containing silicon with a contacting member containing metal antimony; in the second patent, the contacting member contains arsenic and antimony, in the third, metal bismuth, and in the fourth, metal arsenic.

Considerable progress is reported in the development of wireless fog-signaling apparatus, the perfection of which will greatly promote safety at sea during fog.

BOOK REVIEWS.

"Graphical Determination of Sags and Stresses for Overhead Line Construction." By Guido Semenza and Marco Semenza. Translated from the Italian by C. O. Mailloux. New York: McGraw-Hill Book Company, Incorporated. Cloth, 24 pages (8¾x11¼ inches). Supplied by the Electrical Review Publishing Company, Inc., for $3.00.

This volume is a mathematical treatment of the problems involved in determinating the sags and stresses in overhead lines. The text is supplemented by 13 charts, in which the results are plotted on cross-sectioned paper, these charts being of double-page size. The purpose of the work is to substitute for the rule-of-thumb methods, which have been used especially upon low-tension and less important lines, a method based upon rigorous application of the physical laws involved. The authors are specialists in transmission-line work in Italy, and the translator has given an excellent rendering. After considering the principles and the results obtained from them, explanations of the charts are given with examples of their practical use. In addition the necessary allowances for wind and ice conditions are taken up. This volume is invaluable to the transmission engineer who desires to base his work upon mechanical laws and apply them with precision. The charts enable the proper sag or tension for a given case to be found by inspection.

"Organization of Workshops and Factories." By Robert Grimshaw. New York: Published by the author. Paper, 95 pages (3½x5¼ inches). Supplied by the Electrical Review Publishing Company, Inc., for 50 cents.

This volume is an outline which may be followed in systematizing the work of factories and shops, and its brevity has limited it to little more than a skeleton, without any illustrative or concrete examples. The work is a syllabus of the lectures which the author has recently given at New York University and the Pratt Institute.

"Resuscitation." By Charles A. Lauffer, M. D. Second edition. New York: John Wiley & Sons, Incorporated. Flexible cloth, 90 pages (4x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for 50 cents.

This edition of the very valuable exposition of the Schaefer, or prone-pressure method of resuscitation, by Dr. Lauffer, has been somewhat enlarged. The advantages of this method are emphasized, as well as the necessity of non-professional men being familiar with its application. Readiness to apply the method will result in a saving of many lives which would otherwise be sacrificed.

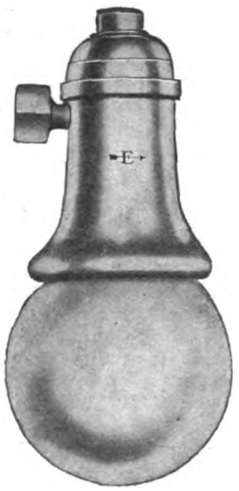
Digitized by Google

New Electrical and Mechanical Appliances

Ornamental Porcelain Socket.

An attractive porcelain socket, designed particularly for use in bathrooms and other damp places where a porcelain socket is either required or desirable, has been placed on the market by the Arrow Electric Company, Hartford, Conn. This socket is known by the trade name Arrobell, suggestive both of its maker and shape.

Use of this socket dispenses with a special husk and also eliminates using a round glass diffusing globe, since the socket is specially suitable for use with standard frosted round-bulb Mazda lamps. The socket harmonizes particularly with the No. G 25 bulb and its round porcelain skirt gives the effect of a white-enamel husk. The porcelain is a pure white, nicely glazed. This socket is interchangeable with quite a number of caps and bases.



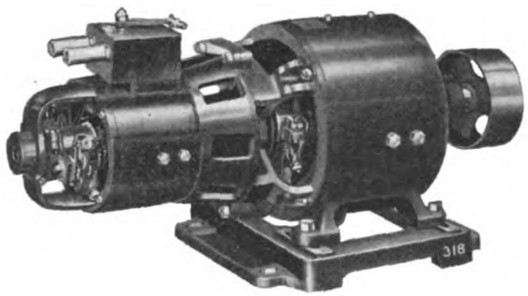
Arrobell Porcelain Socket.

Unique Generator Set for Country-House Lighting.

The steadily increasing demand for the conveniences of electric light in farm houses, country homes, summer resorts, etc., is calling for a variety of generating equipment in those places where the absence of electric service lines compels use of small engine-driven plants. Of such equipments, one of the most unique is illustrated herewith.

This outfit consists really of two generators mounted on the same shaft. The large machine is the generator proper which furnishes energy for the lights. The overhung machine is very much smaller and is used primarily as a starting motor for cranking the engine and, after the engine is started, it serves as a generator to charge a small storage which furnishes the current for the starting motor in cranking the engine the next time.

In this system no storage battery is used for the lighting or appliance load. Whenever light or current for some small motor or other appliance is desired at any point in the premises, a button is pushed which first closes (through a third wire) a circuit between the small storage battery and a solenoid. The latter closes the switch for the small starting motor, connecting it across the battery. The small machine then cranks the gasoline or oil engine. As soon as the engine begins to run on its own power it quickly speeds up and supplies lighting current from the main generator. The entire starting operation takes only about 15 seconds or less.



Duplex Generator for Rural Lighting Plants.

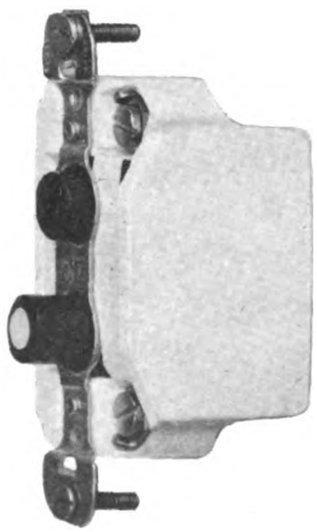
As long as the set is in operation, the little machine, which is designed for about six volts, continues to charge at a decreasing rate the three-cell battery for restarting.

The large machine is a standard 110-volt generator, so that current can be transmitted to the garage or other buildings at some little distance without great loss; use of this voltage also permits putting in standard lamps and wiring. The large generator can be either a direct-current or aternating-current machine. In the latter case, the small machine is made of sufficient capacity to act as an exciter for the alternator as well as to serve as a combined starting motor and charging dynamo.

Improved Flush Push-Button Switches.

Desirable improvements have recently been made by the General Electric Company in the design of its flush wall switches. The corners of the porcelain boxes have been rounded, making the binding screws more accessible and the boxes less liable to breakage when the switches are installed. The walls of the boxes have also been considerably strengthened without increasing the overall dimensions of the switches.

A fiber dust cover is now permanently attached, effectively closing all openings to the mechanism but interfering in no way with the wiring of the switch. Adjusting nuts are furnished with each switch. This method of adjusting switches to outlet boxes is superior to the old-style washer type of adjustment. Holding-down screws are pointed, making it easier to locate holes in the outlet boxes and to enter the screws. These switches are made both single pole and double pole. The illustration herewith shows the single-pole type.



Improved Wall Switch, Face Plate Removed.

The Universal Lightning Arrester.

Central-station operating men have learned by experience that the ideal lightning arrester for outdoor service on overhead distribution lines, from both the cost and the service viewpoints, must not only offer an easy

Digitized by Google

path to ground for lightning or static charges while shutting off the flow of this path, that is, it must have a choke discharge, but it must have some means of forcing the lightning to take this path, that is, it must have a choke coil which will not permit the high-frequency discharge to pass the arrester. Furthermore, it must be troubleproof, it must have no moving parts or box to collect dirt, cause trouble and require frequent inspection and

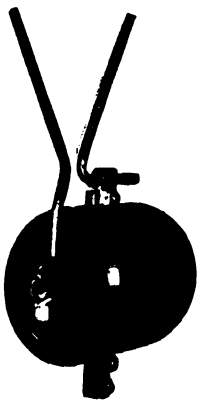


Fig. 1.—Universal Lightning Arrester.

repairs, and it must be mounted in such a way as to minimize the danger of the linemen's coming in contact with it or of its burning the pole during heavy discharges. Finally, to reduce the stock kept on hand, it should operate equally well on any circuit, whether arc, incandescent, power or transmission.

With these requirements in mind, the "Universal" lightning arrester was designed by the engineer of an eastern central-station company supplying a territory of about 800 square miles in

Fig. 2.—Reverse End of Arrester.

a mountainous country where lightning conditions are most severe. A long, 2,200-volt, single-phase circuit having a high mark of 16 transformer burnouts in a day and an average of several during each storm, was fully equipped with Universal arresters. During the following season there was not a single transformer failure. In another district, having 1,900,000 feet of 2,300-volt lines, which would require 950 arresters properly to protect it, 74 Universal units were installed, with the result that transformer burnouts were reduced from 150 per season to 40 per season. For the past three years the Universal arrester has been subjected to the hardest kind of service on this company's lines, and during this period the theories underlying its design have been thoroughly tested and every possible source of trouble eliminated before it was placed on the market by Hubbard & Company, Pittsburgh, Pa.

The Universal arrester is so named because it is made in only one style and may be used for line or station service on direct-current or alternating-current, constant-current or constant-potential lines of from 500 to 13,200 volts. It is claimed to be the only arrester made for distribution lines which combines four fundamental features: a choke coil to insure the removal from the line of dangerous foreign charges; a horn gap which will allow this discharge but will cut off the flow of the line current which follows it; a troubleproof construction that eliminates all repairs, cleaning and accidents and greatly reduces inspection costs; a design that allows it to be used on any central-station circuit up to 13,200 volts.

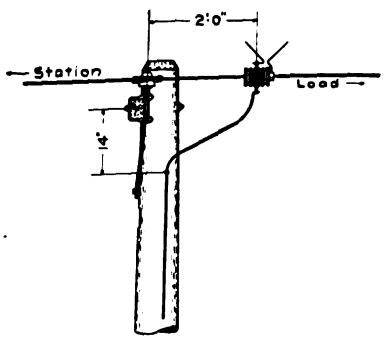


Fig. 3.—Method of Installing Arrester.

The accompanying illustrations show its construction. It is of the horn-gap, choke-coil type, and is mounted directly on the line wire, as illustrated by Fig. 3. The line wire passes through the choke coil, which is a four-inch length of iron pipe clamped inside the porcelain insulating tube. This pipe has sufficient inductance to insure the discharge of the high-frequency static charges, but does not appreciably affect the line voltage. The arrester is clamped to the line wire by the split sleeve and two set screws, shown in Fig. 1, which provide a good electrical connection for the line horn. The grounded horn is held by a set screw in the upper end of one of the clamping bands, and at this point the length of the air gap is adjusted by means of a gauge furnished with each arrester to suit the line voltage. The ground connection is inserted in the hole shown in the lower end of the other band and is held by a set screw. The brown porcelain insulator is of the Locke Insulator Company's manufacture and has a large factor of safety when used on lines of the highest voltage specified. Freedom from corrosion is insured by making the horns, bands, screws and clamp casting of brass, and by thoroughly hot-dip-galvanizing the choke coil.

Fig. 3 shows the method of installing the arrester. The horn gap is adjusted with the gauge, the line wire is cut, slipped through the arrester and spliced, and the ground connection attached to the lower end of the clamp band. It will be noted that the arrester requires no cross-arm space and may be supported far enough away from the pole to eliminate danger to linemen and the possibility of burning during severe discharges.

One of the gretest advantages of the Universal over the older types of lightning arresters for distribution lines is that it is the only one that possesses a choke coil and on this account it is the only arrester that limits the lightning discharge to the section of line in which it occurs. With the older types of arresters it is very common for every arrester on the line and in the station to discharge when the line is hit, which clearly shows the necessity for some limiting device. That the Universal is capable of carrying off the heaviest charges and breaking the power arc which follows has been demonstrated by its three years of service, without a single case of trouble due to the arresters.

Gold Medal for Standard Underground Cable Exhibit.

The Standard Underground Cable Company, Pittsburgh, Pa., has been awarded a gold medal, or highest award in its class, by the International Jury of Award, Panama-Pacific International Exposition, for its exhibit of a complete line of electric wires, cables and cable accessories.

This is the seventh award of this degree which has been received by this company in as many different expositions, and as its products have never been in similar competition oftener, this constitutes a perfect score.

The exhibit consists of samples of bare and insulated wire and cables of different kinds, illustrating the great variety of these products manufactured by the Standard Company. Cable terminals, junction boxes and other cable accessories are also shown in considerable variety adapted to various classes of service. A unique and interesting feature of this company's exhibit is the use of copper ingots as posts and a large stranded

Digitized by Google

bare copper cable as railing for inclosing its exhibit space. In order to introduce some movement into its display two braiding machines are shown in operation weaving cotton insulating braid on a copper wire.

New Mercury-Arc Rectifier for Charging Small Batteries.

A new and inexpensive mercury arc rectifier is just being marketed by the General Electric Company for charging small storage batteries, such as are used for starting, lighting and ignition current in gasoline automobiles and motorboats, for operating electric bells, for electroplating and for numerous other uses where not over five amperes, fifteen volts direct current is required and only alternating current is available.

The new rectifier consists of a metal base, on which are mounted the necessary reactance coils and the rectifier tube in a suitable cover, the whole being encased in perforated sheet metal. It is designed for charging one three-cell, one six-cell or two three-cell batteries as required, and is automatic in that it is self-adjusting to any of these three conditions. In fact, the rectifier may be connected to a single-cell battery and will charge it at the rate of approximately six amperes from 110-volt alternating-current supply.

This type of rectifier can be furnished for 60, 50, 40, 30 or 25 cycles, 110-volt circuits. It is exceedingly compact, the outside dimensions being roughly: width, 6.5 inches; depth, 9.5 inches; height, 11 inches. The total weight of the 60-cycle rectifier is approximately 15 pounds; therefore, it may be transported from place to place in a garage, rendering unnecessary the removal of the battery from the car.

The rectifier is completely self-contained and requires no mechanical ability either to install or operate it. It is so designed that it will maintain a fairly constant current as the voltage of the battery risers. It is very easily started, simply by screwing the flexible lead attaching plug, with which it is furnished, into any convenient alternating-current lamp socket and connecting the two binding posts, distinctly marked, to the corresponding terminals of the battery to be charged. After the alternating-current supply has been turned on by the socket switch, the rectifier should be tipped slightly by means of the handle on the top. The mercury arc will then start, rectifying the current, charging the battery; the apparatus requires no further attention until the battery is entirely charged. Where two batteries are to be charged, they are connected in series and the terminals from the rectifier attached to outside posts of the two batteries.

The cost of charging either a twelve-volt battery or two six-volt batteries, for a 10-hour charge, is about 13 cents; or the same for a single six-volt battery. This cost is based on a rate of 10 cents per kilowatt-hour for current. Where the rate is less, the charging cost will be proportionately lower. This cost is exceptionally small when compared with the usual cost of at least 50 cents for charging a six-volt battery, and 75 cents for a 12-volt battery, and there is the added convenience of being able to charge on the ground. This rectifier should therefore become popular with public and private garages where only a few batteries are to be charged.

New Exide Depot, Woodward Avenue, Detroit.

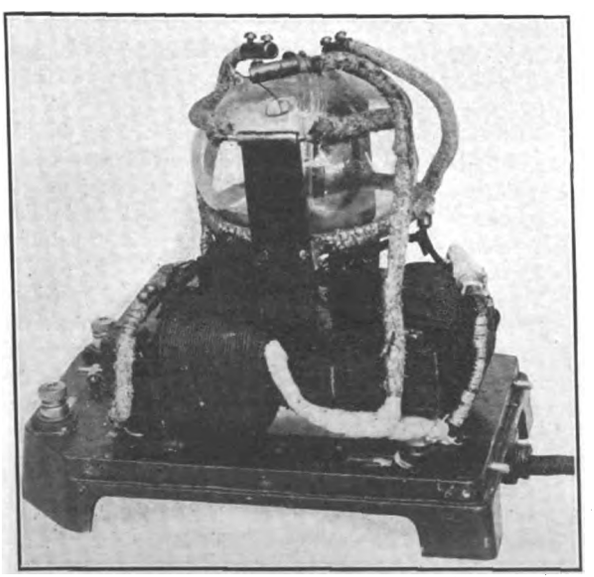
New Exide Depot in Detroit.

The Exide Battery Depots, Incorporated, of Philadelphia, Pa., has just opened a new battery depot in Detroit, Mich. This depot is located at Garfield and Woodward Avenues within easy reach of the automobile section of Detroit.

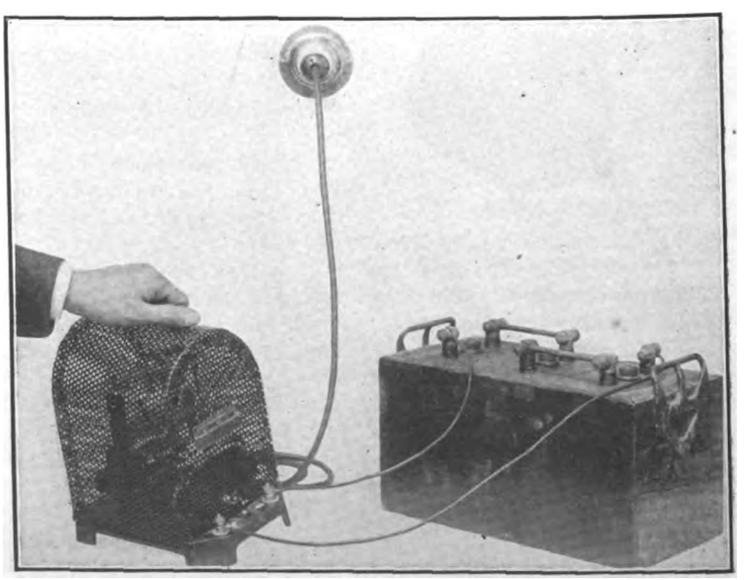
Over 5,000 square feet of floor space are available, giving ample room for all the facilities necessary in the care and repair of storage batteries. The depot is equipped with a full stock of repair parts for Exide, Hycap-Exide, Thin-Exide and Ironclad-Exide electric vehicle batteries, and also carries a full stock of complete batteries and parts for Exide starting and lighting batteries of the various types.

Application of Rotary Converters to Coal-Mining Service.

It is interesting to note the favorable impression being made by the rotary converter in coal mining, particularly since the manufacturers have developed the new commutating-pole machine in smaller sizes. One of the

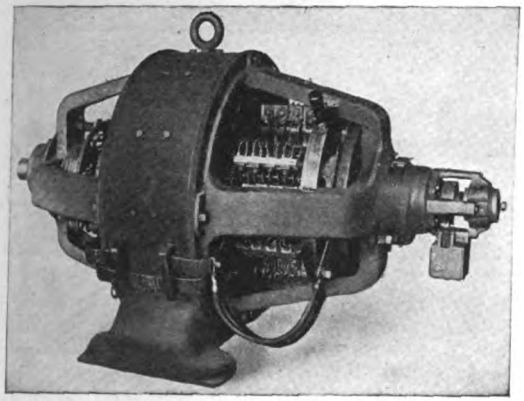


Small Rectifier Charging Set, With Cover Removed.



Method of Connecting and Starting Rectifier.

Digitized by Google



Rotary Converter for Coal-Mining Service.

chief troubles in mining work, particularly with small rotaries, has been commutation because the mining load varies anywhere from 10 per cent of full load to 100 per cent overload in a very short space of time. With the non-commutating-pole rotary, it was necessary to shift the brushes with the change in load, or sparking and damage to commutator would result. This damage to commutator frequently brought about short-circuited coils and burnouts.

Since the application of commutating poles, a machine normally designed for 35 degrees rise in temperature at full load, will carry a 50 per cent overload for two hours with a rise not exceeding 55 degrees, and a momentary overload of 100 per cent without the least sign of sparking, this better performance being due to the application of the commutating poles. With this design the brushes are set on the neutral point and fixed there, and the varying loads have no effect whatsoever insofar as the sparking is concerned.

The Westinghouse Electric & Manufacturing Company has received an order from the Stonega Coke & Coal Company of Virginia for 24 rotary converters, commutating-pole type, 150 kilowatts, wound for six-phase, 60 cycles, 275 volts, direct current, operating at a speed of 1,200 revolutions per minute. These will be placed in twelve underground substations, which will be supplied with power purchased from the Kentucky Utilities Company. The power will be delivered to five points at a voltage of 33,000 and stepped down in special substations to 2,300 volts, at which voltage it will be transmitted to the mine, where there will be two banks of transformers, each consisting of three 50-kilovolt-ampere, single-phase transformers wound for 2,300 volts on the high-tension side and for the rotary voltage on the low-tension side. Each of these substations ill be controlled by a five-panel similar, except

that it will be above ground, is the Connemaugh Smokeless Coal Company in the Pittsburgh field. This installation consists of one 200-kilowatt rotary converter, with the same characteristics as for the Stonega company. The machine is of the bracket type, as will be seen from the accompanying illustration, and the frame is of rolled steel, the feet being pressed out of a single sheet. This machine is built in three sizes, which are most popular in the mining field, i. e., 100, 150 and 200 kilowatts.

The Westinghouse company has also built this new machine in the larger sizes, having furnished one 300-kilowatt, 275-volt rotary converter of the commutating-pole type, and a machine similar in design of 500-kilowatt capacity for the Lehigh Coal & Navigation Company, at Lansford, Pa.

Fly-Chasing Electric Fan.

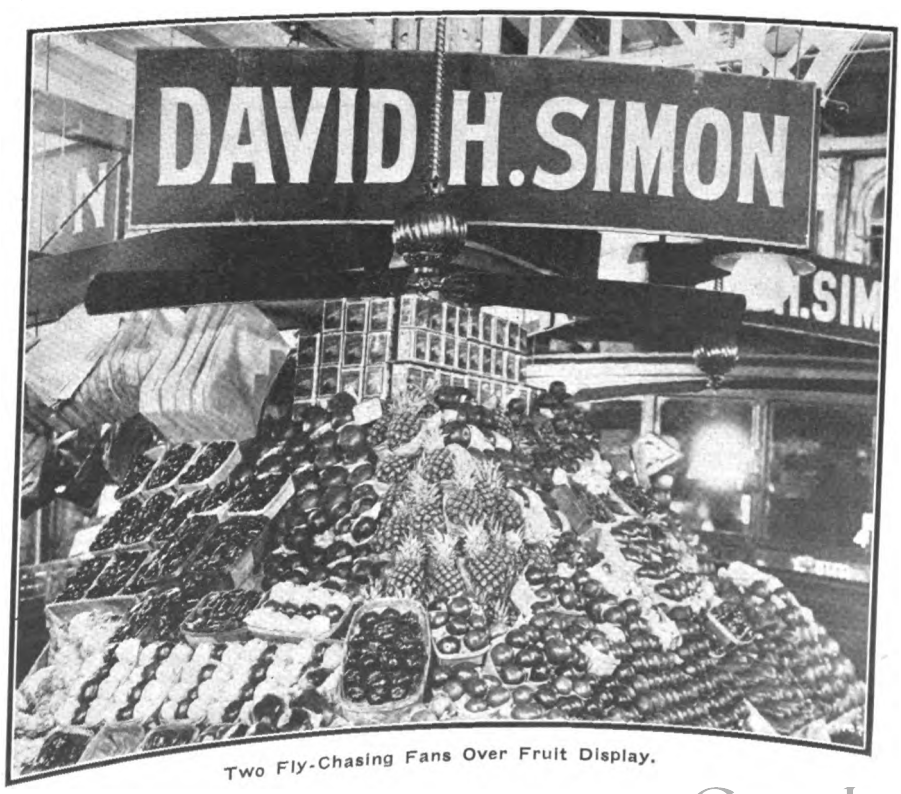
The anti-fly campaign now being waged in many cities has stimulated attentive study of the habits of this insect. In the psychology of the fly it has been discovered that there is an interesting trait; this is that the fly is frightened by alternate flashes of light and shadow and it is this that frequently warns it of impending doom by the "swatter." It occurred to W. C. Williams, of Philadelphia, Pa., that a modified form of electric ceiling fan could be devised to produce this alternating shadow effect over market displays of edible products and experiments showed the efficacy of this method. The fan developed for this purpose runs at 100 revolutions per minute. Its blades have only a slight pitch, so as to produce practically no breeze; their sweep is 90 inches. In the Reading Terminal Market in Philadelphia, 42 of them have been installed and they have completely solved the fly problem. The booths equipped with them are entirely free from flies, whereas in adjoining booths with the ordinary higher-speed breeze-producing shadowless ceiling fans flies are very much in evidence, in fact, seeming to enjoy the breeze. The accompanying illustration shows two of the new fans installed.

An essential feature of this method of driving away flies is to have a bright light over the fan, so that the latter produces the moving shadow on the food displayed.

These fans are known as shadow fans and are manufactured by the Robbins & Myers Company, Springfield, O.

Simplex Electric Heating Company Salesmen Take High Honors.

Five of the salesmen of the Simplex Electric Heating Company, Cambridge, Mass., have been awarded prizes in the contest arranged by the Rice Leaders of the World Association, for high ability in salesmanship. Ernest R. Jackson, Chicago representative, received first prize, an Overland touring car; Ernest B. Stebbins, Philadelphia representative, the second prize, a gold watch, and Henry F. Holland, Los Angeles representative, third prize, a gold watch. The other two representatives to receive prizes were Roger P. Ingalls, of North Lexington, and Robert C. Libbey, of Jamaica Plain, Mass.



Two Fly-Chasing Fans Over Fruit Display.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

LUDLOW, MASS.—This town will install an electric lighting system, and contract for the erection of a power station.

SALEM, MASS.—The Salem Electric Lighting Company has contracted with the D. D. Sargent Company, a new firm organized for the manufacture of shoes in that city, to supply 150 to 200 horsepower to operate electric motors in this new shop.

SALEM, MASS.—Electrical energy is being used extensively in the construction of a new plant, consisting of storehouse, spinning mill and weave mill, for the Naumkeag Steam Cotton Company, at Salem. Concrete mixers and elevators are electrically operated, as are also rod-bending machines, wood saws and numerous pumps. Energy is from the Salem Electric Lighting Company.

TURNERS FALLS, MASS.—The contract for constructing the remaining half of a dam for the Turners Falls Power and Electric Company has been awarded to Fred T. Ley & Company, Springfield, Mass., who have been building a new power station at Montague City.

WENHAM, MASS.—A 150-horsepower electric motor will be installed in a pumping station now being erected in Wenham to furnish water to Salem and Beverly. Directly connected to the motor will be a pump having a capacity of 25,000,000 gallons of water a day. Energy will be furnished by the Beverly Gas and Electric Company.

DOVER, DEL.—The Mississippi Valley Railway and Power Company has been organized, with a capital of $4,500,000, to construct, maintain and operate steam and electric power motors used on all kinds of railroads, etc., to construct railways, telephone, telegraph lines, etc. Incorporators: Charles B. Bishop, Clarence J. Jacobs and Harry W. Davis, all of Wilmington, Del.

NORTH CENTRAL STATES.

CINCINNATI, O.—The Tubular Products and Steel Works, of Pittsburgh, Pa., has secured a tract of 15 acres for use as a site for a large plant in Cincinnati, where it will manufacture steel tubing for various purposes, by an electric-welding process. It is stated that the company will use 2,000 kilowatts per hour, which will be developed by its own generating plant.

LONDON, O.—An ornamental street-lighting system, involving the use of sidewalk cluster lights, is being planned by the City Council, with the support of property owners on a number of streets. L.

PAINESVILLE, O.—Bonds have been voted to enlarge the local electric light plant. Address City Clerk.

ST. MARY'S, O.—T. J. Turley, of Owensboro, Ky., has been chosen secretary and sales manager of the St. Mary's Machine Company, manufacturer of gasoline engines, which have a wide sale for small electric plants. Mr. Turley is president of the T. J. Turley Company, of Owensboro, and will continue his business and residence there. His company is sales agent for the engine for a large territory, Mr. Turley recently having acquired a considerable interest in the St. Mary's Company.

COLUMBUS, IND.—The Thomas Electric Company has been awarded the contract for the electric wiring in the new $35,000 vocational school to be built here. The general contract went to J. R. Dunlap & Company, for $26,335.

FREEPORT, ILL.—The city will probably be equipped with an improved fire alarm system. Address Mayor.

HILLSBORO, ILL.—The Southern Illinois Light and Power Company has increased its capital stock from $1,000,000 to $2,000,000.

LEWISTOWN, ILL.—Members of the City Council have entered a contract with the Lewistown Electric Light Company, increasing the street lights from 40 to 89 lights, to be run on the all-night-moonlight schedule. The installation of the 49 new lights will begin as soon as the company can secure them. Z.

HASTINGS, MICH.—The Thornapple Gas and Electric Company will increase its capital from $100,000 to $500,000.

OWOSSO, MICH.—The Owosso Improvement Association is discussing plans for new boulevard system of lighting. Address Mayor DeYoung.

LACROSSE, WIS.—Plans have been completed for erection of new power station and rehabilitation of central heating system for the Wisconsin-Minnesota Light and Power Company. Cost, $210,000. Address Mayor.

PORTAGE, WIS.—The plant of the Portage Electric Light and Power Company has been sold to Woodmansee & Davidson, of Chicago.

BUFFALO CENTER, IOWA.—A new municipal light plant will be built here. Address City Engineer.

FREDERICKSBURG, IOWA.—Bonds to the amount of $10,000 have been voted to improve the water works and electric light service. Address City Clerk.

DREXEL, MO.—An electric light plant will be built here. Bonds have been voted for the purpose. Address Mayor.

GACKLE, N. D.—Plans are being developed for the electrification of this village.

MINOT, N. D.—The Consumers' Power Company is planning to expend between $50,000 and $75,000 in the remodeling of and building an addition to its power house, and installing additional boilers, engines and other machinery for the proper carrying on of its business,

YANKTON, S. D.—Ways and means are under consideration for the installation of an electric light plant. Address John W. Summers, City Auditor.

FREMONT, NEB.—The electric light system will be extended. Address president of the Board of Local Improvements.

ELKHART, KANS.—A petition is being circulated for a special election to vote bonds for a municipal water works and light plant. Address City Clerk.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—The Kentucky Utilities Company contemplates erection of two outdoor substations, for which material has been purchased. One will be of 200 kilowatts and the other 2,300 kilowatts.

LOUISVILLE, KY.—Though bids for the general contract on the new Y. W. C. A. in Louisville have been received by the architect, John Bacon Hutchings, bids on the electric wiring contract have not been called for as yet. This work will be handled through the architect's office.

LOUISVILE, KY.—The Board of Park Commissioners of Louisville is considering a project to experiment with electrically-lighted tennis courts for night play. The plan is for a trial installation in Central Park and then for extension of the service to additional courts. If the Board can find the required funds, figuring at $133 for the first court in any group, and $110 for additional adjoining courts, it is stated that courts both in Central Park and in Shelby Park, the most ascessible to the largest number of people, would be fitted up for night playing.

PADUCAH, KY.—The Illinois Central Railroad has announced that it will immediately proceed to install automatic, electrically-operated blocks on the remainder of its lines in Kentucky not now so provided. This includes most of the line between Paducah and Louisville.

CHATTANOOGA, TENN.—The Board of City Commissioners is considering placing of all electric wires on Market Street between Ninth and Main Streets under ground. This section of the street is soon to be repaved and it is stated that such would be the time for construction of the conduit lines.

SHELBYVILLE, TENN.—The People's Power Company has been incorporated here with $25,000 capital, incorporators being J. E. Huffman, E. C. Huffman, A. E. McGill and others.

Digitized by Google

NEW DECATUR, ALA.—The Alabama Power Company will enlarge its lighting plant. Address T. L. Beauchamp, local manager.

BOSWELL, OKLA.—Bonds will be issued for the installation of an electric light plant. Address City Clerk.

BROWNWOOD, TEX.—The elevator and mill of the Brownwood Mill and Elevator Company here, which was recently leased by H. H. Sigman & Company, will be equipped with electric motors for operating the plant. D.

DALLAS, TEX.—It is announced that the properties of the Texas Traction Company and the Southern Traction Company will be consolidated under the law which was passed by the Legislature at its recent session. It is also stated that the interurban electric line of the Southern Traction Company, which runs from Dallas to Waco, will be extended to San Antonio, via Austin, a distance of about 185 miles. D.

DALLAS, TEX.—The Commissioners' Court of Dallas County has under consideration an application of the Texas Power and Light Company for a franchise to run its electric power transmission lines along the county roads. D.

DALLAS, TEX.—It is announced that the Dallas Union Terminal Company will install its own power plant in connection with the new Union depot, to provide heat, light and power, the cost to be $60,000. The recommendations of Chief Engineer C. H. Dana have been approved by the board of directors.

DALLAS, TEX.—The contract for the electrical work of the proposed new high school building in South Dallas has been awarded to the F. E. Newberry Electric Company, at $5,280. D.

LA PORTE, TEX.—The La Porte Water, Power and Light Company is building an extension of its lighting system to Morgan's Point through Bay Ridge. D.

WESTERN STATES.

WISDOM, MONT.—A small municipal electric-lighting plant to furnish current for illumination of city buildings and streets, costing about $5,000, is being seriously considered by the City Council. O.

SILVER CITY, N. M.—The Empire Zinc Company is installing an electric light and power plant at Cleveland.

HOLBROOK, ARIZ.—The Board of Supervisors will soon hold a hearing on the application of T. M. Quebedeaux and K. H. Myers for a franchise for the construction and operation of an electric light and power plant in this city.

ARCO, IDAHO.—Ralph Edmonds and B. Clarke, of Idaho Falls, have applied for a seven-year franchise to install and operate an electric light, power and water plant in this city, the city having the right to purchase same at the end of that period.

BOISE, IDAHO.—It is reported that McKay power dam will be replaced by the Utah Construction Company, owners of the Big Lost River Irrigation project. Estimates of cost and preliminary investigations are being made by engineers of the company. O.

COEUR D'ALENE, IDAHO.—The has been instructed by the City Council to apply to the Public Utilities Commission at Boise for permission to construct, operate and maintain an electric light plant and waterworks system. If permission is granted, according to reports, steps will be taken immediately to install the improvements. O.

ABERDEEN, WASH.—The City Council has refused to grant George H. Tilden, of Seattle, a franchise for the operation of an electrical system.

ELLENSBURG, WASH.—The $60,000 municipal light bond issue of this city has been purchased by the State Board of Finance.

SEATTLE, WASH.—An effort to purchase a developed power site for the city of Seattle, as an auxiliary to the municipal lighting plant, is being made by Superintendent of Lighting J. D. Ross. In a recent communication to the Council, Superintendent Ross recommended that the capacity of the Lake Union steam auxiliary in Seattle be doubled, estimating this improvement to cost approximately $400,000. Mr. Ross advises that the power plant be acquired and the steam plant doubled, stating that in his opinion it will be some time before the Cedar Falls power plant at Camp No. 2 will be ready for service, because of the great amount of work necessary to seal the impounding basin. The Lake Cushman power site is favored by Superintendent Ross, who advises that same be purchased and developed by the city of Seattle. The question of doing this has been so strenuously opposed by the Council that the Lighting Department has decided that it would be more suitable to purchase a plant already developed. It is understood the Elwha plant, near Port Angeles, can be purchased for approximately $2,500,000, and the city is making investigations which may lead to the purchase of the property. The proposition of purchasing current from nearby power plants, or from mills in Seattle, operated by electricity, has been abandoned. O.

TACOMA, WASH.—A resolution of intention creating local improvement district numbered 5507, where an up-to-date street-lighting system will be installed, has been passed by the City Council. It is understood the improvement will be made this summer.

TACOMA, WASH.—A new power house, and additional electrical machinery for various parts of the plant, are among the improvements to be made at the plant of the Tacoma Smelting and Refining Company, according to W. R. Rust, president of that concern. An additional fine copper furnace will also be installed, and the copper refinery will be doubled in size. O.

PORTLAND, ORE.—Approximately $19,000 will be expended in the city of Portland in making needed extensions and improvements to the telephone system, according to Manager Fred Spoeri, of the Pacific Telephone and Telegraph Company. O.

PORTLAND, ORE.—The Power Equipment Company of this city has opened an office in Seattle, Wash., at 524 Central Building, where W. A. Rode is in charge. H. L. Shepard, president of the company, states that they now represent the Kerr Turbine Company, Alberger Pump and Condenser Company, E. Keller Company, and the Elliott Company, all power equipment concerns, and the De La Vergne Machine Company.

ANAHEIM, CAL.—The Board of Supervisors has granted the application of the Pacific Telephone and Telegraph Company to lay a pipe line in the Garden Grove and Bolsa road districts.

CORONA, CAL.—A committee has been appointed by the city trustees to investigate the proposition of a municipal electric light plant.

GILROY, CAL.—At a recent election a lighting district was established at San Martin.

LOS ANGELES, CAL.—Application has been made to the Board of Supervisors for the transfer of a contract for a lighting system in the Miramento and Florence Lighting District, from the Los Angeles Gas and Electric Company to the Pacific Light and Power Corporation.

LOS ANGELES, CAL.—The City Council has resolved that the City of Los Angeles issue, sell and deliver to the sinking fund in the treasury of the city, known as the "Electric Plant Bond Election 1910 Interest and Sinking Fund," $117,000 of bonds, being part of the issue of $6,500,000 electric plant bonds authorized by voters at a special election. The bonds are part of an issue of $1,432,000 Class A bonds described in an ordinance adopted June 19, 1914, numbered and payable as follows: Bonds No. 113 to 156, inclusive, on August 1, 1920; bonds 157 to 195, August 1, 1921; Bonds No. 196 to 234, August 1, 1922.

LOYALTON, CAL.—July 12 has been set as the date for a special election for voting on a $5,000 bond issue for the construction of an electric light and power plant.

MONROVIA, CAL.—J. H. Bartle, president of the First National Bank of this city, has purchased from L. C. Brand, of Casa Verdugo, the San Fernando Valley Home Telephone Company. It is understood the new management will make many improvements in the service.

PLACERVILLE, CAL.—The Western States Gas and Electric Company is preparing to increase the capacity of the American River flume, to renew the bulkhead on the south side of the American River dam and to install an additional 1,500-kilowatt generator at the power house, located about five miles north of this city. The improvements will be commenced by November, this year.

REDONDO, CAL.—Requests have been submitted to the City Council by the Pacific Light and Power Corporation and the Pacific Electric and Associated Oil Company to install pipe lines on Railway Avenue and to extend their lines to Wharf No. 2.

RIVERSIDE, CAL.—The City Council has passed a resolution ordering the improvement of East Fifth, Sixth, Seventh, Eighth and Ninth Streets, Pachappa, Park, High, Sodgwick, Comer, Eucalyptus, Franklin and Kansas Avenues by the installation of electric lights.

SACRAMENTO, CAL.—The Pacific Gas and Electric Company will expend $10,000 for improvements.

WILLIAMS, CAL.—The city trustees have passed a resolution calling for bids for the installation of a street-lighting system.

Digitized by Google

PROPOSALS.

LIGHTING FIXTURES.—Sealed bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until August 13, for the lighting fixtures for the new United States post office at Gardiner, Me. Drawings and specifications may be obtained from the custodian of site at Gardiner, Me., or at the office of the Acting Supervising Architect, Washington, D. C.

LIGHTING FIXTURES.—Sealed proposals will be received until August 11, at the Supervising Architect's Office, Treasury Department, Washington, D. C., for lighting fixtures to be installed at the United States post office at Wellsburg, W. Va. Drawings and specifications may be obtained from custodian of site at Wellsburg, W. Va., or from James A. Wetmore, Acting Supervising Architect, Washington, D. C.

WARREN, MINN.—G. O. Gross, city recorder, will receive bids until July 22, for labor and materials in constructing an addition and making improvements to the municipal electric light plant. Work will consist in furnishing and erecting one brick addition to present building, piping connections, etc., one 150-kilowatt, direct-current engine-generator unit, switchboards, etc. Alternate bids are also invited on alternating-current apparatus of equivalent rating.

ELECTRIC GENERATOR.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until July 30, for supplying to the experimental station, United States Bureau of Mines, Pittsburgh, Pa., one electric generator and generator panel, in accordance with specification, copies of which may be obtained at the office of James A. Wetmore, Acting Supervising Architect, Washington, D. C.

MILACA, MINN.—Proposals will be received by W. A. Erickson, recorder, until July 20, for alterations and additions to the city's power-plant equipment. Present boilers and auxiliary equipment are to be dismantled and removed, and new and larger boilers and certain new auxiliary equipment to be installed. Plans at office of recorder, Minneapolis and St. Paul Builders' Exchanges, and in the office of C. L. Pillsbury Company, engineers, Minneapolis.

LAKEFIELD, MINN.—E. C. Andersen, village recorder, will receive bids until July 28, on the construction of additions and improvements to the waterworks and electric light plant as follows: For waterworks: one motor-driven deep well pump; one motor-driven centrifugal pump. For electric plant: one 125-horsepower fire tube boiler breeching, 4x100 feet; concrete chimney, piping connections, etc.; one 75-kilovolt-ampere belted alternator for present engine; one 100-kilovolt-ampere engine-generator unit, switchboard, etc. (Alternate) one 160-horsepower Diesel oil engine, direct connected to one 100-kilovolt-ampere alternator, including all auxiliaries; one 75-kilovolt-ampere belted alternator for present engine, switchboard, etc.; poles, wire, street lamps, transformers, etc. Erle D. Jackson, St. Paul, Minn., is consulting engineer for the village and has the specifications for the new equipment available.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

TELEPHONE EQUIPMENT, NO. 17,326.—A firm in Paris advises an American consular officer that it desires to communicate with American manufacturers of telephones and telephone equipment. Samples of wire, catalogs, and prices should be sent immediately. Correspondence may be in English.

ELECTRIC MOTORS, ETC., NO. 17,357.—An American consular officer in France reports that a number of civil engineers in his district desire to communicate with American manufacturers and exporters of electric motors and all accessories of electric installations. Quotations should be c. i. f. French ports. Payment will be made against shipping documents in France.

ELECTRICAL FITTINGS, NO. 17,395.—An American consular officer in England reports that a firm in his district desires to receive quotations from American manufacturers of lamp-holders (sockets) fitted with cord grip and shade-holder—bayonet type, and one-half inch and five-eighths inch plain and with shade-holder, and with key; ceiling roses, two-plate and three-plate; enameled-iron shades, 8, 9, 10, 12, 15 and 18 inches; porcelain cleats; porcelain fuses, 5 and 10 amperes; tumbler-pattern switches, 5 and 10 amperes—all suitable for 250 volts. Prices should be quoted c. i. f. British ports.

CARBONS AND ELECTRIC LAMPS, NO. 17,412.—An American consular officer in Italy transmits a detailed report relative to an opportunity for the sale of carbons and electric lamps. A copy of the report may be had on application and samples of the carbons may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

ELECTRICAL ACCESSORIES, CHEMICALS, ETC., NO. 17,418.—The Bureau of Foreign and Domestic Commerce is in receipt of a letter from a business man in India, stating that he desires to communicate with American manufacturers and exporters of electrical accessories, chemicals, etc., to be used in dyeing and coloring. He is also interested in hardware, machinery, and railway supplies. He states that he will arrange to pay cash in New York. He states that he is also in need of a reliable buying agent to represent him in the United States.

NEW INCORPORATIONS.

WILMINGTON, DEL.—The McHugh Electric Company has been organized with a capital of $25,000.

MIDDLETOWN, O.—The Butler Cycle and Electric Company has been chartered, with a capital of $10,000, by H. D. Riley and others.

NEW HAMPTON, MO.—New Hampton Electric Company. Capital, $4,000. Incorporators: C. A. Rowland, W. A. Denny and E. C. Morgan.

NEW HOLLAND, ILL.—New Holland Light and Power Company. Capital, $4,000. Incorporators: Harry Cooper, G. A. Trenkle and James Ryan.

BELFIELD, N. D.—The Chryster Light & Power Company has been incorporated with a capital of $25,000 by George S. Chryster, Beach, N. D., and others.

MARTINSVILLE, IND.—Morgan County Light and Power Company. Capital, $45,000; electric light. Directors J. H. Stewart, J. J. Albion L. Lowenberg.

NEW YORK, N. Y.—The Power Generating Company has been incorporated, with a capital of $10,000, by Frederick Krause, W. H. Kimmell and C. A. Broder.

AKRON, O.—The Wolfsperger Electrical Company has been organized by W. E. Wolfsperger, Frank M. Peck, William H. Mallery, J. V. Kahl and S. E. Klein, with a capital stock of $5,000.

ATHENS, O.—The Central Electric Producing Company has been organized with a capital of $300,000, by H. D. Mannington, O. E. Harrison, H. C. Allread, E. H. Davis and H. R. Schweinsberger.

BROOKLYN, N. Y.—Charles T. Staines, Incorporated; to manufacture electric and gas lighting fixtures. Capital, $5,000. Incorporators: Charles T. Staines, Abraham Levitt and Olga Koski.

CLEVELAND, O.—The Kenohio Electric Company has been incorporated, with a capital stock of $10,000, by William J. Kenyon, Floyd E. Waite, L. M. Sewell, E. G. Hoag and Charles A. Colvin.

ROCHESTER, N. Y. — Rochester Electrical Supply Company, Incorporated. Capital, $25,000. Incorporators: Bernard E. Finucane, Clarence M. Platt and Carl F. W. Kaelber, all of Rochester.

NEW BRITAIN, CONN.—The Spring & Buckley Electric Company, of New Britain, has been organized, with a capital of $25,000, by G. K. Spring, of Newington, John H. Buckley, of New Britain, and others.

BOSTON, MASS.—The L. L. Bates Company has been incorporated, for the purpose of installing burglar and fire-alarm systems; capital stock, $10,000. Incorporators, Oscar W. Codding, William E. Nutting, George E. Bradford.

BOSTON, MASS.—The Case Company has been incorporated, to manufacture and deal in electric and other motor vehicles. Capital stock, $30,000. Incorporators, Frank K. Bull, Charles A. Snow, Nettie M. Bates. W.

CANANDAIGUA, N. Y.—W. R. Townley & Company, Incorporated; to manufacture wire cable, lightning conductors, etc. Capital, $5,000. Incorporators: William R. Townley, Milton Rapalyo and Patrick H. Menihan.

BOSTON, MASS.—The Universal Light Company has been incorporated with a capital of $10,000, to deal in and install electric and other lighting fixtures. Incorporators, Frank A. Epstein, Harry E. Epstein, Paul E. Epstein.

NEW HOLLAND, ILL.—The Holland Light and Power Company has been incorporated, with a capital of $4,000, by Harry Cooper, G. A. Trenkle and others, to supply light and power in the town and along the line to Mason City.

RINARD, ILL.—The Rinard Electric Company has been incorporated with a capital stock of $2,000. The company is to furnish current for lights and other purposes. The incorporators are A. R. Smith, F. M. Smith and A. J. Phillips. Z.

Digitized by Google

CLINTON, TENN.—The Clinton Electric Light and Power Company has been granted a charter by the secretary of state. It has a capital stock of $10,000. The incorporators are H. G. Amerine, J. H. Underwood, C. J. Sawyer, E. E. Cross and O. S. Scruggs.

TRENTON, N. J.—Articles of incorporation have been filed by the Standard Electric Company. Those interested are Henry M. Hartman, Walter D. Cougle and Charles E. Milum. The company is capitalized at $125,000, and will deal in electrical, steam, gasoline and other kinds of goods.

ST. CLOUD, MINN.—The St. Cloud Public Service Company, with a capital of $2,000,000 has filed articles of incorporation with the secretary of state. A. G. Whitney, R. L. Gale, A. D. McKenzie, P. H. Collingnon and W. H. Stewart, all of St. Cloud, are the incorporators.

BOSTON, MASS.—The New England Fuse Manufacturing Company has been incorporated with a capital of $1,500, to buy, sell and manufacture mechanical supplies. The incorporators are Frank Sanford, Whitman, Mass.; Arthur W. Brooks, Natick; William F. Poole, Cambridge.

PORTLAND, ME.—A certificate of organization has been filed by the Chantray Manufacturing Company to manufacture and deal in all kinds of lighting devices. Capital stock, $100,000. The officers of the company are Horace E. Eaton, president; Benjamin G. Ward, clerk; Harold S. Richards, treasurer.

LYNN, MASS.—The Reliance Electric Company has been incorporated with a capital stock of $5,000. The incorporators are: President, Fred R. Farwell; treasurer, W. W. Moore; directors, Wilbur B. Flanders and Clark W. Shattuck. The purposes of incorporation are, to carry on the business of electrical contractors and manufacturers of apparatus.

BOSTON, MASS.—The Flagg Marine Signal Company has been incorporated with a capital stock of $10,000, for the purpose of manufacturing and dealing in marine and land signals and other electrical appliances. The incorporators are: President, Isaac V. Brock, Boston; treasurer, Amasa C. Gould, Newton; directors, E. C. Fisher, W. J. Martin, G. R. Merrill.

FINANCIAL NOTES.

Stockholders of the Southern New England Telephone Company, in a special meeting, voted to accept an amendment to the charter giving the company the right to increase its authorized stock from $10,000,000 to $20,000,000. No new issue is contemplated at the moment.

Connecticut Power Company has sold to Stone & Webster $300,000 first and consolidated five-per-cent bonds which are being offered at 95 and interest or on a 5.30 basis. The proceeds from the sale of these bonds will be applied toward the retirement of the floating indebtedness of the company amounting to $405,000 incurred for extensions and improvements made to meet the demands of increasing business.

The property of the Dorchester Electric Company has been sold in foreclosure proceedings to the committee of stockholders for $100,000. Recently interests associated with the Shawinigan Water & Power Company organized a new corporation with $3,000,000 capital, and it is reported that this company will take over Dorchester Electric when the reorganization is completed and will operate it in close relationship with the Shawinigan company.

Dividends.

	Term.	Rate.	Payable.
Asso. Gas & Elec.	Q	1.5 %	July 15
Bay State St. Ry. pf.	S	$3.00	Aug. 2
Boston Sub. Elec.	Q	50c	July 15
Commonwealth Edison	Q	2 %	Aug. 2
Dayton Pr. & Lt. pf.	Q	1.5 %	July 15
Detroit United	Q	1.5 %	Sept. 1
Duquesne Lt. pf.	Q	1.75%	Aug. 2
Elec. Util. Corp. pf.	Q	1.25%	July 15
International Trac. pf.	S	2 %	July 15
North. Ontario Lt. & Pr. pf.	S	3 %	July 15
North. States Pr. pf.	Q	1.75%	July 15
Ottumwa Ry. & Lt. pf.	Q	1.75%	July 13
Penn. Cent. Lt. & Pr. pf.	Q	1 %	July 5
Pub. Serv. Inv. pf.	Q	$1.50	Aug. 2
Pub. Serv. of No. Ill. pf.	Q	1.5 %	Aug. 1
Pub. Serv. of No. Ill. com.	Q	1.25%	Aug. 1
Puget Sd. Tr., Lt. & Pr. pf.	Q	75c	July 15
Ry. & Lt. Sec. pf.	S	3 %	Aug. 2
Ry. & Lt. Sec. com.	S	3 %	Aug. 2
United Rys. & Elec. com.	Q	50c	July 15
West. Sts. Gas & Elec.	Q	1.75%	July 15

Reports of Earnings.

REPUBLIC RAILWAY & LIGHT.

	1915	1914
April gross	$237,745	$252,461
Net after taxes	88,077	100,286
Surplus after charges	31,269	44,291
Balance after preferred dividends	5,312	18,334
Four months' gross	962,584	991,579
Net after taxes	356,335	373,610
Surplus after charges	128,894	150,877
Balance after preferred dividends	25,066	47,049

DETROIT EDISON COMPANY.

	1915	1914
May gross	$ 577,727	$ 485,927
Net after taxes	207,110	164,689
Surplus after charges	119,228	95,760
Five months' gross	3,189,170	2,701,337
Net after taxes	1,230,334	973,100
Surplus after charges	810,734	632,128

CITIES SERVICE COMPANY.

	1915	1914
April gross	$ 342,337	$ 337,223
Net after expenses	327,039	328,260
Balance after interest	286,206	299,093
Surplus after preferred dividends	155,373	162,261
Twelve months' gross	3,946,539	3,076,961
Net after expenses	3,808,932	2,983,099
Balance after interest	3,342,265	2,743,370
Surplus after preferred dividends	1,730,270	1,541,128
Balance after common dividends	1,573,236	894,799

PACIFIC LIGHT & POWER.

	1915	1914
May gross	$ 227,156	$ 210,865
Net after taxes	152,324	131,385
Total income	163,352	142,307
Surplus after charges	54,737	23,650
Five months' gross	1,136,916	1,053,882
Net after taxes	744,306	605,754
Total income	799,976	679,456
Surplus after charges	259,273	176,656

UTAH SECURITIES CORPORATION.

	1915	1914
May gross	$ 378,314	$ 373,128
Net after taxes	188,912	182,098
Five months' gross	1,876,977	1,876,708
Net after taxes	955,587	931,027

COMMONWEALTH POWER, RAILWAY & LIGHT.

	1915	Changes from 1914
May gross	$1,108,008	Inc. 0.16%
Net earnings	586,396	Inc. 0.18%
Surplus after charges	162,293	Dec. 8.24%
Balance after preferred dividends	82,293	Dec. 15.04%
Five months' gross	5,722,698	Dec. 0.67%
Net earnings	3,017,797	Inc. 1.59%
Surplus after charges	886,110	Dec. 4.37%
Balance after preferred dividends	486,110	Dec. 7.63%
Twelve months' gross	14,017,929	Inc. 0.97%
Net earnings	7,291,945	Inc. 6.33%
Surplus after charges	2,203,286	Dec. 0.19%
Balance after preferred dividends	1,243,286	Dec. 0.33%

WESTERN POWER COMPANY.

Western Power Company reports for the fiscal year ended December 31, 1914, as follows:

	1914	1913
Gross earnings	$2,681,099	$2,698,214
Expenses and taxes	873,763	965,970
Net earnings	1,807,335	1,732,245
Other income	246,235	231,854
Total income	2,053,571	1,964,099
Interest charges	1,280,849	1,183,751
Surplus	772,721	780,358
Dividends on California Electric Generating preferred	150,000	150,000
Sinking funds	53,275	53,585
Other deductions	227,070	24,276
Additions to surplus	7,223	46,075
Unappropriated balance of surplus	349,610	598,562

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
May gross	$ 323,374	$ 323,036
Net after taxes	132,007	131,228
Surplus after charges	80,483	80,568
Balance after preferred dividends	64,160	65,733
Five months' gross	1,424,675	1,403,920
Net after taxes	523,907	543,810
Surplus after charges	267,946	292,995
Balance after preferred dividends	185,333	217,969

NORTHERN STATES POWER.

	1915	1914
May gross	$ 374,830	$ 333,878
Net after taxes	202,713	172,078
Twelve months' gross	4,716,528	4,208,890
Net after taxes	2,604,593	2,191,115

Operating results twelve months ended May 31, 1915:

Gross earnings	$4,688,438
Expenses, taxes and maintenance	2,103,574
Net earnings	2,584,864
Interest and other charges	1,461,027
Surplus	1,123,837
Preferred dividends	587,069
Balance available for depreciation and common dividends	536,768

NEW PUBLICATION.

ELECTRICAL MEASURING INSTRUMENTS.—A second edition of Circular No. 20, recently issued by the Bureau of Standards, Washington, D. C., has been completely revised. It describes the operating principles of electrical instruments used for commercial measurements, including ammeters, voltmeters and wattmeters. It gives such information on the errors of instruments as will assist those who use them to obtain the most accurate results in any given case. Other related subjects are treated as follows: Current and voltage transformers, which make it possible to measure currents so large and voltages so high as to be out of the range of ordinary instruments; standard apparatus by which ordinary instruments may be checked.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 5.	June 28.
American Tel. & Tel. (New York)	120½	123⅜
Commonwealth Edison (Chicago)	135	134
Edison Electric Illuminating (Boston)	237	237
Electric Storage Battery common (Philadelphia)	53¼	52½
Electric Storage Battery preferred (Philadelphia)	53¼	52½
General Electric (New York)	168½	171
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	5½	5¾
Massachusetts Electric preferred (Boston)	35½	36
National Carbon common (Chicago)	137	140
National Carbon preferred (Chicago)	120	117
New England Telephone (Boston)	129	129
Philadelphia Electric (Philadelphia)	23¾	23½
Postal Telegraph and Cables common (New York)	75	79
Postal Telegraph and Cables preferred (New York)	66¼	64
Western Union (New York)	66⅛	66⅛
Westinghouse common (New York)	99⅜	100
Westinghouse preferred (New York)	123¼	125

Digitized by Google

PERSONAL MENTION.

MR. GEORGE F. STOLDT has been appointed superintendent of the Jacksonville, Ill., municipal electric light plant, succeeding Mr. W. H. Catherwood.

HON. ALONZO R. WEED has been reappointed a member of the Massachusetts Gas and Electric Light Commission by Governor Walsh. Mr. Weed has been chairman since the death of Mr. Forrest E. Barker, November 20, 1914.

MR. FRANK R. FARNHAM has joined the staff of Walter B. Snow, publicity engineer and advertising agent, Boston, Mass. Mr. Farnham was previously with the McGraw Publishing Company, New York, in charge of the copy service department for its several publications.

MR. J. WILLIAM ELLIS, who is said to be the only blind wireless operator in the world, has opened a station at Rocky Point, R. I., for exhibition and transmission purposes. He will communicate with ships at sea, and give demonstrations of the working of the radio apparatus to visitors. Mr. Ellis has been a wireless operator for the past 10 years, and has also manufactured and installed outfits.

PROF. CHARLES M. SPOFFORD, of the firm of Fay, Spofford & Thorndike, consulting engineers, Boston, and head of the Department of Civil and Sanitary Engineering of the Massachusetts Institute of Technology, has been appointed by the Governor of Massachusetts a member of the Terminal Commission, constituted by a recent legislative act to investigate the subject of terminal facilities and the improvement of facilities for the transportation of freight in the Boston Metropolitan District.

MR. MIKE S. HART, one of the most popular electrical men of Chicago and vicinity, has resigned as general manager of the commercial department of the Middle West Utilities Company, to go into the cotton brokerage business in New Orleans, La., with headquarters at 506 Hibernian Bank Building. Mr. Hart has been connected with the electrical industry for many years, and superintended the construction work of the Consumers Electric Company, of New Orleans, in the employment of his father. Later he was made secretary and superintendent of the company. The property subsequently passed through a receivership and became known as the Consumers Electric Light and Power Company, the receiver, Mr. Samuel Insull, appointing Mr. Hart as general manager. When the commercial department of the Middle West Utilities Company was organized in 1912, Mr. Hart was appointed general manager. In this important position he carried out many aggressive sales campaigns, and was responsible for the excursion of a fully-equipped electrical exposition car to all of the company's properties. In addition to his business activities, Mr. Hart has been conspicuous in fraternity work, and his services as a Jovian have been marked and productive of considerable development on behalf of the Order. He has been a Statesman of the Jovian Order for both Louisiana and Illinois, and was secretary of the Rate Research Committee of the National Electric Light Association for two years. In Chicago, Mr. Hart took a prominent part in the councils of the local Jovian League, acting on various committees and serving as one of the managers since its inauguration.

DATES AHEAD.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 20-23. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Fifteenth annual convention, San Francisco, Cal., July 21-24. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

American Association for the Advancement of Science. Summer meetings, San Francisco, Cal., August 2-7, Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building. Seattle, Wash.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America, Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23, 24 and 25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-20. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York City.

With the Electrical Manufacturers

The Electric Controller and Manufacturing Company, Cleveland, O., has appointed the O. H. Davidson Equipment Company, 510 Ideal Building, Denver, Colo., and the O. H. Davidson Equipment Company, Walker Bank Building, Salt Lake City, Utah, as its selling agents.

Delta-Star Electric Company, Chicacago, Ill., is distributing descriptive leaflet No. 740, describing the construction of high-tension outdoor wooden-pole substations. Ten typical installations are shown, which will be of interest to those concerned in high-tension transmission.

The Metalyte Company, Incorporated, 366 West Fifteenth Street, New York City, manufacturer of incandescent lamps, has opened a Chicago office at Room 412, 105 West Monroe Street. This is in charge of J. L. Brantigan, who was formerly in the Winnipeg, Canada, office of the company.

Railway & Industrial Engineering Company, Greensburg, Pa., has issued a booklet of views and brief descriptions of Burke horn-gap switching and protective equipment for outdoor substations. A considerable number of such substations of various voltages and sizes are also shown. The company is prepared to design and furnish equipment for practically any outdoor-substation requirements.

The Fargo Manufacturing Company, Incorporated, Poughkeepsie, N. Y., manufacturer of electrical wiring and mechanical devices, has ready for distribution catalog No. 700, devoted to mechanical connecting devices; catalog

Digitized by Google

No. 402, devoted to wiring devices, and catalog No. 800, devoted to electrical and mechanical devices, including cable lugs, cable grips and connectors. These catalogs will be sent to those interested upon request.

The Electrical Sales Engineers, Incorporated, 19 South Fifth Avenue, Chicago, will hereafter, by arrangement with the Thomas G. Grier Company, of Chicago, represent exclusively the Condit Electrical Manufacturing Company, of Boston, Mass., and the Luminous Unit Company, of St. Louis, Mo. The following are the officers of the company: Paul W. Koch, president and general manager, formerly manager of the Thomas G. Grier Company; Fred B. Duncan, vice-president, formerly sales engineer of the George Cutter Company; Alfred O. Dicker, secretary and treasurer, formerly illuminating engineer, Commonwealth Edison Company.

The Harvey Company, 113 South Street, Baltimore, Md., has been organized under the laws of the State of Maryland to establish a supplies and equipment department for railroads, contractors, industrial and isolated plants, garages, etc. Arrangements will be made for quick shipments either direct from mill or stock at warehouse in Baltimore. A storage yard will be maintained at Curtis Bay, Md., on the Baltimore & Ohio Railroad. J. Edward Harvey, president of the company, is well known to the railway and contracting fields, and was formerly vice-president of the South Baltimore Steel Car and Foundry Company, of Baltimore, and was also proprietor of the Eastern Railway Supply Company. The company desires complete catalogs from manufacturers.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently issued a number of new publications, among which are the following: "Considerations in the Design of Railway Motors," a treatise on the ventilation of this type of motor, by R. E. Hellmund, has been issued in pamphlet form; this is a reprint of an interesting article which appeared in the *Electric Journal*. The June issue of Westinghouse Railway Data Exchange is on the subject of freight haulage; it contains several articles, among which are: "Fast-Freight Service on the Winona Interurban Railway," "Effect of Brake-Setting on Power Consumption," and "Effect of Car-Wheel Diameter on Motor Heating," all containing valuable information on freight haulage by electric locomotives. Leaflet No. 3823 describes the construction and operation of rotary converters of the commutating type; a number of construction details are illustrated and several installation views are shown. Leaflet No. 3760 describes alternating-current, remote hand-control switchboards; it describes the application of this type of board, together with the different methods of mounting, and gives a typical wiring diagram. Leaflet No. 3820 describes alternating-current heavy-duty slip-ring motors, which are especially adapted for constant and varying-speed applications where continuous service and strong starting effort are required, and where squirrel-cage motors would not be adaptable. Leaflet No. 3787 is devoted to large-squirrel-cage induction motors. Folder 4197-N describes the various types of Westinghouse electric household helps. Leaflets 3789 and 3790 are descriptive of Type C semi-magnet and full-magnet elevator control, both of which are suitable for freight and passenger elevators. The paper read by W. M. Dann and H. H. Rudd before the Ohio Society of Mechanical, Electrical and Steam Engineers, at Toledo, O., on June 17, with the title "The Use of Current-Limiting Reactors," has been reprinted in pamphlet form. Telephone battery charging by means of the mercury rectifier has been described in folder No. 4204-A. Small Motors No. 23 describes and illustrates the type CA single-phase motor and its starting mechanism; this motor is made in sizes from one-twentieth to three-quarter horsepower. Descriptive leaflet No. 2322-C covers the complete line of type AR single-phase motors, and descriptive leaflet No. 2362-C illustrates and describes the line of type CA single-phase small motors for use in the home, office and shop. The July issue of the Show Window Calendar, a monthly publication issued by the company to assist distributors of its electric ware, contains suggestions especially suitable for July Fourth. Catalog Section DS930 describes electrostatic ground detectors and voltmeters: these are for use on both single-phase and polyphase circuits and are connected to the circuit through condensers; they are both sensitive and economical.

Record of Electrical Patents

Issued by the United States Patent Office, June 15, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,142,791. Electrical Equipment for Internal-Combustion Engines. V. G. Apple, assignor to Apple Electric Co., Dayton, O. Wiring and switches in dynamo and battery equipment for starting and lighting.

1,142,804. Telephone-Receiver Support. A. H. Drake, Waterloo, Iowa. Extensible bracket secured to telephone normally depresses hook but releases same when extended to hold receiver to ear.

1,142,818. Cap for Lamp Shells, Switch Receptacles, and Analogous Devices. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Insulating lining secured by interlocking with metal cap.

1,142,819. Cap for Lamp Sockets and the Like. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Has metallic lining with enameled insulating surface.

1,142,833. Electric Welding. J. A. Muir, assignor to the Toledo Electric Welder Co., Cincinnati, O. Welding current controlled automatically or at will.

1,142,835. Outlet Box for Protective Casings for Line Conductors. T. E. Murray, New York, N. Y. Structural details of sheet-metal box. (See cut.)

1,142,846. Trolley-Wheel Mount. T. Sanders, Kingman, Ind. Details of wheel contactor.

1,142,847. Circuit-Controlling Mechanism. E. Schildhauer, Culebra, Canal Zone. Electromagnetically operated means for locking oil switch closed controlled by handle.

1,142,852. Electromagnet and Solenoid. A. Simon, assignor to Cutler-Hammer Mfg. Co. Auxiliary plunger cuts down current after main plunger operates.

1,142,857. Automatic Telephone Signaling System. M. Suwa, Tokyo, Japan. Rings by unbalancing of transmitter batteries when receiver is taken down.

1,142,858. Electroresponsive Regulator. L. L. Tatum, assignor to Cutler-Hammer Mfg. Co. Operation accelerated but over-running prevented.

1,142,859. Electric Switch. A. A. Tirrill, Schenectady, N. Y. Pull-cord rotary snap switch.

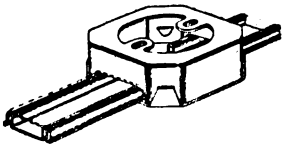
1,142,861 and 1,142,862. Electrical Heating Unit. E. G. Van Wie and R. W. Davenport, assignors to Detroit Stove Works, Detroit, Mich. Mounting of electrically heated plate and of resistance coil.

1,142,866. Electric Current Generator. J. M. Wilson, assignor to Splitdorf Electrical Co., Newark, N. J. Working current controled by contacts operated by field magnet.

1,142,875. Electromegaphone Receiver, Etc. C. K. Cregier, Chicago, Ill. Telephone-receiver diaphragm varies frictional tension device of loud-speaking diaphragm and thereby vibrates same.

1,142,881. Pantograph-Grounding Circuits for Electric Railway Vehicles. E. R. Hill, East Orange, N. J. Has switch in ground connection.

1,142,898. Thermoelectric Ammeter. P. M. Lincoln, Pittsburgh, Pa. Voltage indicated of thermoelectric couple acted on by heat produced by current to be measured.



No. 1,142,835.—Outlet Box for Molding.

1,142,912. Electric Signal. C. M. Saeger, Allentown, Pa. Block system having device for recording signal conditions.

1,142,920. Ignition System for Internal-Combustion Engines. H. R. Van Deventer, Sumter, S. C. Both polarities of alternating current alternately used at igniter.

1,142,935. Support for Electric Trolley Mechanism. F. C. Coseo, assignor to Jeffery Mfg. Co., Columbus, O. Mounting on mining locomotive permits transverse adjustment of pole.

1,142,939. Electrically Heated Oven. R. W. Davenport, assignor to Detroit Stove Works. Construction and location of resister elements.

1,142,964. Adjustable Lamp. F. C. Howe, New Haven, Conn. Secured to plate adjustable over surface of globe.

1,142,973. Electrical Apparatus. J. H. Lehman, New York, N. Y. Igniter vibrator has contacts operated by movable core of induction coil.

1,143,002. Trolley Retriever. F. A. Wasson, Milwaukee, Wis. Air-pressure operated.

1,143,003. Controlling Device for Winding Machines. J. W. West, East Braintree, Mass. Electrically actuated stop-motion device controlled by weight of thread.

1,143,008. Automobile or Train-Lighting System. C. E. Willey, assignor to Jas. Clark, Jr., Electric Co., Louisville, Ky. Structure and speed control of axle-driven generator.

1,143,024. Electrical Signaling Apparatus. D. E. Beatley and P. M. Feltwell, Sewickley, Pa. Automobile signal with electromagnetically operated arm and lamps.

1,143,026. Spark Plug. H. J. Berthold, Irvington, N. J. Particular structure of contacts and insulation.

1,143,041. Current Corrector. N. C. Darby, East Orange, N. J., assignor of one-half to R. Miehling. Rectifier has translating device in parallel with coil whose core intermittently breaks supply circuit.

1,143,050. Flatiron. S. Kako, San Francisco, Cal. Steam electrically generated in iron is discharged through face.

1,143,097. Medicated Mouthpiece-Connector. C. M. Andres, assignor of one-half to A. Soloman, Albany, N. Y. For telephone.

1,143,104. Apparatus for Drawing Glass. W. R. Campbell, Lancaster, O. Glass-drawing bait is electrically reheated after it and attached glass cylinder are removed from drawing apparatus.

1,143,108. Arc Lamp. J. L. Dinsmoor, New York, N. Y. Particular structures of converging-carbon holders and clutches.

1,143,119. Magneto. D. B. Hughes, assignor to Citizens Savings & Trust Co.,

Digitized by Google

Cleveland, O. Transformer mounted in field.

1,143,140. Telephone-Call Register. J. A. Robinson, assignor of one-fourth to A. J. O'Brien and one-fourth to S. J. Boughton, Denver, Col. Operated by co-operating action of signal-lamp cap and plug.

1,143,144. Mining Machine. F. L. Sessions, assignor to Jeffrey Mfg. Co., Columbus, O. Mounting and arrangement of motor and power connections.

1,143,149. Insulator. L. Steinberger, Brooklyn, N. Y. High-tension insulator clamped in position on supporting rods.

1,143,175. Synchronous Electrical Contact-Maker. F. G. Cottrell and H. A. Burns, assignors to International Precipitation Co., San Francisco, Cal. High-tension rectifier for electrical fume-precipitation system.

1,143,176. Electric System. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Regulation of system with storage battery floated on line.

1,143,181. Dry Cell. M. A. Foos, assignor to National Carbon Co., Cleveland, O. Container structure with guard.

1,143,189. Electromagnetic Sound-Producer. L. Grubman, assignor to Electric Spark Appliance Co., New York, N. Y. Auto horn; electromagnetic vibrator strikes diaphragm.

1,143,190. Automatic Crossing Gate. C. I. Hall, Mount Vernon, Wash. Operated by train-controlled motor.

1,143,191. Electrical System. G. W. Hallock, assignor to the Safety Car Heating & Lighting Co., New York, N. Y. Regulation of car-lighting system having generator and storage battery.

1,143,194. Motor Controller. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co. Controls connections and field strength of series motor.

1,143,195. Vehicle. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co. Electric-automobile duplex controllers have driving seats adjustably guarded.

1,143,201. Electric Talking Sign. L. H. Jones, Wichita, Kans. Desired groups of banks of lamps lighted by motor-driven switching mechanism.

1,143,206. Electric Switch Device and Receptacle. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Lamp socket having oppositely disposed push-buttons.

1,143,207. Push-Button. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Extension of push-button plunger permits operation through husk about lamp socket.

1,143,213. Method and Apparatus for Converting Alternating or Pulsating Electric Currents into Unidirectional Currents. R. W. Lohman, Oakland, Cal. Current withdrawn from conductors subjected to rotating electrostatic field or corona.

1,143,220. Electric Welding. R. Mack, assignor to Thomson Electric Welding Co., Lynn, Mass. Machine for forming continuous seam.

1,143,233. Device for Attracting Submarines and the Like. L. Schramm, Jr., Armiger, Md. Powerful electromagnets are secured to ship's sides.

1,143,242. Capping Off Apparatus for Glass Cylinders. E. H. Thompson and J. E. Kajut, assignors to Window Glass Machine Co., Pittsburgh, Pa. Cracking-off wires are electrically heated.

1,143,246. Rain Signal. J. J. Barrash, Chicago, Ill. Electric alarm sounded when rain collects in receptacle.

1,143,264. Electrical Push-Button. C. A. Franck, Yonkers, N. Y. Has insulating housing carrying contacts bridged by metal button sliding in housing.

1,143,270. Automatic Ship's Bell. J. E. Hudson, Batavia, N. Y. Clapper operated by electromagnet.

1,143,279. Table. W. C. Johnson, Cincinnati, O. Has motor-driven, rotary central part.

1,143,290. Illuminator for Cash Registers. N. R. Lippincott, Pittsburgh, Pa. Lamp controlled by drawer lights front.

1,143,305. Transformer. L. C. Nichols, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Particular corrugated spacing means for coil sections.

1,143,306. Combined Attachment Plug and Base. Mortimer Norden, assignor to J. Norden, New York, N. Y. Plug contacts mechanically secure plug to base and connection is made and broken by twisting plug in base.

1,143,312. Signaling Circuit. W. M. Perry and A. E. Boozer, Columbia, S. C. Circuit arrangements of push-controlled lamps and bells.

1,143,313. Signaling System. W. M. Perry, Columbia, S. C. Circuit arrangements of bell and lamp-call system for hospital.

1,143,322. Outlet Box. M. Robinson, Newton, Mass. Conduits enter bottom of box and are clamped therein by central clamping member pressing outwardly against them.

1,143,327. Vacuum Regulation. H. C. Snook, Cynwyd, Pa., and E. W. Kelly, Philadelphia, Pa. Vacuum control for X-ray tubes.

1,143,340. Watch Stand. E. L. White, assignor to J. H. White Mfg. Co., Brooklyn, N. Y. Dry cell and lamp for illuminating watch face.

1,143,363. Time-Recording Device. C. M. Cook, assignor to Stromberg Electric Co., Chicago, Ill. Time stamp having type wheels electromagnetically operated.

1,143,364. Time Recorder. C. M. Cook, assignor to Stromberg Electric Co. Modification of above.

1,143,367. Call-Registering Mechanism. A. F. Dixon, assignor to Western Electric Co., New York, N. Y. Movement of coin distributer electromagnetically controls register.

1,143,368. Switch Selector. A. F. Dixon, assignor to Western Electric Co. Switches have tripping means, of which selected ones are locked in tripping positions and actuation performed.

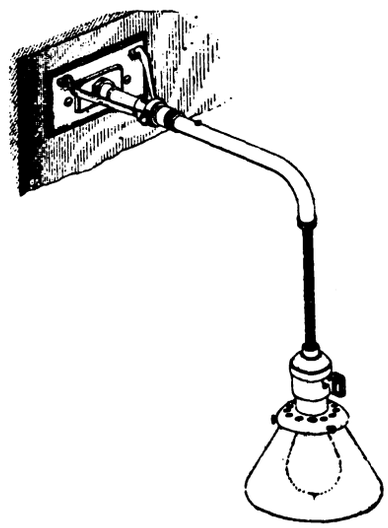
1,143,369. Stop Means for Sheet-Handling Apparatus. P. J. Dreher, Toledo, O. Control for electric driving motor.

1,143,378. Starter and Ignition Control. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Has engine-starting dynamo-electric machine, a storage battery and means for preventing opening of ignition circuit while battery is connected to dynamo.

1,143,402. Antifrosting Window. W. N. Johnson, Williamsport, Pa. Electric heating elements about edges of pane.

1,143,404. Typewriter. E. E. Kennedy, Neepawa, Manitoba, Can. Platen rotated and carriage returned to initial position by electric motor.

1,143,412. Underground-Conduit Construction. M. H. Loughridge, New York, N. Y. Relates to junction-box construction.



No. 1,143,536.—Attachment Bracket.

1,143,425. Application of Power to Reciprocating-Bed Printing Presses. R. Miehle, assignor to Continental & Commercial Trust & Savings Bank, Chicago, Ill. Motor runs at increasing speed during first part and at decreasing speed during last part of stroke.

1,143,464. Process of Producing Transparent Coatings. E. N. Todd, Millburn, N. J. Electrically produced heat furnishes drying atmosphere for hygroscopic lacquer.

1,143,473. Contrivance for Automatically Detecting the Presence of Certain Gases and Vapors. A. Williams and L. D. Williams, London, England. Conbustible gases detected by exposing pair of thermoelectric elements, one containing a catalytic element and noting voltage.

1,143,485. Battery Connection. C. H. Beck, Altoona, Pa. For securing to wire end to connect with battery terminal.

1,143,487. Microphone and Like Instrument. E. Belin, Paris, France. Variable resistance comprising adjustable contacts connected by resistance and successively bridged by flexible member so no abrupt short-circuit occurs.

1,143,491. Wind Shield. E. P. Bidwell, Monrovia, Cal. Electric heating element at lower side of pane.

1,143,493. Apparatus for Mounting Filaments. L. Dorzychowski, assignor to General Electric Co., Schenectady, N. Y. Securing filaments to supporting arms in incandescent lamps.

1,143,515. Jaw Prop. W. F. Dunlop, New York, N. Y. Carries electric illuminator.

1,143,529. Magnetometer. E. Garretson, Buffalo, N. Y. Permanent magnet with pole pieces and an adjustable magnetic shunt between them.

1,143,530. Electrically Controlled Valve. H. G. Geissinger, assignor to Geissinger Regulator Co., New York, N. Y. Fluid-pressure operated with electromagnetically controlled pilot valve.

1,143,536. Attachment-Plug Fitting. G. W. Goodridge, assignor to The Bryant Electric Co., Bridgeport, Conn. Lamp-supporting extension bracket can be plugged into wall receptacle. (See cut.)

1,143,539. Headlight. C. A. B. Halvorson and L. O. Ingalls, assignors to General Electric Co. Has rear chamber containing operating mechanism to protect from arc fumes.

1,143,568. Electric Water Heater. R. P. Barnstead, Boston, Mass. Heater elements screwed into sockets in container bottom.

1,143,572. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Flatiron with control switch in handle and thermostatic cutout in body.

1,143,573. Automatic Cutoff for Electrically Heated Devices. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co. Thermostatic switch control for above.

1,143,574 and 1,143,575. Electric Resistance Element. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co. Slotted units for flatirons.

1,143,576 and 1,143,577. Electric Resistance Unit. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co. Different constructions of flatiron elements.

1,143,578 and 1,143,579. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co. First patent, toaster unit; second patent, curling-iron heater controlled by compartment door.

1,143,583. Belt Gearing. C. F. Hotchkiss, assignor to Stow Mfg. Co., Binghamton, N. Y. Pivoted arm carries flexible shaft and motor and gearing for driving tool.

1,143,586. Process of Producing Chlorates of Alkalis and Alkaline Earths. W. Laib, assignor to Ohio Salt Co., Wadsworth, O. Aqueous solution of chloride of base whose chlorate is to be formed is subjected to electrolysis in cell having graphite anode at low temperature and further electrolyzing at high temperature in cell having platinum anode.

1,143,598. Passenger-Exit Register. C. C. Frum, Clarksburg, W. Va., assignor of one-fourth to J. W. Agnew. Electromagnetically operated.

Patents Expired.

The following United States electrical patents expired on July 5, 1915:

606,646. Rheostat. H. B. Cutter, Philadelphia, Pa.

606,663 and 606,664. Electric Railway. J. C. Henry, Denver, Colo.

606,746. Electric Light Switch. F. L. Temple, St. John, Canada.

606,761. Method of and Apparatus for Generating Alternating Curents. M. Hutin and M. Leblanc, Paris, France.

606,762. Alternating-Current Dynamo. M. Hutin and M. Leblanc.

606,764. Telephone Exchange. F. A. Lundquist, Chicago, Ill.

606,792. Electric Radiator. F. W. Quidas, Mount Washington, Md.

606,795. Electric Meter. W. Stanley, Pittsfield, and F. Darlington, Great Barrington, Mass.

606,803. Telephone System. B. R. Dodge, Post Mill Village, Vt.

606,819. Contact Device for Electrically Propelled Vehicles. H. P. Davis, Pittsburgh, Pa.

606,825. Contact Device for Electric Railways. C. A. Terry, New York, N. Y., and H. P. Davis, Pittsburgh, Pa.

606,826. Current-Collecting Apparatus for Electric Railways. C. A. Terry and H. P. Davis.

606,827. Overhead Construction for Electric Railways. C. A. Terry and H. P. Davis.

606,828. Traveling Contact Device for Electric Railways. G. Westinghouse, Pittsburgh, Pa.

606,830. Insulator. B. Willard, Schenectady, N. Y.

606,852. Telephonic Transmitter. T. F. Ahern, Detroit, Mich.

606,863. Alternating-Current Dynamo. L. Gutmann, Peoria, Ill.

606,884. Electric Snap Switch. A. F. Wood, Philadelphia, Pa.

606,887. Electric Extraction of Poisons. J. B. Campbell, Cincinnati, O.

606,912. Means for Preventing Disturbances in Telephonic Circuits. O. T. Blathy and K. de Kando, Budapest, Hungary.

606,917. Electric Brake. H. P. Davis, Pittsburgh, Pa.

606,939. Switch for Arc Lamps. C. A. Pfluger, Chicago, Ill.

606,990 and 606,991. Electric Railway. J. C. Henry, Denver, Colo.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVII, No. 3. CHICAGO, SATURDAY, JULY 17, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer.

A. A. Gray, General Manager. H. S. Tuthill, Business Manager.

C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER SOCIETY ELECTRICAL DEVELOPMENT DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Control of Water Powers..... 93
Refunding Bond Issues..... 94
Putting the Inventor to Work..... 94
Powers of State Utility Commissions..... 94
Rates for Electric Heating and Cooking..... 95
Courtesy by Utility Employees..... 95
DEPARTMENTS:
Commercial Practice.....102
Electrical Construction.....106
National Association of Electrical Inspectors.....110
Public Service Commissions.....112
Among the Supply Men.....114
Questions and Answers.....115
New Electrical and Mechanical Appliances.....122
Latest Approved Fittings.....128
Current Electrical News.....129
Record of Electrical Patents.....132
LEADING ARTICLES:
Electricity in Implement Manufacturing.—By W. J. Kyle. 97
Credits, Collections and Cash Discounts.—By W. H. Vilett.106
Electric Welding.—I.—By Gordon Fox.....117
MISCELLANEOUS:
National Electrical Contractors' Association..... 96
Marconi International Progress..... 96
Program for New England Section, N. E. L. A. Convention 96
First Electric Automobile in Edinburgh..... 96
Electric Shovel to be Used in Coal Mining.....101
A House Electric at No Cost.....102
Cool Weather Affects Consumption.....102
Fan Keeps Flies Out of Restaurant.....102
Big Hotel Installation in London.....102
Successful Electric Show Held in Cincinnati.....103
Springfield Company Inaugurates Rural Service.....103
Frank D. Beardslee.....104
Electric Drive Effects Economy in Large Tire Factory..104
Battery Exchange Service in Boston.....105
A Letter That Eliminated Much Misunderstanding.....105
Massachusetts Board of Examiners.....107
Hearing on Renewable Fuses.....108
New Fire-Alarm System for New York City.....109
Joint Contractors' Meeting at Kansas City.....109
Summer Outing of Cedarmen.....119
Electrical Prosperity Week.....120
Program of Ohio Convention.....120
Electric Club-Jovian League Picnic Arrangements.....120
Service at Any Cost.....121

Copyright, 1915, by Electrical Review Publishing Company, Inc.

CONTROL OF WATER POWERS.

Much discussion has taken place during recent years regarding the control of water powers which are located within the boundaries of the national forests or other districts over which the Federal Government still has control. Partisans for one side claim that the Federal Government should retain as complete control as its present powers permit it to exercise, while others demand that entire control over such matters, so far as they are not connected with navigable streams, should be turned over to the respective states within whose boundaries the water powers exist. While these discussions have been going on as to where authority should reside, the state and federal officials have been seeking a solution of the problem through co-operation in their administration. The Secretary of Agriculture has already made agreements with the State Water Commissions of two of the Pacific States whereby there shall be no clash in authority, but federal and state officials act in harmony, each keeping the other informed of any action taken and refraining from taking any action which would conflict with the regulations and policies of the other. Development of water powers within the limits of the national forests cannot be undertaken without a permit from the district forester, and state laws in several of the states also provide for authority from state officials before water can be diverted from any stream for private use. Under the agreement above mentioned, neither official will grant a permit unless the sanction of the other is also obtained in the case, where both are involved.

The matter is brought to attention by the endeavor of one of the hydroelectric companies in California to utilize certain water powers in the Inyo National Forest. The State Water Commission regarded such utilization as contrary to public interest, and although the United States forester has legal power to permit such development to take place, he declines to do so under such circumstances and has been upheld by the Secretary of Agriculture in this attitude. In taking this position the federal officials do not relinquish any federal rights or authority in the matter, but take the position of choosing to exercise such authority as is vested in them in conformity with the policy of the state officials. Such an attitude upon the part of the federal administration should satisfy those who have been clamoring for the federal government to turn the matter entirely over to the individual states.

Digitized by Google

REFUNDING BOND ISSUES.

The decision of the Appellate Division of the Supreme Court of New York State, referred to in last week's issue, is of great importance to utility companies. This case arose from the appeal against the decision of the Public Service Commission of the First District in regard to the issue of bonds for refunding a previous issue which is about to mature. The court held that the Commission has the same supervision over such issues as over those issued at the time of contracting the debt.

The reason this case came up to the court for decision is because the Commission refused to approve of the issue until it was satisfied that the debt was represented by property of value or cost equal to the face value of the bonds, or that the obligations to be refunded were represented in capital account. The contention of the company that it was entitled as a matter of course to the consent of the Commission to the new issue merely because the outstanding obligations were valid is not sustained by the court.

This decision upholds the idea which was intended to be made effective when the Commission was given control over issue of securities. This idea is that the public may at least feel secure when investing in such an issue of bonds that the funds thereby represented have been actually used as capital and are represented by definite investments in permanent property, rather than disbursements for operating expenses or other temporary purposes. The Commission, however, is not permitted to apply to the issue of such securities, tests as to whether the present value of the company's property or its present earning capacity are suitably related to the face value of the securities issued. The utility company is required, however, to satisfy the Commission regarding the other points mentioned and the fact that the obligations were originally incurred before the public utility law went into effect have no bearing upon the situation.

PUTTING THE INVENTOR TO WORK.

Announcement is made that in response to an invitation from Secretary of the Navy Daniels, Mr. Thomas A. Edison has consented to head an advisory department on behalf of the Government. As we understand it, Secretary Daniels has evolved the idea that there should be a bureau of information and advice co-operating with the Administration with a view to having the best inventive talent in the United States suggesting methods for improving governmental agencies of attack and defense.

If the idea is developed Mr. Edison will undoubtedly have for associates in such a council many inventors whose names are illustrious through actual achievement. The motives underlying their effort are to be entirely patriotic, and the glory attending the effort is to be their only recompense.

Such a council could and would advise in splendid fashion and develop to the limit many ideas not now given an opportunity for demonstration. Their genius, however, must have direction, and the development of their ideas must be attended with faith and an open mind as regards expenditures. The success of invention lies as much in the effort that is put behind its development to a stage of practical usefulness, as it does in its apparent availability in original form.

POWERS OF STATE UTILITY COMMISSIONS.

In a few of the states the state utility commissions receive their powers from the state constitution, but in most of the states the powers of the state commission are granted by statutes and are a delegation of the powers which already reside in the legislature. In other words, in creating a utility commission to carry out the usual functions, the legislature is transferring to it powers which it already holds in its own hands. Such powers can, of course, be withdrawn at any time and are subject to any restrictions which future legislatures may choose to exercise.

The intent of most legislatures in creating utility commissions has been to exercise powers of regulation by a body of men who can give proper study to the subject and to the merits of the particular cases which may come up for action. Such a body can act with greater justice to both the public and the utilities involved than can the legislature itself, and is in a much better position to determine whether rates are reasonable and whether service is furnished as it should be. The delegation of such powers to a commission usually infers an intent upon the part of the legislature to no longer directly exercise such functions itself.

Has a commission created under such circumstances the right and power to repeal action which has already been taken by the state legislature? This question has recently arisen in New York, where a railroad company petitioned the commission for authority to change a rate which had previously been established by a legislative act. What the powers of a particular commission may be in such a case depend entirely, of course, upon the provisions of the specific act by which it was created and given powers. The Public Service Commission for the Second District of New York has decided that it has no power to overrule action previously taken by the State Legislature, although this opinion was not a unanimous one, two of the commissioners dissenting from the majority. A question of this kind, of course, involves the interpretation of the utility act and may eventually involve a decision by the state courts.

It must be evident, however, that the legislative intent in creating a utility commission is to have it pass upon all such matters of rates after due investigation, as it is only by such investigation that reasonableness of any rate can be established. In states where the legislature has not already given the commission power over rates which have been previously determined by statute, such powers should certainly be granted by amendment to the original laws.

Digitized by Google

RATES FOR ELECTRIC HEATING AND COOKING.

We have referred a number of times in these columns to the fact that there are in England 23 central stations which supply energy for electric heating and cooking at an energy rate of one cent per kilowatt-hour, usually accompanied by some form of a demand charge. The matter is brought to attention once more by a paper presented at the meeting of the Incorporated Municipal Electrical Association held last month, entitled "The Practical Result of the Point-Five Tariff" by Messrs. A. S. Blackman and Thomas Roles, managing engineers of two of the utilities which offer this rate. The paper is of interest principally in demonstrating the possibility of obtaining a load of this character when a suitable rate is offered, the fact that energy can be successfully supplied at such a rate, and that no substantial progress can be made, at least in England, in supplying electric energy for these purposes where the charge per kilowatt-hour exceeds one cent.

In a number of the communities enjoying this rate, the demand charge has been based upon the assessed valuation of the residence served, in conformity with a system originally inaugurated in Norwich. The particular manner of determining this demand charge is, however, of minor importance, as it might readily be based upon the consumer's actual demand where this can be determined, or upon the average demand of the class of consumers involved. As applied in Bradford, for instance, the demand charge is so chosen as to amount practically to bringing the unit charge for lighting up to about eight cents, while the additional current used for heating and cooking is obtained by the consumer for one cent per unit. It is found that consumers' load-factors are remarkably increased when a cooking load is added to the lighting load, and the output of the station is so affected that the additional cost of supplying the additional energy comes well within the price charged. This consideration falls directly in line with a point of view adopted by most American central stations in formulating schedules for power consumers and other classes of customers who perhaps do not pay their full share of fixed charges, but whose acquisition in connection with the plant already operating permits a reduction in the average cost of energy supplied.

The form of rate in question has proved very popular in English communities where it has been adopted, as is evidenced by the large increase of the consumers connected to the lines. In most cases the form of charge we refer to is elective and the majority of new customers choose to be served under this form of schedule.

There are a number of companies in this country having a step system of rates which has enabled a cooking load to be supplied at the minimum rate, but in most cases this minimum is not less than three cents per kilowatt-hour for residence consumers. The experience of English companies would point out the feasibility of making this minimum rate less than is now customary. A cooking load could probably be acquired in this country at a rate somewhat higher than is necessary to secure it in England; but electric cooking will never become generally popular while the cost remains unreasonably high as compared with the direct use of fuel.

In many cases the problem is complicated by the necessity of supplying hot water from the same source of energy. According to the evidence of Mr. D. F. Henderson given at the recent convention of the American Institute of Electrical Engineers, this problem has been successfully solved in Spokane, Wash., where a water heater is operated upon a flat rate and left permanently connected to the line except when the electric range is in use. The switch is so arranged that when energy is used for cooking the water heater is disconnected.

COURTESY BY UTILITY EMPLOYEES.

It has been announced that one of the great railroad systems of the country has decided to have regular meetings of its employees, which are to be designated as "courtesy meetings." It has been felt that something of this kind is needed to cultivate the proper attitude of the employees towards the public with whom they come in contact and to eliminate the rudeness and boorishness on the part of conductors, porters, ticket sellers, and other employees of the corporation. It is felt that such conduct, as to which there are frequent complaints, can be avoided, and that neither efficiency nor speed in carrying on a man's work need to be sacrificed because he takes the trouble to exercise good manners.

The consideration of this subject is entirely in order on the part of electric utilities, where examples of discourtesy and boorishness are not entirely lacking. Such conduct is frequently due entirely to thoughtlessness, and not to any intention on the part of the employee to be deliberately ill-mannered. The cultivation of a desirable attitude towards those with whom one comes in contact should, however, be the result of a deliberate purpose, and it is only by giving thought to the subject that the purpose and its achievement can be realized upon the part of all employees. The elevation of courtesy to the position of a slogan, and regular discussion as to the details of what it covers and how it is to be achieved and practiced, serve to keep the subject in the minds of the employees and will result in more definite efforts to get results.

Telephone companies have, perhaps, placed more emphasis upon the use of the word "please" and similar evidences of courtesy than have the other utility companies. But there is no reason why the use of polite language should be limited to conversation over the telephone. Those who have given study to this subject sincerely believe not only that time and thought given to the exercise of courtesy is not only not wasted, but actually brings a financial return.

Digitized by Google

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION.

Program of Annual Convention to be Held at San Francisco Next Week.

The fifteenth annual convention of the National Electrical Contractors' Association of the United States will be held at San Francisco, Cal., July 21 to 24. A special train to the convention left New York City over the New York Central Railroad on Saturday, July 10, at 5:30 p. m., the route being by way of Chicago, Kansas City, Los Angeles and San Diego, with a stop in Arizona at the Grand Canyon. The train will arrive at San Francisco on Sunday, July 18, at 9:55 a. m.

On Monday, July 19, there will be an executive meeting of the California Association of Electrical Contractors and Dealers at the Auditorium, at 9:00 a. m. and an open meeting at 1:00 p. m. On Tuesday there will be a meeting of the National directors and Executive Committee at the Clift Hotel at 10:00 a. m. At 6:30 p. m. there will be the regular monthly meeting and dinner of the California Association at the Clift Hotel. The principal speaker of the evening will be W. L. Goodwin, vice-president and general sales manager of the Pacific States Electric Company. His topic will be "Co-operation Between Contractors and Jobbers."

Wednesday, July 21.

The National Electrical Contractors' convention will open on Wednesday, July 21, with an open session at the Auditorium, Market, Hayes and Larkin Streets, at 10:00 a. m.

Address of Welcome, C. F. Butte, president of the San Francisco Association.

Address by John R. Galloway, president of the National Electrical Contractors' Association.

Address by C. V. Schneider, president of the California Association of Electrical Contractors and Dealers.

Address by James Rolph, Jr., mayor of San Francisco.

Illustrated address by John A. Britton, president of the Pacific Gas and Electric Company.

Address by C. C. Moore, director-general of the Panama-Pacific International Exposition.

Short talk by George B. Muldaur, of the Society for Electrical Development, Incorporated.

Address by Thomas A. Addison, Pacific Coast manager of the General Electric Company.

Business session at 2:30 p. m.

Reception and dance at Clift Hotel at 9:00 p. m.

Thursday, July 22.

Business session at Auditorium, 10:00 a. m.

Automobile ride for ladies and guests through Golden Gate Park and Presidio, 2:00 p. m.

Business session, Auditorium, 2:30 p. m.

National Electrical Contractors' Association night at the "Zone," Exposition Grounds, evening.

Friday, July 23.

Final business session at Auditorium, 10:00 a. m.

Board of Directors at Clift Hotel, 2:30 p. m.

Executive Committee at Clift Hotel, 3:30 p. m.

Dinner-dance and vaudeville at Pompeian Court, Hale Building, Fifth and Market Streets, 7:00 p. m.

Saturday, July 24.

Trip by special steamer around San Francisco Bay and through the Golden Gate, landing at Exposition Grounds early in the afternoon. Luncheon to be served on board, 9:00 a. m.

At 3:00 p. m. there will be a demonstration of transcontinental telephony at the Palace of Liberal Arts, in the auditorium of the American Telephone and Telegraph Company. Conversation will be carried on with members of the Association in New York City.

There will be several important reports read at the convention. They are:

E. McCleary, "The National Electrical Code."

G. M. Sanborn, "Universal Data and Sales Book"; also "Conduit Charts."

J. T. Marron, "Membership."

P. H. Jaehnig, "Legislation, Ordinances and Laws for Electrical Contractors."

Joseph A. Fowler, "Liability Insurance and Workmen's Compensation."

James R. Strong, "Convention Details."

A. J. Hixon, "Reducing Cost of Electrical Construction."

George E. Shepherd, "Publication."

Ernest Freeman, "Co-operative Protective Committee"; "Concentric Wiring"; and "Bookkeeping System."

Marconi International Progress.

The directors of the Marconi International Marine Communication Company show that notwithstanding disorganization and loss due to war, the business made substantial progress. Revenue from ships' telegrams, subsidies, etc., was $875,105 for 1914 as compared with $731,584 for 1913. The number of telegraph stations owned and worked by the company as public telegraph stations on the high seas increased during the year from 788 to 905, and during 1915 further progress has been made, the number now being 970. There are now over 2,000 ships, exclusive of ships of war, fitted with Marconi telegraph stations, chiefly worked under this and allied companies.

Program for New England Section N. E. L. A. Convention.

A preliminary program for the convention of the New England Section, N. E. L. A., has been formulated and includes a reception, cards and dancing on the first evening, September 14; two business sessions on September 15, devoted to "Power," with papers by managers of isolated plants and central-station representatives; a formal dinner in the evening, with National Association officers, the Governor of Maine and members of New England utility commissions as guests; a Public Service Commission session the morning of September 16, and in the afternoon a paper, with discussion, on "Present Developments of the Type C Lamp." The morning of September 17 will be given to electric vehicles, with a report by E. S. Mansfield; the afternoon will be devoted to sports. The convention will be held at the Mt. Kineo House, Kineo, Maine.

First Electric Automobile in Edinburgh.

No vehicles driven by electric power have heretofore been in use in Edinburgh, Scotland, for pleasure or business. It is noteworthy that the Edinburgh municipal corporation is the first purchaser of an electric vehicle in the district, and still more noteworthy that it is the intention of the committee in charge of the municipal electric plant to encourage the introduction of electric trucks, vans, and other cars. The committee has acquired, through a London agency, an American-built electric lorry or wagon, having a carrying capacity of one and a half tons and a guaranteed speed of 11 miles per hour on the level and 5 miles per hour on a gradient of 1 in 10 with full load. The accumulators are of the Edison type. With a full charge, the lorry is capable of traveling 40 miles with a load of one and a half tons and 50 miles with a half load. The control is effected by one handle fixed to the steering wheel, which alters the speed of the motor, so that there are only the controller and brake to operate.

The electricity required for one full charge is about 35 kilowatt-hours. With electricity at one penny (two cents) per unit, the cost per mile will be slightly less than 1.75 cents on moderately level roads with good surface.

The committee has undertaken to supply electricity for the charging of such vehicles at the rate of one penny per unit and has made arrangements not only for charging, but also for storing lorries in the municipal electric stations. It is considered not unlikely that the result will be a fair demand for commercial electric lorries and vans and also electric cars for pleasure and professional purposes.

Digitized by Google

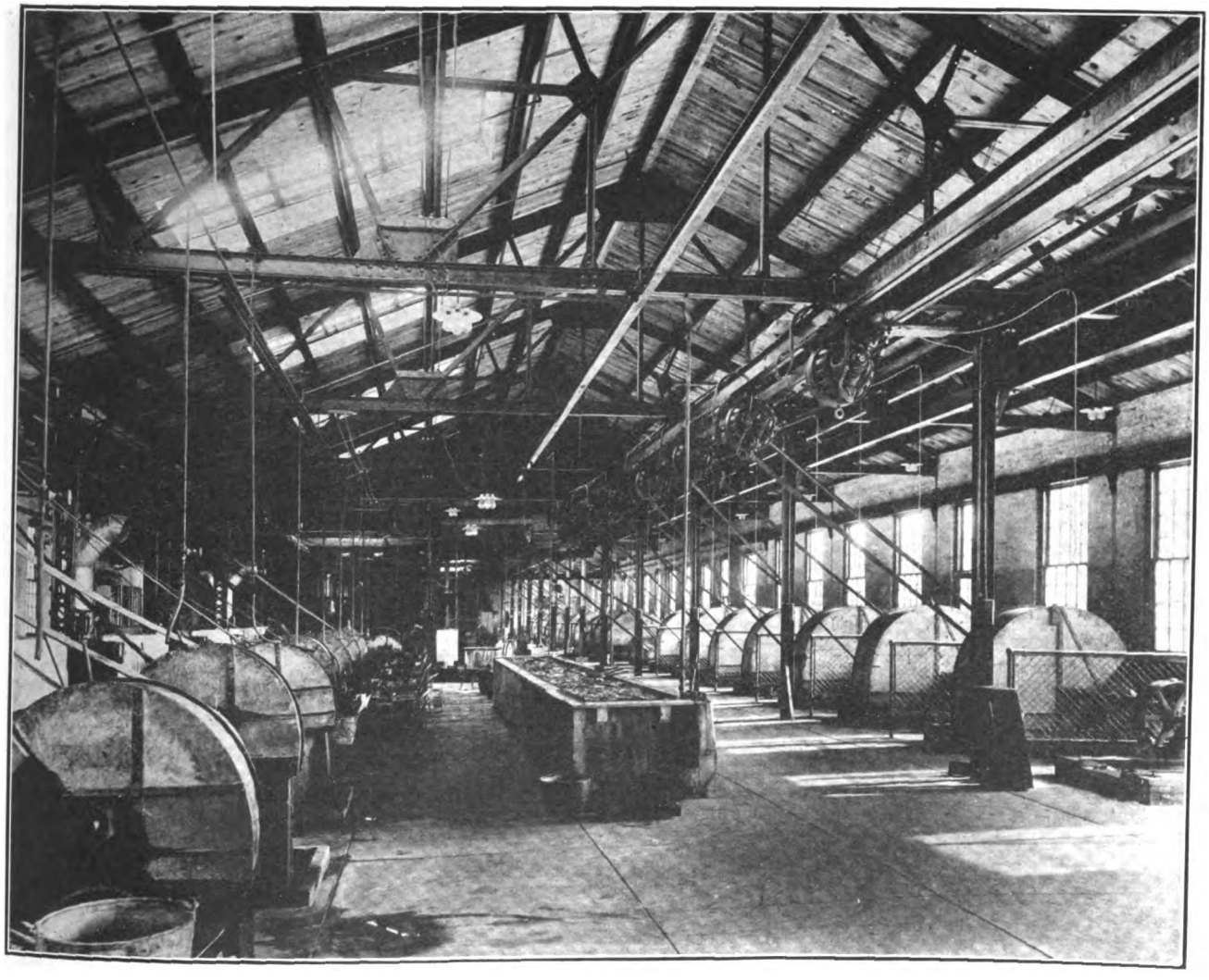
Electricity in Implement Manufacturing.

By W. J. Kyle.

A brief summary of the advantages of electric motor drive in a farm-implement establishment are given in this article, together with a comparison of isolated-plant and central-station costs. An annual saving of 30 per cent is made by using purchased power in this case. Data are given on the motor installation.

There has been a great deal of matter written on the subject of central-station power and the application of motor drive to various industries, all of which are interesting in many features.

The plant about to be treated manufactures the cutting parts of farming implements such as the triangular sections of a reaper, sickles, guard plates, rake teeth, etc., and these parts are purchased by the farming implement manufacturers and form the most important part of such implements, great care being taken in the selection of material, grinding, fitting and tempering of the sections.



Group of Grindstones Driven by Individual Motors.

When the writer negotiated this proposition for the central station it was estimated that the average monthly consumption of energy would be 22,897 kilowatt-hours and the monthly average obtained for the first six months after electrification was complete and full operation was maintained on central-station service was 22,888 kilowatt-hours.

In the manufacture of cutting parts the bevel cutting edge is first ground on large stones while a continuous flow of water is maintained over the surface. This water in the plant under consideration is furnished by two centrifugal pumps drawing water from a number of well points, the water being close to the surface and ball check valves placed in the suction between the well point and pipe connection. This maintains the pump primed, but in case of failure of any check to properly operate the pumps can be primed from the tank located on the roof of the building, the tank acting as a static head for the water distribution. The pumps are controlled by an automatic governor from a float switch in the tank.

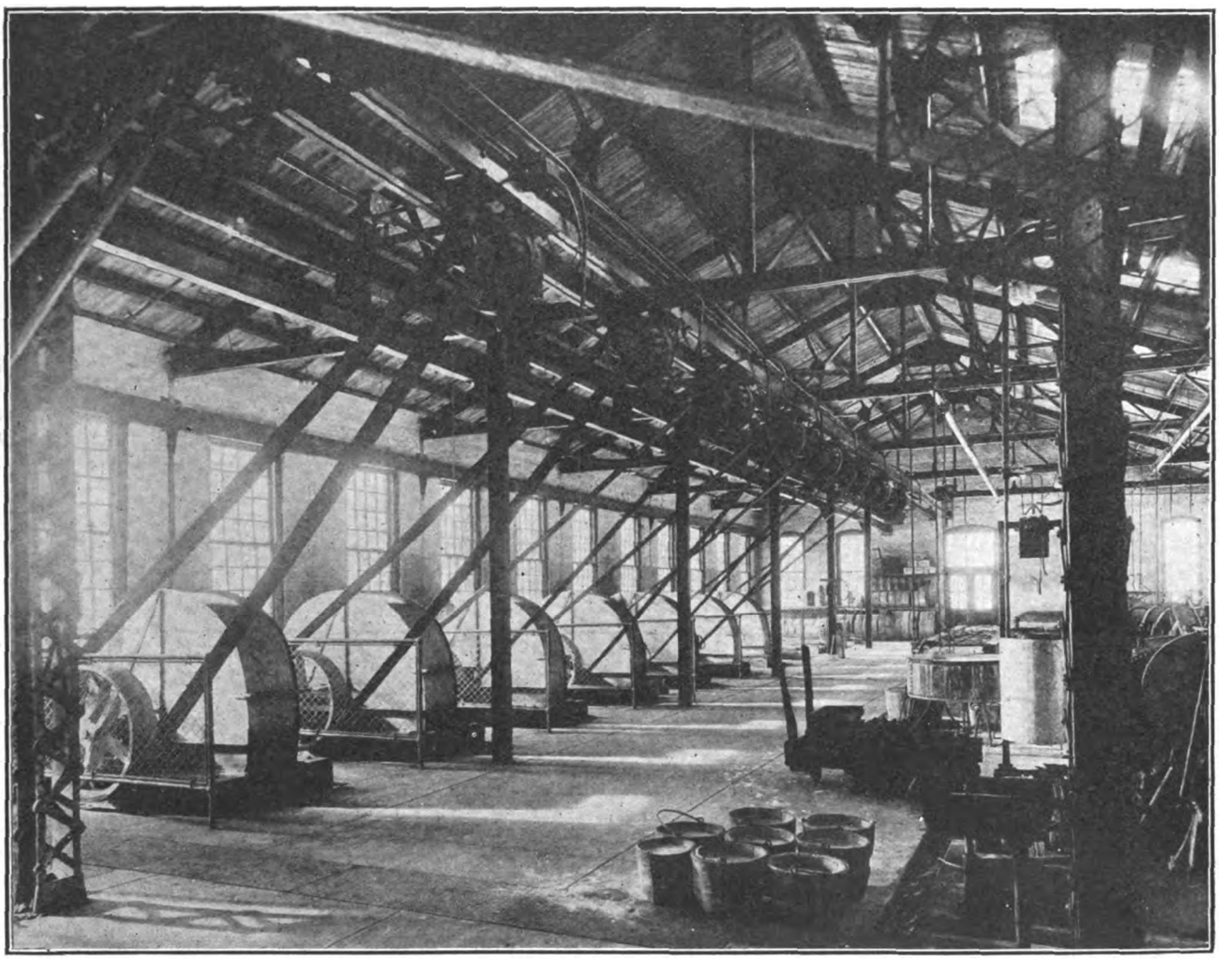
The water after being used on the grindstones flows by gravity to a sump in which is placed a submerged centrifugal pump driven by a vertical squirrel-cage motor operated with a float switch in the sump. The discharge from the pump is outside of the building and flows by gravity to a creek near the plant.

Fire protection is provided for by a 60,000-gallon tank on a tower and a 60,000-gallon concrete cistern located

Digitized by Google

slightly above the pump level. There is a pump of 1,000 gallons per minute capacity driven by 100-horsepower induction motor located in a brick building isolated from the main buildings. The pump takes suction from the cistern and discharges into the sprinkler system. Hose connections are also provided and a pressure of 120 pounds can be secured from the pump. This motor has a separate bank of transformers and the lines are brought in to avoid interference in case of fire.

The heating system is low pressure and vacuum is maintained with a variable-speed motor-driven vacuum pump, returning the water to the boiler.



Group of Grinders Driven by Individual Motors.

The large grindstones shown in one of the accompanying illustrations are 13 inches face by 6 feet diameter, and weigh slightly over 5,000 pounds, each, when new. These stones are used until they are worn down to about 40 inches in diameter, when they are then replaced by stones of 6 feet diameter. Each is driven by a 15-horsepower slip-ring motor.

The problem encountered in this installation was the high starting effort required to start the stones when new, which was at their maximum weight. It can be readily seen that various starting-duty and operating conditions had to be met. When the stones are of full size the average power required for operating is slightly lower than normal, due to the fact that there is considerable stored energy in the fly-wheel effect but power required for starting is at maximum. As the stone wears down, it reduces the starting torque required, and increases the power for operating. As the stones wear down, the pulley on the shaft is changed, so that the peripheral speed is maintained at all times the same, during the life of the stone. The mechanical arrangement of mounting these motors has proved very satisfactory. The motors are mounted on four channel irons running parallel through the shop, two on each side of the motor base. These channel irons are bolted to the I-beams, supporting the roof trusses. This affords very rigid support, and easy adjustment for the motors and holds them in complete alinement with the grindstone shaft. From the illustrations, it will be noted that the circuit-breakers are mounted close to the motors, and are operated by two cords, one for throwing in the circuit-breaker, and the other for throwing it out. This is done to afford easy access for the operator in case he wishes to stop the motor quickly. The operators are not permitted to start the motors. When it is necessary to start or stop the motors the foreman operates the controllers which are located in the foreman's office, and incased in glass. This arrangement affords him a complete view of the shop, and the machinery he is starting. The reason for this arrangement is on account of the class of labor employed, the superintendent believing that by having one man responsible for the care of the apparatus, it would be kept in better condition, and experience has proved him correct.

One of the stones shown in one of the illustrations is an automatic machine which grinds the triangular sections automatically. This machine is fed automatically, and discharges its product automatically in a bucket placed under the machine. It is operated by one man, and equipped with a 30-horsepower slip-ring motor. This motor is the only one that is started and stopped by the operator of the machine, who is expressly instructed

Digitized by Google

Farm-Implement Manufacturing—Data Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for twenty-four hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Company manufacturing power knives, reaper sickles, guard plates, lawn mowers, etc. There are 150 men employed working 10 hours per day.

Total connected horsepower, 619. Total number of motors installed, 54. Average kilowatt-hours per month, 22,888.

Load-factor 6.8 per cent; operating-time load-factor 15 per cent.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 440 volts. All motors, unless otherwise specified, are of the squirrel-cage induction type.

No.	Horse-power	Speed R. P. M.	Application
8	15	850	Slip-ring motors, each belted direct to a grindstone. Stones average about 36 inches diameter and 12-inch face. They are used to grind bevel on the cutting implements. Driving pulley 10 by 9. Driven pulleys 28 by 8 inches.
1	5	1,120	Vertical motor coupled to an American Well Works vertical bilge pump. No. 2½, capacity 200 gallons per minute, 3-inch suction and 2.5-inch discharge pipe vertically mounted with float chains and a Cutler-Hammer switch automatically starting and stopping motor. This pumps out the water and dirt from the well and the grindstones.
1	20	690	Slip-ring motor, belted to a large grindstone used for beveling cutters. Stone is 72 by 12 inches. Pulley 9 by 9 inches. Driven pulley 42 by 8 inches.
10	15	870	Slip-ring motors belted to 10 grindstones for beveling cutting tools. Stones vary in size between 48 by 14 and 72 by 14 inches. Pulleys 10 by 9 inches. Driven pulleys 20 by 8.
5	7.5	1,120	Belted to five surface girders. Stones have grinding face (side) average about 30 inches. Pulleys 8 by 9 inches. Driven pulleys 24 by 8 inches.
1	20	850	Belted to a surface grinder. Stone has a grinding face (side) of 36 inches. Pulley 8 by 9 inches. Driven pulley 24 by 8 inches.
1	5	850	Belted direct to Williams White & Company No. 3 hammer.
1	7.5	850	Belted to a Garden City blower No. 1. Pulley 6 by 10 inches. Driven pulley 24 by 8 inches.
1	10	1,120	Belted to a 78-foot 10-hanger shaft driving four automatic-feed 76-link hardening machines and four hand-feed 76-link hardening machines. These machines are about 10 feet long and the links each carry one piece to be hardened. It is driven by a chain and sprocket from the line shaft. Two two-foot by three-foot tumbling barrels. One 100-pound drop hammer.
1	10	1,120	Belted to a 50-foot 7-bearing shaft driving one No. 3 Parker punch press, flywheel, 48 by 5 inches; one scrap cutter; one small emery wheel; three machines for serrating sections; three guard-plate cutting machines; one A. Leggoe & Company machine for serrating special knives; one American Gas Furnace Company high-pressure blower; one Webster & Perks Tool Company section serrating machine; one section serrating machine; one emery wheel 14 by 2 inches; one Pittsburgh counter-sinker; two Parker small punches, flywheels 24 by 3 inches; one 30-foot four-hangers shaft driving one small punch for guard plates; one E. W. Bliss Company automatic punch, No. 3 flywheel 38 by 5.5 inches; one Pittsburgh Machine Works counter-sinker; one roller for straightening small bars; one Bliss punch, flywheel 36 by 5 inches, and one double emery wheel.
2	3	1,120	Backgeared and belted to two Bliss No. 4 blanking presses, flywheels 42 by 6 inches. One of these machines is located in the machine shop.
1	10	1,700	Belted to a 36-foot 5-hanger shaft driving one Bliss No. 5 punch, flywheel 46 by 6 inches; one Bliss shear for cutting sections, flywheel 42 by 6 inches; one Pratt & Whiting 12-inch drill; two Stiles & Parkin presses No. 1, flywheels 26 by 3 inches; one Pratt & Whitney 12-inch drill; one guard milling machine; one special punch, flywheel 48 by 5.5 inches.
1	3	1,700	Belted to a riveting machine that will rivet three at a time, flywheel 36 by 5.5 inches.
1	1	1,700	Belted to a small gasoline pump.
1	10	1,120	Belted to a 45-foot 7-hanger shaft driving one 16-inch Steptoe shaper; one Fox Machine Company No. 23 milling machine; one Danson & Goodwin 16-inch lathe; two E. W. Bliss No. 2 presses, flywheel 30 by 4 inches; one special press, flywheel 27 by 3 inches, and one small screw machine.

Digitized by Google

Farm-Implement Manufacturing—Data Sheet No. 2.

1	10	1,120	Belted to a 42-foot 7-hanger shaft driving a Dietz, Gang & Company 24-inch lathe; one double emery wheel 4 by 0.5 inches; one automatic tool sharpener; one Smith & Mills 16-inch shaper; one Knecht Brothers Company 12-inch drill; one Barnes 24-inch drill; two Q & C hack saws for 12-inch blades; one H. C. Pease & Company plane; one double buffing arbor, wheels 16 by 4 inches; one small surface grinder, 7-inch wheel; one two-spindle drill; one Bliss No. 2 punch, flywheel 30 by 4 inches; one two-spindle drill, 16 inches; one special drill; one special surface-grinding machine; one grindstone 18 by 3 inches, grinds surfaces of cutters; one Rudolph's Krummel No. 4 punch, flywheel 26 by 6 inches; and one machine carrying two sets of rolls for treating sections.
1	15	1,120	Belted to a 72-foot 10-hanger shaft driving one Pratt & Whitney 24-inch drill; one Barnes 18-inch drill; four Barnes 20-inch drill; one double emery wheel; one small fan about 12 inches in diameter for a forge fire. There is also another centrifugal fan for exhausting the 6 or 8 emery wheels.
1	5	1,120	Belted to a 50-foot 7-hanger shaft driving one four-spindle Barnes drill press; one Barnes 28-inch drill; one Barnes 22.5-inch drill; one Kempsmith Manufacturing Company No. 32 plain miller; one Garvin Machine Company No. 2 plain miller; one Fox Machine Company No. 3 miller; and one milling machine.
1	10	1,080	Belted to a 52-foot 8-hanger shaft driving two double emery wheels, Northampton, 9 by 2 and 10 by 2 inches; one double 16-inch buffer; one No. 1 Styles & Parker punch, flywheel 6 by 3 inches; two double Northampton surface grinding wheels, 8-inch face, and one double emery wheel.
1	7.5	1,150	Direct-coupled to shaft of drum of a 3,000-pound freight elevator at 50 feet.
2	30	1,120	Slip-ring motors belted to two automatic surface-grinding machines. Grinds the surfaces of the cutting tools. Pulleys 15.5 by 9 inches. Driven pulleys 22 by 8.5 inches.
5	7.5	1,120	Belted to five hand-feed surface grinders. Grinders average about 28 inches in diameter. Pulleys 8 by 9 inches. Driven pulleys 30 by 8 inches.
2	2	1,120	Belted to two finishing machines.
1	5	1,120	Belted to a finishing girder for heavier work. Grindstone is 14 inches by 3 inches. Driven pulley is 28 by 6 inches.
1	20	850	Belted to a sickle grinder. This consists of a stone about 42 inches face or diameter across which the whole sickle is pulled and thus sharpened. Pulley 10 by 11 inches. Driven pulley 36 by 8 inches.
2	15	690	Slip-ring motors belted to two stones used both as a grinder to bevel the cutter and also to grind surfaces. Two men on each grindstone at a time, one nearly on top and one in front. Stones are 40 by 14 inches. Pulley 9 by 9 inches. Driven pulleys 30 by 8 inches.

Company manufacturing a small line of farm and garden implements, such as hoes, rakes, garden plows, etc. There are 12 men employed, working 8 hours per day.

Total connected horsepower, 89. Total number of motors installed, 12. Average kilowatt-hours per month, 2,730.

Kilowatt-hour consumption for 9 months: July 2,270, August 3,050, September 2,060, October 2,730, November 2,240, December 4,180, January 2,560, February 2,600, March 2,750.

Load-factor, 5.6 per cent; operating-time load-factor, 14 per cent.

The following is a list of the motors installed with their respective drives. The supply source is two-phase, 60 cycles, 220 volts.

No.	Horse-power	Speed R. P. M.	Application.
1	50	690	Belted direct to air compressor.
1	7.5	1,200	Belted direct to Prentice engine lathe.
1	5	1,200	Belted direct to one S. & M. two-spindle shaper.
1	5	1,200	Belted direct to one Prentice 30-inch drill press.
1	2	1,700	Belted to a Buffalo No. 3 forge blower; and one 12-inch emery wheel.
1	25	1,200	Belted direct to a No. 3 mortising machine.
1	15	1,200	Belted direct to one cut-off saw.
1	10	900	Belted direct to one 18-inch rip saw.
1	7.5	900	Belted direct to one grindstone.
1	5	1,200	Belted direct to one grindstone.
1	2	1,200	Belted direct to one 36-inch band saw.
1	5	1,200	Geared direct to one milling machine.

Digitized by Google

as to its care and operation. The grindstone on this machine does its grinding on the side face of the stone, and there is a disk, which revolves in the opposite direction, which carries the plate, and grinds the entire surface of the triangular section, there being three sections in contact with the stone at one time. The starting torque required on this machine is extremely heavy, and the operating load is very constant. This machine is giving very good satisfaction, although when deciding on this application, it was impossible to make a satisfactory test upon it and the application was based largely on the engine test.

The other stones shown are driven by squirrel-cage motors. They are approximately 29 inches in diameter, and are called "surface grinders." These machines are started and stopped by the ordinary autostarter or compensator and the operators handle the autostarters themselves, starting and stopping same at their leisure. The machine shop is equipped with squirrel-cage motors for driving the short line-shaft groups.

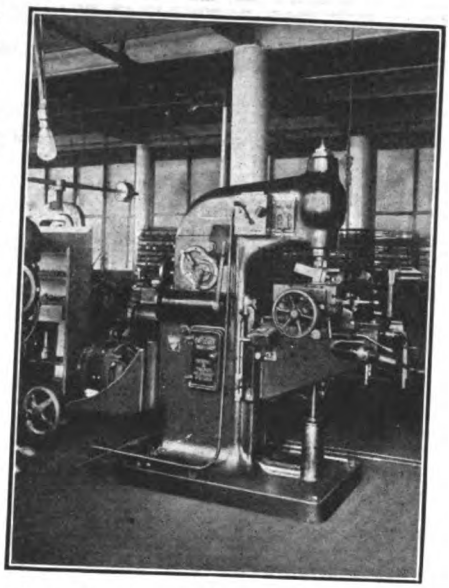
The illumination of the plant is accomplished entirely by clusters of tungsten-filament lamps in suitable ceiling fixtures. The shop is readily operated nights, as well as daytime. The energy furnished is three-phase, 60-cycle, 440 volts obtained from the local central-station company. It is brought into the building, and taken through the meters on a three-panel switchboard and from there distributed to the various parts of the shop. The entire installation is wired in iron conduit throughout.

The following is a comparison of the previous steam-plant costs with present costs of central-station service. An outline of the motor installation is given in the accompanying table.

Monthly Operating Costs Steam Plant.

(Figures from Books.)

Engineer	$ 80.00
Fireman	50.00
Coal passer	50.00
325 tons of fuel @ $1.50 per ton.	487.50
Repairs to engine, boiler, valves, piping, boiler tube cleaning, etc.	110.00
Cylinder and engine oil	5.67
Boiler compound	17.00
Waste and packing	4.20
Total	$804.37



Three-Horsepower Motor Driving Milling Machine.

Record of Electrical Operations 260 Hours Per Month.

	Kilowatts	Kilowatt-Hours
Tower shop, including all friction	12.3	3,198
Grinding room, eliminating friction	52.4	13,645
Machine shop, including friction	16.2	4,212
Ventilating fan	2.0	520
Small service pump	2.4	624
Factory lighting	20.0	700
Total		22,897

The cost of change to produce the above results was $5,895.

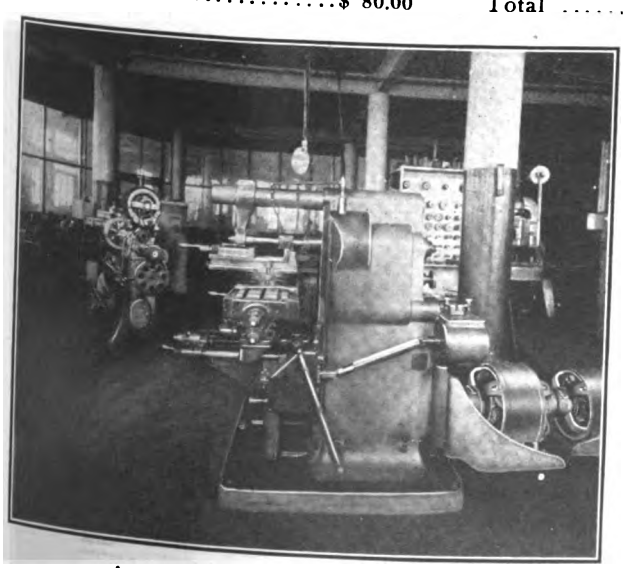
At the rate earned by the company the approximate saving in operating costs per month is 30 per cent.

Electric Shovel To Be Used In Coal Mining.

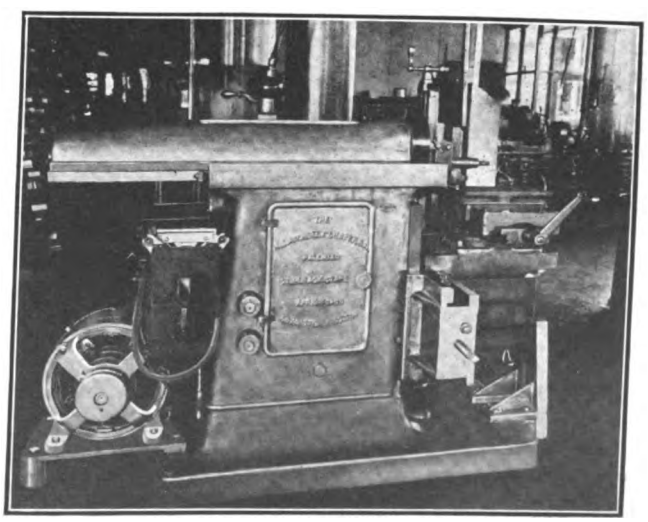
The Piney Fork Coal Company, with headquarters at Columbus, O., is starting a coal stripping operation in Jefferson county, of that state, which will employ what is said to be the first electric power shovel ever used in connection with coal mining. The shovel itself, the manufacturers state, will have the largest boom of any machine ever built for excavating. The boom will be 90 feet long. That of the shovels used in the Panama Canal work was 70 feet.

A five-yard dipper will rip up a strip of earth 135 feet wide with one placement of the shovel, owing to the great sweep of the boom. The lowest point necessary to go in order to reach the top of the coal is 50 feet, and in many portions of the tract the seam lies much nearer to the surface. The shovel is being built according to specifications that will give it this maximum depth in digging from an original level. Electricity is to be used because it will permit of more steady operation than steam power. In the latter water for boilers would have to be conveyed by exposed pipes, which would be subject to freezing in the winter time. Power for the operation of the shovel will be purchased from Wheeling, W. Va.

The Louisville Gas & Electric Company for the week ended June 25 secured contracts from 125 electric customers with 81 kilowatts of lighting and 130 horsepower in motors. For the first six months of 1915 the company increased its number of electric customers by 1,700 or 7.4 per cent and its gas customers by 1,200 or 2.3 per cent.



Individual Motor Drive of Machine Tools.



Two-Horsepower Motor Geared to Shaper.

Digitized by Google

Commercial Practice
Management, Rates, New Business

A House Electric at No Cost.

The New Orleans Railway & Light Company has been fortunate in a recent opportunity which practically amounted to a "House Electric" at no cost. The company learned that the Maison Blanche, one of the largest New Orleans department stores, was about to feature as an educational advertising influence, a complete modern bungalow constructed and equipped on one of the floors of the store. This bungalow was furnished and decorated from the store's own stock on a very elaborate and interesting scale. The company immediately offered to co-operate by installing lamps and a complete assortment of electric household appliances of the latest type and the Maison Blanche Company responded with enthusiasm, realizing that the additional display would add greatly to the attractiveness of the bungalow.

It is estimated that the exhibit is being visited by not less than 3,000 people each week and it will undoubtedly stimulate the public interest in the household applications of electricity as nothing else would.

Cool Weather Affects Consumption.

Abnormally cool weather, coolest in 42 years—according to the records of the Weather Bureau, has been experienced in Louisville this summer, with an effect on the sales of electric fans and consumption of current such as might be expected. Although the middle of July has arrived, a time usually marked by torrid weather, the highest the thermometer has reached is 89 degrees, and that was on an April day. In spite of this condition, sales of the new $2.99 panel board of the Louisville Gas & Electric Company have been going on at the rate of 25 or 30 a day, the boards being placed as fast as they are made and delivered to the company.

The Louisville company has not been making a detailed comparison of this year with other years, but it is apparent that the consumption for this summer is below normal. Especially is this true in the business district where a large portion of the electric fans are ordinarily in use.

"Motors on hire" are advertised by the Municipal Electricity Department of Shanghai, China.

Fan Keeps Flies Out of Restaurant.

The use of ceiling fans for restaurants and other business places has increased in favor in the cities around Boston. In one suburban community a coffee-house proprietor has installed an ordinary ceiling-type fan 3.5 feet in diameter over the entrance to his restaurant, with a four-foot metal hood over the fan and motor for protection to the apparatus and also to "create a breeze."

The fan overhangs the sidewalk and

Ceiling Fan Over Entrance to Restaurant.

its movement is an allurement for passersby to enter the attractive place of refection, being assured that there will be no annoyance from flies.

Big Hotel Installation in London.

The electrical installation at the new Regent Palace Hotel, Piccadilly Circus, London, is considered to be the most extensive of its kind in Europe. The hotel has considerably more than a thousand bedrooms each having its electric radiator of 1.5 kilowatts capacity, and altogether 6,000 electric lamps are installed. The hotel complete is said to have cost $3,000,000. More than 300,000 feet of screwed conduit and 180 miles of electric cable are installed. Energy is obtained from a public supply company's mains at 220 volts. Steel conduit is used throughout with brass unions, and a special watertight junction-box placed at frequent intervals enables any length of wire or cable to be drawn out without causing interference with the structure, decorations, etc. Each of the bedrooms has two lights with a three-point switch at the bedside, and corridor lights, which are centrally controlled from master switches, are on a circuit independent of the bedroom lighting. Semi-direct illumination is the system generally in vogue. Of the 32 electric elevators five are passenger, one a luggage lift and two goods lifts serving nine floors, also a number for service and restaurant purposes. Electric motors ranging from 2 to 8 horsepower drive the vacuum-cleaning equipment, a refrigerator, ice-making machine, almond crusher, a whisk, a bacon-cutter, a mincing machine and boot-cleaning machines. For the cold-storage rooms a special refrigerating plant is provided; an 18-horsepower motor drives it, and a motor of 2.75-horsepower drives its brine-circulating pump. Motor-driven ventilating fans are used, two large centrifugal fans serving the chief reception rooms, and all the other principal rooms have their independent air-extracting fans; a five-horsepower motor drives a Sirocco fan for the large linen room, and a duct running to the top of the building ventilates each bedroom, etc. The temperature of hot water, which is supplied to every bedroom, and to the general hotel compartments, is controlled by means of special electric valves, and electrically driven pumps assist the circulation. The entire installation is controlled by one man and a number of contrivances, chiefly electrical, expressly designed by the designer of the whole installation, A. H. Barker, which have not yet been completed, owing to the general state of affairs, will enable the temperature to be ascertained here of practically any part of the hotel. Telephones, electric bells, and a motor-driven pneumatic-tube service, are included in the installation. The heating circuits are controlled from a special 30-foot distributing board in a chamber situated in the basement part of the building, the board having 60 double-pole fuses and switches. The whole of the heaters can be turned on at once without harm. Alternative sources of supply are of course provided.

Digitized by Google

Successful Electric Show Held in Cincinnati.

The Electric Shop, conducted for the past year by the Union Gas & Electric Company, Cincinnati, O., as a retail selling and demonstrating agency for various electrical appliances, was the scene recently of what was termed the first annual electrical show, participated in by a number of manufacturers of electrical goods, and open free of charge to the public. The extent to which public interest was aroused may be gathered from the attendance figures, which, with an estimate of only 1,000 for Saturday, the last day of the show, runs to 14,100, despite inclement weather on several days during the week.

The idea of holding a show, at which a wide variety of electrical appliances for various domestic purposes could be shown and demonstrated in addition to the goods always on display by the company, is credited to R. E. Flower, manager of the store.

Among the manufacturers who displayed goods in space allotted to them in the store for that purpose were the following: Westinghouse Electric & Manufacturing Company, General Electric Company, H. W. Johns-Manville Company, showing its electrically operated ice and refrigerating machinery; the Bissell Motor Company, the Clements Manufacturing Company, the Eureka Vacuum Cleaner Company, Standard Electric Stove Company, with electric ranges and fireless cookers; the Hamilton Beach Company, with its line of electric toilet appliances; the Landers-Frary-Clark Company, showing its "Universal" appliances; the Brokaw-Eden Manufacturing Company, with the Eden washing-machine; while an electrically operated Columbia phonograph furnished music, the noon concerts held during the week proving especially popular.

Liberal newspaper space was used to keep the public apprised of the show, in advance as well as during the week; and besides this, other methods were used for the same purpose. All of the Union Gas & Electric Company's electric consumers were notified at their last billing that the show would be held, and their attendance, as being among those who would naturally be interested in so extensive a display of electric domestic goods, was invited. Souvenirs were given to visitors during the entire week; and crowds were attracted to the building, which is favorably located at Fourth and Race Streets, by elaborate decorations and the clever displays in the two windows.

One of the windows was devoted to electric fans, the other being given over to lamps. A unique feature of the latter was the fact that a tiny marmoset and a rabbit were kept in the window, it being asserted that the pair were very fond of each other, and this was apparently the case. The presence of the monkey naturally excited curiosity, and it was connected up with the electric bulbs shown by a card declaring that the lamps could be "monkeyed" with without hurting them. The attendance during the week indicates pretty conclusively that the publicity end of the show was well attended to.

Sales during the week also showed a heavy increase over an ordinary week, as might be expected, although much of the efforts of the various salesmen on hand, connected with the Union Gas & Electric Company and the exhibiting manufacturers, were of course devoted to demonstration work and to securing the names of prospects. They were especially successful in the latter connection, as all visitors were requested to register and many indicated special interest in some specific device.

A pleasant event of the week, held in the dining room, was the dinner given by Mr. Flower and his assistants, to the eight manufacturers' representatives who attended the show. All of the items on the menu were prepared by means of electricity, and electricity was much in evidence in other respects.

The unqualified success of the display, and the extent of the interest shown by the public, makes it certain that the show will be repeated annually.

Tea Room of Cincinnati Electric Shop.

Portion of Appliance Display Cases.

Springfield Company Inaugurates Rural Service.

A big civic celebration marked the switching on of electric lights in the streets and a score of homes of Rochester, a little town of 600 inhabitants near Springfield, Ill., on July 9. Energy is supplied by the Springfield Gas & Electric Company.

The city is one of the most modernly lighted in the middle west. It has installed the new nitrogen-filled tungsten lamps with Holophane refractors for street service and the results are so pleasing that many of the prominent residents are placing standard lamps with the same equipment in their lawns and on their porches.

There are more than 150 homes in the little village and 20 per cent of them are already wired. Many farmers along the route of the seven-mile transmission line are using service.

New Power Business at Minneapolis.

The sales department of the Minneapolis General Electric Company during the week ending June 25 secured contracts for 231 electric customers with 227 kilowatts lighting load and 1,104 horsepower in motors. The power business secured includes 800 horsepower for the Atkinson Milling Company, a new flour mill.

Digitized by Google

SUCCESSFUL COMMERCIAL MANAGERS.

Frank D. Beardslee.

"There are many difficulties encountered by central stations in securing business but there is rarely any difficulty which cannot be overcome by the use of a broad mind and good judgment." F. D. Beardslee, sales manager of the Union Electric Light & Power Company, St. Louis, Mo., who is the author of this creed for commercial managers, has convincingly demonstrated its truth, as the new-business records of the Union company testify. And the actual statistics on increased connected load, overwhelming as they are, is not the only manifestation of the unusually broad mind and rare judgment of Mr. Beardslee. Perhaps no company enjoys more harmonious relations with its customers and the public in general than the Union Electric Light & Power Company of St. Louis but this situation is not the result of a natural evolution of public opinion. Instead, almost heroic effort has had to be extended, first, to remove the natural antagonism against public utilities and then by the adoption of the "public-be-pleased" policy to mold public sentiment in favor of the company.

Mr. Beardslee was one of the first to realize that the public forms its opinions of the company by the treatment received from employees and has organized his department with the theory in mind that every salesman must be in reality, as well as in name, a representative of the company. With this same thought in view he has established a school for employees where the company's policies in regard to the public are drilled into the men and when it is found necessary to fill a position in the sales department, records of the educational classes are examined and men are promoted according to their class rating.

Periodic departmental meetings of division heads and of all employees is another policy of Mr. Beardslee which has had its effect in improving the service of the company and gaining the good will of the public. At these meetings matters for the good of the service are brought up by employees and provisions are made to immediately rectify any trouble or adopt beneficial suggestions.

Other innovations established by Mr. Beardslee at St. Louis, all of which have contributed to the success of the company commercially, have been a clearing house for sales-department data, supervised by an efficient clerk, where salesmen can obtain data on any completed or pending transaction, or information relative to any phase of commercial-department work; and a clipping bureau which obtains information respecting prospective business from newspapers, building reports, etc.

Mr. Beardslee, although a young man, is one of the veteran employees of the company and has seen service in most of the departments. The Missouri Electric Light & Power Company was incorporated December 29, 1888, and started in business February, 1889, succeeding the Metropolitan Electric Company, and two months later F. D. Beardslee was employed as office boy. Shortly after, he became meter reader, bill clerk and collector, reading meters for several days each month, then making out and collecting bills, and at odd times doing wiring, meter and test work.

Frank D. Beardslee,
Sales Manager, Union Electric Light & Power Company, St. Louis.

At this time the only incandescent lighting circuit in St. Louis ran from Channing and Franklin Avenues along the narrow-gauge railway to Cabanne, and for some time the principal lighting business was that for residences, which paid for the service 25 cents per kilowatt-hour, as against an average of 8 cents today.

He had charge of lamp renewals and sales when a 16-candlepower lamp sold for $1.25, as against 15 cents today. For a short time he was switchboard tender at the plant then located in basement of the old St. Louis Cable & Western Railway power house at Channing and Franklin Avenues. He was contract clerk for some time, then solicitor, and when the Edison Illuminating Company of St. Louis (successor to Municipal Light & Power Company) and the Missouri Electric Light & Power Company were consolidated into the Missouri-Edison Electric Company, he became contract agent and retained this position until shortly after the consolidation of the Missouri-Edison Company and the Imperial Light, Heat & Power Company into the Union Electric Light & Power Company, when, on account of ill health, he left the city for a year and a half, returning as manager of the county properties (Suburban Electric Light & Power Company and the King Electric Company) under A. C. Einstein, president, until October, 1908, when he returned to the Union Electric Light & Power Company as commercial engineer. When the sales and commercial-engineering departments were combined, March, 1912, he became sales manager, which position he now holds.

Mr. Beardslee has seen the electric business in St. Louis grow from the old high-tension direct-current series incandescent lamps and Thomson-Houston belt-driven series arcs and 100-kilowatt belt-driven generators to the present 20,000-kilowatt turbines.

Mr. Beardslee has been active in national and local electrical societies, having served on important committees of the National Electric Light Association and others. Since April, 1913, he has held the office of secretary-treasurer of the Missouri Association of Public Utilities and has served as vice-president and now president of the St. Louis League of Electrical Interests, Jovian Chapter.

Electric Drive Effects Economy in Large Tire Factory.

By the use of specially constructed drives and control, the application of electric power to the intricate process of manufacturing automobile tires from crude rubber has resulted in remarkable success in the plant of the Wilson Tire & Rubber Company at Springfield, Ill.

The plant, recently completed, has a capacity of 500 tires per day. The building, costing in excess of $175,000, represents the latest practice in steel and concrete construction and because of the fact that electric drive was to be used throughout, the machinery was arranged entirely with a view to eliminating excess handling of material and to permit of adequate natural illumination and ventilation.

Electric drive is used throughout, energy being purchased at three-phase 60-cycles, 6,600 volts and converted to direct current by means of a 100-kilowatt rotary converter. Alternating current at 110 and 220 volts for lighting and the operation of a number of small motors is obtained by the employment of a bank of 75-kilovolt-ampere transformers. The motors used vary in size from 1 to 150 horsepower.

The largest motor in the plant drives four mixing mills where the rubber is washed and cleansed of all foreign

Digitized by Google

matter. It is geared to a line shaft with spur gears to each of the mills. The motor is a three-phase, 60-cycle machine rated at 580 revolutions per minute.

Featuring this particular installation is a unique safety device which has a double value in this particular installation. By electrical connection to a swinging arm over each of the machines within easy reach of the operator, instant control of the entire line shaft is made possible, each machine being equipped with one of the latest types of electrical clutches and brakes.

Aside from the protection which it affords the operators of all four machines it leaves the line shaft entirely free from the excessive vibration of the motor.

The calenders are of a special type and are equipped to roll the mixed rubber into sheets of any thickness. They are gear-driven by 75-horsepower motors, running at a speed of 950 revolutions per minute.

The auxiliary machines and pumps and elevators are all driven by individual motors. While the installation has not been in operation a sufficient length of time to determine fully the operating costs, the manufacturers are enthusiastic over the results and confidently expect manufacturing costs to be even less than originally estimated.

Battery-Exchange Service in Boston.

The Edison Electric Illuminating Company of Boston has completed arrangements whereby battery service will be furnished to such users of electric vehicles as purchase a General Vehicle chassis and use service at such points as may be designated by the central station. Batteries, which will be of Electric Storage Battery Company manufacture, will be charged and maintained by the Edison company and furnished to the user at a cost based on mileage with the addition of a nominal fixed charge. The complete schedule of charges is shown herewith.

SCHEDULE OF SERVICE SYSTEM CHARGES

1000-LB. WAGON	
FIXED COST	Per month $17.00
RUNNING COSTS	A price of 8c per mile will be charged for the first 500 miles the wagon is operated each month.
FIRST DEDUCTION	A price of 2½c per mile will be charged for all miles in excess of 500 and up to and including 750 each month.
SECOND DEDUCTION	A price of 2¼c per mile will be charged for all miles in excess of 750 and up to and including 1000 each month.
THIRD DEDUCTION	A price of 2c per mile will be charged for all miles in excess of 1000 each month.
2000-LB. WAGON	
FIXED COST	Per month $21.00
RUNNING COSTS	A price of 3½c per mile will be charged for the first 500 miles the wagon is operated each month.
FIRST DEDUCTION	A price of 3c per mile will be charged for all miles in excess of 500 and up to and including 750 each month
SECOND DEDUCTION	A price of 2½c per mile will be charged for all miles in excess of 750 and up to and including 1000 each month
THIRD DEDUCTION	A price of 2¼c per mile will be charged for all miles in excess of 1000 each month.
4000-LB. WAGON	
FIXED COST	Per month $23.00
RUNNING COSTS	A price of 5c per mile will be charged for the first 500 miles the wagon is operated each month.
FIRST DEDUCTION	A price of 4½c per mile will be charged for all miles in excess of 500 and up to and including 750 each month.
SECOND DEDUCTION	A price of 4c per mile will be charged for all miles in excess of 750 and up to and including 1000 each month.
THIRD DEDUCTION	A price of 3½c per mile will be charged for all miles in excess of 1000 each month.
3½-TON TRUCK	
FIXED COST	Per month $33.00
RUNNING COSTS	A price of 6c per mile will be charged for the first 500 miles the wagon is operated each month.
FIRST DEDUCTION	A price of 5½c per mile will be charged for all miles in excess of 500 and up to and including 750 each month.
SECOND DEDUCTION	A price of 5c per mile will be charged for all miles in excess of 750 and up to and including 1000 each month.
THIRD DEDUCTION	A price of 4½c per mile will be charged for all miles in excess of 1000 each month
5-TON TRUCK	
FIXED COST	Per month $36.00
RUNNING COSTS	A price of 7c per mile will be charged for the first 500 miles the wagon is operated each month.
FIRST DEDUCTION	A price of 6½c per mile will be charged for all miles in excess of 500 and up to and including 750 each month
SECOND DEDUCTION	A price of 6c per mile will be charged for all miles in excess of 750 and up to and including 1000 each month.
THIRD DEDUCTION	A price of 5½c per mile will be charged for all miles in excess of 1000 each month.

Schedule of Rates for Battery-Exchange Service.

That such a battery-exchange system will give decided impetus to electric-vehicle development in Boston is indicated by the contracts received considerably in advance of the actual completion of the plan.

Under the plan the chassis owner is not at the expense of purchasing any batteries, these being the property of the central-station company. The first cost of vehicles of this type is thus considerably less than with battery included, and the owner has the advantage of knowing in advance exactly what his operating costs will be. The plan follows in some respects one which has been in operation in Hartford, Conn.

A Letter That Eliminated Much Misunderstanding.

There are perhaps more complaints regarding supposedly high bills in November than during any other month on the central-station calendar. Much educational work has been undertaken to show the justification for the apparent jump in amount of energy used and in some of the smaller cities personal visits have been made to customers. Last November A. L. Scott, sales manager of the Edison Electric Illuminating Company, of Lebanon, Pa., conceived the idea of having representatives of the company call on all customers, informing them that the company's representatives were at their service at all times if their lighting equipment or bills were not satisfactory.

Supplementing this, the following letter was written and sent out to all consumers, inclosing a little booklet, entitled, "How to Read the Meter":

"Dear Consumer—You check your storekeepers' bills—of course you do, and we would greatly appreciate it if you would also check your electric light bills. It is just as easy, and, if you would do it, you would realize how reasonable the cost of electricity is.

"We are inclosing you herewith a booklet on 'How to Read Your Meter.' You will find on the front and back pages space for each month's reading of your meter which you can set down on the day the same is read by our employee. Doing this, when your bill arrives, which is always two or three weeks after a reading, will enable you to check your bill, and, if any error should appear, you will have the evidence and we would be only too glad to correct any errors that we make, as the policy of this company is service and courtesy at all times.

"We have at your service an expert meter reader, who will gladly call on you at any time you specify and give you full instructions as to how to read your meter. We are going to a great deal of expense in endeavoring to get all of our consumers to check their bills as closely as any other bills that they may receive.

"To make this a success we need your co-operation, as we want our service to be absolutely without a flaw.

"Always at your service, I beg to remain, yours very truly, etc.

"P. S.—A word from you will be most gratefully appreciated."

Mr. Scott reports that as a result of this letter the usual number of complaints of high bills was noticeably reduced. Reading meters was started by a few, the number gradually increasing until today practically all of the company's customers read their own meters, resulting in few kicks.

Digitized by Google

Electrical Construction

CREDITS, COLLECTIONS AND CASH DISCOUNTS.[1]

By W. H. Vilett.

The subject is so broad and comprehensive that to do it full justice would require more time and thought than we can bring to its consideration today. Consequently I shall be brief and touch upon such points as I feel will best apply to the subject.

You are all familiar with the old adage: "It takes money to make the mare go." Therefore, no difference how much business you get or how much profit you make (presuming, of course, that you are getting at least a fair margin of profit) if you do not make prompt collections your business is going to suffer for the want of money. In other words, the money that you should have in the bank is there to the credit of your customers. You all know that it is harder to collect over 50 per cent of your accounts than it is to get the orders. If some method of overcoming this could be worked out it would make the work more pleasant and profitable.

The first subject to be dealt with is Credits, the vital force in our business transactions. Every contractor is hungry for business and there is a lot of it taken of a kind such that if customer's credit standing would be carefully looked up, it would be good business policy to absolutely refuse the order, unless a cash payment was made in advance.

The man who is frank and fair should always be given the most liberal treatment even though he be deeply in debt or has not much capital to start with. By cutting off the unworthy from credit we are in position to extend it to the worthy more than we ever could before. No man should be given credit beyond his means. Don't act hastily on requests for extensions. Apply to each case a thorough investigation, make your conclusion deliberately and with material on hand which insures a sound decision.

Credit information can generally be secured through local credit-rating associations or mercantile agencies. We should be more than willing to impart credit information to competitive members of the Association for their guidance and the extension of credit favors, if this confidence would not be abused by its being used for any other than credit purposes. We should try to interest every eligible prospect in becoming a member of our organization in order that its efficiency may be increased. We should back up our faith in the organization by taking a greater personal interest in its welfare. The more efficient we make it the smaller our credit losses.

It frequently happens that credit is asked by some local invidual or combination of two or more men, whose financial responsibility is of a negligible quantity with small commercial rating or none at all. Naturally such cases require close scrutiny, and the granting of credit must be based largely on past and present business reputation, personal habits, location, probable earning power and the ability and desire to fulfill a reasonable credit contract. When such applicant is first embarking in business and seeking credit accommodation it is dangerous to place exclusive reliance in one's own investigation, as the one or more pertinent facts necessary to reach an intelligent decision may be overlooked, or the personality of the applicant may be such that his powers of persuasion would overcome any misgivings you may have. It is, therefore, advisable that the consensus of several opinions be secured, and through the banding together of local electrical interests in what is termed a "Moral Risk Club," dealing primarily with risks of this character, with their exchange of intimate ledger data, possible prior knowledge of the applicant's past performances and the desire of the membership to co-operate in such matters for the benefit of the craft as a whole, you are frequently put in possession of reliable information that will either confirm or disprove any favorable or unfavorable action you may have contemplated.

In times past such brotherly feeling among competitors would have been looked upon as the approach of the millennium, and the slightest inkling of your inner affairs coming to the knowledge of your neighbor was not to be thought of. But here we have men, in the same line of endeavor, freely discussing the value of an account, possibly of long standing with one or more of them, and frankly giving an honest estimate of the worth of the account under discussion with no fear that the information given will be used to his detriment. It is merely an exchange of business confidences among gentlemen, and the instances wherein this confidence has been violated are few indeed.

Credit risks are divided into two classes—moral and financial. Through the agency of credit-rating associations and mercantile agencies we can secure unexcelled first-hand knowledge of the financial status and personal responsibility of a concern which has been in business for a reasonable length of time, but with moral risks it is different. Here the personal equation enters, and it is only by the interchange of experience, ideas and advice through a moral risk club that the information sought can be secured and relied upon. Therefore, if credits were properly looked up collections would be simplified.

An obvious seeming reply to the query as to whom a delinquent account is paid is illustrated by the anecdote concerning a certain very "close" farmer, whom the village storekeeper urged into a liberal purchase by agreeing to wait payment until the farmer was "able and willing" to pay. The story goes that promptly after the customary maturity date the storekeeper appeared at the farmer's door, bill in hand and accompanied by the town constable with summons in a suit for debt. To the farmer's protests the storekeeper answered, acknowledging the agreement, but explaining that he "knew as how he was able" and so just brought the constable along to insure willingness.

The point is that the time of settlement of an account due from a debtor who is delinquent and yet has the ability to raise the money for payment, is reached when the conviction takes hold upon the mind of the debtor that drastic action will immediately follow a failure to make payment forthwith.

Upon the effective development of this psychological state depends the degree of success of the collection department in handling this class of accounts. Methods such as illustrated in the foregoing anecdote, though perhaps productive, leave something to be de-

1 A paper read at the Minnesota Electrical Contractors' Association meeting.

Digitized by Google

sired in the subsequent unamiable frame of mind of the debtor. It is even possible to collect with a length of gas-pipe as an argument, in some cases, but scarcely expedient as an established practice. In fact, it may be admitted that the collection method which develops a state of mind that results in payment with promptitude and in a manner calculated to keep the good will of the debtor is the one nearest perfection. Even though the subsequent trade of the delinquent is not desired, it can scarcely be denied that his passive good will is preferable to his active and certainly to some degree damaging enmity.

Such a method may be worked out, and the desired psychological stage established in the debtor's mind, if only an understanding of what leads to that mental impression is had. A conviction that the limit of leniency has been reached is the crucial and underlying factor in establishing such an impression. Proof of this is afforded in the often observed fact that a creditor may exhaust himself in personal appeals, letters, duns and threats, the repetition of which defeats their own intent, and yet the first notification from a collection agency that the account has been placed in their hands, or from an attorney, brings the delinquent to payment with surprising suddenness. Here the passing of the account from the hands of the party with whom it was contracted into the hands of a second party for the express purpose of collection effects the purpose of convincing that the period of leniency is past, with the result that payment is made to avoid the consequence of suit.

The efficacy of this as a means of establishing the desired state of mind on the part of the delinquent renders it the usual procedure, yet a failure to appreciate the underlying reason for its efficacy is what causes merchants to pay commissions to collection agencies for the use of a weapon which can equally as well be used by the creditor's own collection department through the use of a logically devised series of steps leading up to and establishing a conviction that the account has been placed in other hands for the purpose of collection.

A vital requirement of such a plan on the part of the delinquent renders it cion as to genuineness and it should also be logically consecutive in its steps, to the effect that the debtor realizes that a failure to pay at an earlier stage has resulted in the ensuing more urgent step and that the way points clearly from the first step to that eventual drastic step of turning it over for suit as an inevitable outcome of continued failure to pay.

Such a plan, with intelligently chosen steps, progressive and convincing, accomplishes all that can effectively be done in the way of pushing the class of accounts under discussion to collection and when the requirement of bringing into play the effect of turning it over to a collection agent is indicated, can operate with all the force that actually giving it into the hands of a collection agency would bring to bear.

How many concerns are there that actually know what it costs them to collect their accounts? By taking into consideration collectors' salary, attorneys' fees, stationery, postage, lost accounts, additional bookkeeping expense and interest on borrowed money (because your customer has your money in his bank) you will find that it is at least two per cent of your gross business. The problem before us, therefore, is how best can the contractor eliminate this loss. First, by scrutinizing credits more closely. Second, by charging enough for work to allow a liberal discount for prompt payment. If work is priced out as suggested by the National Electrical Contractors' price book you can afford to allow a cash discount of five per cent, if the account is paid within ten days from date of billing. Most of us allow customers to take two per cent, 30 days, as we do not wish to offend them by returning their checks. However, we are not charging enough for our labor to allow as liberal a discount as this. Therefore, I would suggest that we charge more for our labor and that no charge of less than $1.00 for time be made on any job, for unless you get at least this amount you are presenting your customers with part of your profits. Now let us take an example. Twenty hours at 75 cents equals $15.00; less 2 per cent discount would $14.70. Twenty hours at 80 cents equals $16.00; less 5 per cent would be $15.20. You would, therefore, receive 50 cents more for this same work, get your money promptly and very materially cut your cost of collections and lost accounts. You also make the customer who fails to take advantage of the liberal discount pay for collecting his account.

The above proposition would have to be worked out in each individual locality according to conditions. It is all a matter of education. Like charity, this education must begin at home. Educate the trade to understand that cash discount is a premium for the payment of an invoice within ten days, or whatever the period, before it becomes due, and that cash in 10 days does not mean cash in 15, 20 or 30 days, for at that time it is no longer a cash discount. Therefore, it would be necessary to have all invoices plainly showing the terms of settlement. This proposition should apply to time-and-material work only.

It would be well if the association would get up a regular printed form, and when improper deductions are made, because the cash-discount period is past, to simply pin this form to the check and mail it back to the offending debtor. Punctilious observance of sales terms is one of the best evidences of business integrity and good faith. You would object if a man put his hand in your pocket and took something that did not belong to him, and taking cash discount after the discount period is past is taking something that does not belong to him.

Successful business demands prompt collections and payments, and a closer observance of credits, a proper system of collections and a more strict adherence to discounts will make your business more profitable.

Massachusetts Board of Examiners.

The Board of Electrical Examiners in Massachusetts, provided for under the law which requires the employing electricians and journeymen in the state to obtain licenses after examination, has been organized with Civil Service Commissioner Hogan, of Lowell, as chairman, and David Snedden, commissioner of education, as secretary pro tem. A clerk, who must be an electrical worker with 10 years of experience, is yet to be selected. From a careful reading of the bill, it has been discovered that the Gas and Electric Light Commission is required to formulate a code under which wiring shall be done. This is said to be an unwelcome task. The office of clerk to the Examining Board is a very important one, as the task of marking the examination papers devolves solely upon him as the only technical man connected with the Board. In addition to the two members named, the Fire Prevention Commissioner completes the personnel of the Examining Board. None of them are experienced men in electrical matters, and some curiosity is expressed as to how they will proceed with their duties as outlined in the recent enactment.

The board as originally proposed in a bill which had the support of the Contractors' Association was subordinate to the Electric Light Commissioners, but the latter are now only a board of appeal, besides having the task laid upon them of formulating the code referred to.

New Michigan Officers.

The Michigan Electrical Contractors' Association has elected the following:

President, W. F. Barker; vice-president, H. C. Pappert; secretary, F. W. Woolrich; treasurer, W. D. Gale; sergeant-at-arms, F. C. Hilton; national director, John H. Busby.

Digitized by Google

Hearing on Renewable Fuses.

For some time the Economy Fuse & Manufacturing Company, of Chicago, Ill., has sought to have the renewable inclosed cartridge fuses manufactured by it favorably reported on by Underwriters' Laboratories, Incorporated, and included in the List of Electrical Fittings issued by that organization as complying with the National Electrical Code.

While the examinations and tests of Underwriters' Laboratories were favorable to the Economy fuses, the present requirements of the National Electrical Code were held to prevent the listing, as standard, of a fuse with an element readily renewable by the user.

The Electrical Committee of the National Fire Protection Association at its meeting last March recommended that no change be made in the present Code rule.

On the contrary, it was felt by the Economy Fuse & Manufacturing Company that both laboratory tests and field experience had shown its fuses to be at least as reliable and safe as fuses which had been approved.

In order that the question, as to whether the laboratory tests and field experience had or had not proven the Economy fuses to be as safe or to offer as small a life and fire hazard as approved fuses, could be passed upon by an unbiased referee, Underwriters' Laboratories, Incorporated, and the Economy Fuse & Manufacturing Company jointly appealed to the National Bureau of Standards, Washington, D. C., to act as arbitrator.

As noted in the issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for June 26, the Bureau of Standards had announced that a public hearing on this appeal would be held in Washington on July 8, in order that evidence might be submitted on the following question:

"Has it been shown that the use of fuses manufactured by the Economy Fuse & Manufacturing Company results in no greater fire or accident hazard than the use of other cartridge inclosed fuses at present listed as standard by the Underwriters' Labratories?"

In opening the hearing on the date set, Director S. W. Stratton, of the Bureau of Standards, mentioned that this case marked a new feature in the history of the Bureau. That although originally the Bureau had dealt primarily with scientific investigations and the development of standards of measurement, together with checking materials purchased on government contracts, it was now equally able to serve the public by checking standards of performance. Therefore, it was fortunate that parties in disputes, such as the one under consideration, had an impartial and scientific staff to which their questions might be referred for arbitration. He also remarked that for some two years the Bureau had been co-operating with Underwriters' Laboratories in standardizing apparatus and passing upon types of equipment.

Dr. E. B. Rosa, physicist of the Bureau, outlined the history of this appeal in so far as the Bureau was concerned, together with the method in which the problem had been approached in an impartial manner. To gather independent data, it was stated, the Bureau had sent representatives on inspection trips to learn the uses and abuses of all types of inclosed cartridge fuses; the Bureau had also conducted investigations to learn the operating characacteristics of various makes of fuses, and had invited all interested in the matter to place their experience at the disposal of the Bureau for consideration.

It was asked that such material as was submitted should be put in such form that it might become a part of the permanent record on the appeal. Dr. Rosa announced that the Bureau of Standards had reserved a period of 15 days within which time evidence in rebuttal of that presented at the hearing would be received.

In opening the discussion W. H. Merrill, manager of Underwriters' Laboratories, remarked that it was fortunate that technical and scientific matters could be referred to such an organization as the Bureau of Standards for arbitration and requested that representatives of the Economy Fuse & Manufacturing Company present their arguments first.

Mr. Foote, counsel for the Economy Fuse & Manufacturing Company, presented the arguments. In part he said that many of the fuses at present listed as standard were in reality so designed and constructed as to permit of ready refilling by the user and that the printed labels calling attention to the fact that they were refillable by the maker induced the inexperienced public to attempt doing the same.

Reports were submitted to show that Economy fuses had been purchased and used in every state of the Union, in Canada, many of the European countries, in South America, and Australia. It was submitted that in the three years the appliance had been on the market their sales had been 1,089,000 complete fuses and 3,613,000 refilling elements.

A group of affidavits from municipal and insurance inspection departments and bureaus covering a rather large area was presented to indicate the present usages and abuse of standard inclosed cartridge fuses. In addition to this the field experiences and opinions of a large number of Economy fuse users were introduced.

Speaking for Underwriters' Laboratories, Mr. Merrill called attention to the fact that the appliance under consideration had been on the market but three years. Further, it was stated that within that period there had been three distinct types, or designs, of the Economy fuse and this tended to show instability.

It was submitted that the Electrical Committee of the National Fire Protection Association had unanimously recommended that at present it appeared inadvisable to recognize any fuse which was essentially refillable by the user and that the Executive Committee of the Association had indorsed their action. It was also pointed out that the opinions and field experiences from users of an appliance were probably biased in its favor, through the very fact that it was being used, and, therefore, the indorsements of users should not be given too great weight.

For the Chase & Shawmut Company and the D. & W. Fuse Company, Guy Cunningham presented the statement that each of his clients was prepared to place on the market an inclosed cartridge fuse, which was refillable by the user, should circumstances demand it. However, they both felt that such a situation was highly inadvisable. It was also stated that the investigations and experience of the two companies he represented indicated that a filling material was essential to the satisfactory operation of an inclosed cartridge fuse.

H. R. Sargent, speaking for the General Electric Company, said that the action of Underwriters' Laboratories in not recognizing a type of cartridge inclosed fuse renewable by the user had carried a very strong educational effect with it. By such action the general public had been warned that the renewal of the fuse element by the user was inadvisable and unsafe and this had assisted in checking abuses. However, it was stated that his company was prepared to place a fuse on the market which was readily renewable by the user should that become desirable, but in permitting such an appliance it was believed that the day of the fuse as a safety device had passed.

The matter of a filling material was also touched upon. It was stated that the General Electric Company had found it very essential to the satisfactory operation of a cartridge-inclosed fuse to provide such a filler.

A suggestion was offered that in case fuses renewable by the user were recognized it would be very essential and desirable to standardize the elments. This would make it possible to satisfactorily use the new elements of one maker in the cartridge of another maker.

Digitized by Google

Prof. H. E. Clifford stated that he had been requested to investigate certain data for the Economy Fuse & Manufacturing Company. These contained the reports of tests on some 3,000 fuses. These tests were conducted on 30, 60, and 100-ampere ferrule and knife-blade types of fuses and no developmental work was included.

The results of these tests indicated that the Economy fuses were in no wise inferior to any of the fuses of other makes which were tested under similar conditions. It was stated that in order to determine the ability of an Economy fuse to operate satisfactorily when refilled they were renewed 50 times and performed successfully.

L. W. Downes, speaking for the D. & W. Fuse Company, said that his company held patents for a fuse readily renewable by the user, but had refrained from placing it on the market. He stated that those representing insurance interests on the committee which prepared the standards for cartridge-inclosed fuses were unanimous in asking that they be made as nearly non-renewable by the user as practicable.

Dana Pierce, D. S. Boyd, H. O. Lacount, and G. S. Lawler were other insurance representatives present, but not participating in the discussion, while C. E. Skinner, of the Westinghouse Electric & Manufacturing Company; C. A. Bates, of the Bryant Electric Company; and A. F. Daum, of the A. F. Daum Company, were representatives of manufacturing interests. Aside from those mentioned several persons whose interests were general in nature were present.

New Fire-Alarm System for New York City.

An appropriation of nearly one million dollars has been made for the installation of a new, modern fire-alarm system for the island of Manhattan. The following statements are taken from a report to the Board of Estimate and Apportionment made by Robert Adamson, fire commissioner, and Putnam A. Bates, electrical engineer.

By discontinuing the use of the old fire-department subways and also the high-tension subways of the Consolidated Electrical Telegraph & Subway Company and by confining the fire-alarm cables to the low-tension system of subways to be supplied by the Empire City Subway Company, the plan will eliminate to as great an extent as present-day conditions of such installations afford the possibility of contact between conductors of fire-alarm systems and foreign circuits containing dangerous voltages.

The plan contemplates an entirely new fire-alarm telegraph system for the Borough of Manhattan by the utilization of such parts of the recent construction as are adapted to the new system, and by the construction of the remainder.

The Borough of Manhattan will have an entirely new fire-alarm telegraph system, modern in every respect, including the cables, fire-alarm boxes, and a new fireproof central station in Central Park.

As planned, only ten street boxes will be attached to any single circuit. Each fire house will be connected with the central office by circuits wholly independent of the alarm-box circuits, a maximum of four companies being connected on any one of these circuits. The fire alarms will be sent to the new central headquarters from the street boxes, and will be thence transmitted to the fire house over the central office circuit. Provision is included, by means of independent circuits, for notifying independently the chief of the department, his under chiefs, all fire-boat stations, and the Insurance Patrol, so that they shall receive all alarms of fire at all hours. In this latter system of circuits will be included a connection with the high-pressure pumping stations, the Edison Company's Waterside power station, which furnishes the current for the pressure pumping, and police headquarters. Wires are also provided in the feeder cables for direct connections with fire headquarters in the Bronx, Brooklyn and Queens. Public schools, hospitals and other similar buildings are also to be connected with the street-box system, each such building having assigned to it one box.

In the preparation of the present plan the principles of engineering, as applied to this problem by J. J. Carty and Kempster B. Miller in their preliminary plan, prepared in 1907, have been closely adhered to, and in the planning of the alterations to the central office building, as well as the apparatus which it will house, it is intended that the same general character of equipment and method of installation shall be employed as was then proposed.

License Law for New York City.

The New York Board of Aldermen has passed an electrical code for the city of New York, which provides for the licensing of all persons or firms engaged in electric wiring, after examination by a license board consisting of seven members. A fee of $10 for the first year and $5 for each subsequent year is required. Special licenses granting a person in the employ of an owner or manager of a building permission to install, alter or repair electrical work are obtainable after examination upon the payment of $1. Permits for individual pieces of work may be obtained in the same manner.

Joint Contractors' Meeting at Kansas City.

The joint conventions of the Kansas and the Missouri Electrical Contractors' Associations in Kansas City, July 10, did not result in consolidation of the associations, but close co-operation was inaugurated, in a practical way. The Kansas Association is represented on a committee appointed to investigate the subject of concentric wiring, and make report of its first-hand discoveries and conclusions, disregarding the information obtained from books and pamphlets. The joint convention discussed the subject at length, but most of those present admitted their lack of accurate knowledge, while doubting the feasibility on general principles. It was suggested that the contractors should prepare themselves to give real testimony on the subject, so that in case opposition seemed advisable, definite objections could be made against the adoption of any orders especially by the national associations approving the installation. The committee consists of Fred B. Adams, St. Louis; L. E. Reed, St. Joseph; J. W. Hutchinson, Kansas City, Mo., and J. E. Bushong, Ottawa, Kans.

The subject of consolidating the two state associations was left in the hands of a committee for further investigation, and especially for conference at the national meeting. The chief purpose of combining, the Kansas members declared, was to secure the assistance for boosting organization work of a secretary, and it was suggested that they might properly elect as secretary A. J. Burns, who acts in that capacity for the Missouri Association. The co-operation of the state associations otherwise than by formal union is assured by the declaration that Kansas and Illinois members will be specifically invited to the Missouri state convention; and that when these conventions are held in Kansas City, special effort will be made to secure the attendance of Kansas contractors. When conventions are held in St. Louis, the Eastern Missourians will make efforts to get Western and Southern Illinois contractors to attend the meetings. One objection to formal consolidation was that one state would thereby lose its director, or would be in danger of doing so.

The Kansas contractors were invited to attend some of the meetings of the Kansas City Association at which jobbers were present—one meeting a month being of this nature—where suggestions might be obtained for obviating the competition of jobbers in the retail electrical trade.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y. WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa. WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The vacation season is now on and presumably many of our members are either on or planning for their vacations. The Secretary hopes that each and all may be as pleasantly situated as he is and enjoy their holidays to the full.

Incidentally, an interesting case of what not to do came to his notice a few days ago. He went into the principal hotel in one of the largest Maine cities, and while reclining in the barber's chair happened to look up at the electric fixture overhead. It was mounted on a steel ceiling, and investigation showed was fitted with an insulating joint and an insulating ring for the canopy. There were seven in all in the room and in the process of renovation a few weeks previously each fixture had been carefully *gilded* and not over the canopy alone, but over the ring as well and right onto the ceiling, where as it was apparently fly-specked about the ring the gilding had been carried out for about a quarter of an inch. Presumably the original paint on the ceiling had been destroyed under these spots, for I asked permission to make a test with a pocket flashlight I had, and found I could burn the light perfectly well between the fixture and a wire with which I scratched through the paint a foot or so from the fixture on the ceiling. The test succeeded on every one of the fixtures. I called the attention of the hotel manager to the facts, and when I left he had a man cleaning the rings thoroughly.

High-Temperature Fixtures.

Question 304. Rule 26 v: A claims that under this rule only such forms of fixtures as in which the temperature exceeds 120 degrees Fahrenheit need be submitted for examination and approval. B claims that all such forms of fixtures, irrespective of temperature, must be submitted, the temperature governing only the type of conductor insulation. Which is right, A or B?

Answer 1(O). Unquestionably both parties to this dispute are wrong. All of Rule 26 relates to *wires*, on inside low-potential systems. Section *v* refers particularly to wires for fixture work, and the sentence under discussion is part of a paragraph describing the proper wire to be used in fixtures operating under high temperature. The sentence, however, does not relate to wires, but requires special approval of the high-temperature fixtures under discussion. The sentence is not germane to the subject of wires, but its insertion in this paragraph can be considered as a timely warning that the high-temperature fixtures under discussion are apt to be hazardous to surrounding material, as well as injurious to rubber-covered wire. The broad question as to the necessity of an approval on fixtures is not generally a Code question, but concerns the conduct and policy of the inspection department. Regarding the dispute, A has no right to assume because high-temperature fixtures are required to be specially approved, that it necessarily follows that no other fixture need be approved. On the other hand, B cannot argue that the requirement under discussion applies to any but the special fixtures referred to.

Answer 2(R)*. I personally do not feel that I can submit any information as to procedure under this section.

Answer 3(U). I feel that B is right in his position.

Answer 4 (M). I should say that B is correct.

Answer 5(K).* I consider B is more nearly right.

Answer 6(P).* I side with A. "Such forms of fixtures" undoubtedly refers to those in which the wiring is exposed to temperatures in excess of 120 degrees Fahrenheit.

Answer 7(F and G). We feel that B is right. The last paragraph of the rule plainly reads "all such forms of fixtures must be submitted for examination test" and so forth. This is separate and distinct from the part of the rule which says "slow-burning wire must be used where the temperature is in excess of 120 degrees Fahrenheit."

Answer 8(L). The first six lines of second paragraph, Rule 26 *v*, plainly state what fixtures are to be submitted for approval.

Answer 9(J). B would appear to be correct.

Answer 10(B)*. All fittings, materials, etc., are subject to approval on examination. This holds true of fixtures, which are treated in Rule 77 of the Code. Rule 26 *v* refers to fixture work, and the section specifically referred to by the question appears to me as designed to emphasize the fact that fixtures used under conditions which are not normal conditions, as considered in

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Digitized by Google

the general specifications for fixtures, must be the subject of special consideration by the inspection department having jurisdiction. That is, a fixture which might be an approved fixture for use under conditions where heat to which it is subject is less than 120 degrees Fahrenheit, might not be proper for use under conditions where temperature was higher, unless it was rewired, taking into consideration the special conditions referred to. It also calls attention to certain locations where temperature would probably be in excess of 120 degrees Fahrenheit, as mentioned in section *v*.

Answer 11(T). My interpretation of the last sentence of the second paragraph of Rule 26 *v* is that it is intended to apply more specifically to fixtures of special design for use in show cases and similar places, as outlined in the section.

Answer 12(N)*. I cannot see why this last sentence should be included in the rule in question at all, for this has to do entirely with wires for inside low-potential work.

Moreover, observe that the whole of the second paragraph beginning "In wiring," etc., is an exact repetition of Rule 55 *a*, second paragraph, except that Rule 55 *a* reads "slow-burning wire must be used," while Rule 26 *v* reads "*approved* slow-burning wire must be used."

Further, Rule 77 gives the specification for fixtures, and in section *g*, which is apparently tacked on as an afterthought to section *f*, Test, we find the special requirements for the class of fixtures under discussion.

My opinion, therefore, is that all fixtures to go on approved list must be examined by the laboratories under their system in accordance with Rule 77, and that the provisions under discussion in this question mean that fixtures for this special purpose should be presented *to the department having jurisdiction* before the contractor installs same, in order to see if they comply with the special requirements of 77 *g* (since he might be going to use some fixture on approved list, but not specifically for this location), as well as to see if they need be rewired with the slow-burning wire. B, therefore, is right, the special conditions and probable temperature limit being the reason for the special local examination requirement, and each case being distinct with its own peculiarities within limits.

Answer 13(H)*. The last clause of Rule 26 *v* seems to cover the question. Plainly some one must determine if a lamp is liable to raise the temperature higher than 120 degrees Fahrenheit, and it is obvious that an installed fixture, which has not been locally examined and approved, and did raise the temperature to a dangerous point, would be rather an expensive experiment.

Answer 14(A)*. I should say that the Rule 26 *v* means all forms of fixtures. If you read the first line to comma, then start at the first word after the period it reads: "In wiring certain designs of show-case fixtures, all such forms of fixtures must be submitted for examination." It seems to me that B is unquestionably right.

Inclosing Motors.

Question 305. Rule 8 f, states a preference for inclosed-type motors over wooden boxing about motor. Is it necessary to provide boxing for a squirrel-cage induction motor without commutators, slip rings, or sliding contacts?

Answer 1(O). Squirrel-cage induction motors without exposed live parts or sliding contacts have never been generally required by inspection departments to be of the inclosed type or provided with dust-proof inclosures.

Answer 2(R)*. It is recommended in this vicinity, where deemed advisable by the inspector, to inclose even induction motors of type mentioned, places where foreign matter is liable to become wedged between moving parts, such as coal-crusher work, being an example where good practice would call for boxing.

Answer 3(U). I think the rules cover all motors. The danger is not the burning of the motor, but lighting of inflammable material, in case not only of sparking, but of overheating from poor insulation or other possible causes.

Answer 4(M). I hardly think so.

Answer 5(P)*. The boxing around the motor is more or less a makeshift, as dust will collect within the box. For this reason it is preferable to omit the boxing if there are no sparking conditions.

Answer 6(F and G). Boxing is desirable, as it will tend to keep the motor clean, prevent the accumulation of dirt in the windings, and between the rotor and stator. The air space here is about one-sixty-fourth inch. If the motor is located in a room in which there is dust or lint the air gap is often small enough to become filled with material, sometimes to an extent sufficient to retard the rotor, in which case fire is produced by friction. A case of this kind occurred several years ago in the works of the American Logwood Company, Chester, Pa. The wood dust was exploded, killing several men and wounding others. A law suit followed. The victims and their families were awarded $100,000.

The motor had previously been boxed, the boxing removed, with the result as above stated.

"Safety First" to life and property is a good slogan to tack on to the morning and evening prayer.

Answer 7(L). Common practice is not to box up motors of the squirrel-cage type.

Answer 8(J). I do not think so.

Answer 9(B)*. We should hardly consider it necessary to provide boxing for an induction motor of this type.

Answer 10(T). Under this rule I am of the opinion that an alternating-current motor of the squirrel-cage type should be treated the same as an inclosed type of motor; that is, no boxing required.

Answer 11(N)*. In this jurisdiction it is customary to treat these motors just like any others not completely inclosed. Boxing is required in many cases; it is, however, so easy now to get an inclosed-type motor even of squirrel-cage design that these are usually installed.

Utilities Suffer from Storm in Cincinnati.

The violent storm, accompanied by heavy rain, and reaching cyclonic proportions, which passed through Cincinnati and its suburbs on the night of July 7, caused the loss of more than 30 lives and property damage amounting to not less than $2,000,000. Of this amount, a very considerable part was suffered by the various street-railway, telephone, telegraph and other utility companies in the city, whose wires and poles were blown down and otherwise damaged to an extent which has since interfered seriously with traffic in many instances. The South Covington & Cincinnati Railway Company, operating lines in Covington, Newport and other Kentucky towns, with termini in Cincinnati, was an especially heavy sufferer, while the Union Heat, Light & Power Company, which also does business in the Kentucky towns contiguous to Cincinnati, had its service interrupted by damage to its distribution system. In Cincinnati telephone service was interfered with to some extent, but was by no means crippled, the damage being so distributed as to affect only small sections of the city. Repairs were undertaken at once by the companies involved, and rapid progress toward the restoration of order made.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The San Joaquin Light and Power Corporation was authorized to issue and sell $1,582,000 of Series "C" six-per-cent, 40-year first-and-refunding-mortgage gold bonds; $300,000 of the bonds to be sold at not less than 94 per cent of the face value, and the remainder at not less than 95 per cent of face value plus accrued interest.

The Pacific Telephone and Telgraph Company, the Glenn County Telephone Company and the Tehama County Telephone Company were granted authority to consolidate their telephone properties in Glenn and Tehama Counties. The new company will be known as the Sacramento Valley Telephone Company, and practically all of the stock will be held by the Pacific Telephone and Telegraph Company.

DISTRICT OF COLUMBIA.

The annual report of the Commission for the year 1914 has just been issued. The Commission states that it has not established rates for service for the various utilities for the reason that rates will depend on the value of properties, and the valuation of the properties has not been completed. The Commission has also taken the position that until the completion of the valuations, additional capitalization should be confined to the least amount possible without embarrassing the utilities in the proper performance of their functions. Appraisals are being made of the Potomac Electric Power Company, Washington Gas Light Company, Georgetown Gas Light Company, Chesapeake and Potomac Telephone Company, Washington Railway and Electric Company, Capital Traction Company, City and Suburban Railway of Washington, and Georgetown and Tenleytown Railway Company. The Commission in its report states that failure of the companies to properly co-operate with the valuation bureau, and the incomplete records have caused delay and increased the cost of the work. Attempt is being made to determine the original cost as well as the cost of reproduction new.

IDAHO.

Pocatello Water Company. The Supreme Court has handed down a decision reversing the order, issued by the Public Utilities Commission, directing the Pocatello Water Company to reduce its rates and make certain improvements in its service. The court found that the Commission had erred at several points in computing the value of the property; and the court further deemed it unwise to order improvements in service at this time as it had not been shown that the company has a valid franchise in the city of Pocatello.

The Commission had refused to consider the present actual value of the company's water right, except in the sum of $2,000 which had been expended in the original purchase. The Supreme Court ruled that the water right should be considered at its present reasonable value.

The Supreme Court also directed that evidence on behalf of the proprietor of a public utility that certain expenses have been incurred in building up the business may be considered by the Commission as one of the elements of value, under the head of "going concern value." On that point the court said: "The fact that it is a going concern, in successful operation, should be considered in estimating the value of the physical property and assets, but the Commission should not attempt to calculate or segregate any specific theoretical value which might attach to the plant or system merely by reason of the fact that it is a going concern."

In determining the value of a utility for the purpose of fixing rates, the court held that the "cost of reproduction less depreciation" is the correct general rule to be applied. When deduction is to be made for depreciation, the court ruled that only actual tangible depreciation, and not theoretical, or "accrued depreciation" should be considered, and that if it is shown that the plant is in good operating condition, giving on the whole as effective service as a new plant, the question of depreciation may be disregarded.

The court remanded the case with instructions to the Commission to proceed further in accordance with the views expressed in the court's opinion.

KANSAS.

Postal Telegraph Company. The Kansas Supreme Court has ruled that under the law creating the Commission no public utility under its jurisdiction could discontinue service without first obtaining permission from the Commission.

The Postal Telegraph Company closed its Syracuse office on the ground that it was being conducted at an annual loss. The action was taken without obtaining permission from the Commission, and the attorney for the Commission brought mandamus proceedings to compel the reopening of the office. The court temporarily postponed issuing the writ.

NEW HAMPSHIRE.

Report of Decisions. The report contains the formal and informal cases decided by the Commission during the year ending August 31, 1914. An index-digest is given covering all decisions of the Commission published since its organization in 1911, which have been published in Vol. I to IV, inclusive.

NEW JERSEY.

The Public Service Corporation of New Jersey has secured a writ of appeal in the 90-cent gas case, carrying the case to the United States Supreme Court.

NEW YORK—Second District.

The Ulster and Delaware Railroad. The Commission has refused the petition of the railroad for authority to increase its mileage-book rate from two to three cents a mile. The decision of the Commission is an interesting one as the petition brought out a full discussion of the power of the Commission under the Public Service Commissions Law to increase a rate above a maximum rate set by the legislature.

Chairman Van Santvoord in the majority opinion concurred in by Commissioners Hodson and Irvine, points out that should the Commission assume that the power to permit such increase had been delegated to it by the passage of the Public Service Commission Law, not only the mileage-book law involved in the present case, but such other statutes as the three-cent-maximum-fare law, possibly even the eighty-cent gas law for New York City, and other similar enactments might be in effect repealed by the

Digitized by Google

Commission's decisions. In an extended review of all the statutory sections involved he fails to find that the Commission, either expressly or impliedly, has been granted such power.

Commissioner Emmet and Commissioner Carr dissent. Mr. Emmet, in a review of the circumstances surrounding the passage of the Public Service Commission Law, holds that had not the legislature intended to take the rate-making power out of the "often bungling" hands of the legislature and place it for expert determination absolutely in the jurisdiction of the Commission the whole battle of Governor Hughes for the regulation of public utilities would have been vain. As the power to lower rates irrespective of legislative enactment is expressly granted in the Public Service Commissions Law, Mr. Emmett finds that the power to raise rates is implied beyond reasonable doubt. Were this power to raise rates to afford a reasonable return on investment in accordance with the facts disclosed in each case not implied, Mr. Emmet holds that the intent of Governor Hughes and of the legislature which passed the law would have been anything but the distribution of even-handed justice, to the railroads as well as to the public.

The Supreme Court of Missouri, as quoted in the opinion of Commissioner Carr, has held that the Public Utility Commission of that state, by a statute delegating to it the rate-making power in the same words as does the Hughes law, was empowered to set aside the two-cent fare law of that state. He holds that the "mileage-book law" of this state is in effect but a legislative guide for the railroads which come under it until the rate which it prescribes can be passed upon by the Public Service Commission.

Chairman Van Santvoord in his opinion says, "to fix rates is a purely legislative function, the power to exercise which is not to be lightly assumed although actuated by whatsoever lofty motives in the rounding out of an ideal. While it is not to be denied that the legislature has power to delegate such functions such delegation should be in express terms and not by implication—or at least by an implication so undeniably manifest as to be the substantial equivalent of express declaration. As for the suggestion, so gravely urged, that the Commission 'ought to have the power' invoked, it might be considered in point if we were discussing the question of what constitutes an ideal regulative law, in the abstract. But the concrete question before us is not what the legislature ought to have done, in formulating the Public Service Commissions Law, but what it actually has done and precisely how far it has gone in delegating certain of its law-making functions to a regulative department.

"In deciding that question we are not to be controlled by considerations of policy, by general propositions in ethics, or by accepted ideals in law making. The scope and meaning of a statute of this kind, if unfortunately lacking in either the science of ideal humanity or that other kind of ethics which Kant terms 'pure morals,' is not to be eliminated by the precepts of the Sermon on the Mount. There is no rule of statutory construction which directs us to explore the labyrinth of legislative intent by the light of the Moral Law. There are even people who believe that the legislature has been known to enact laws which really 'ought' not to have been made. But howsoever plain such a case may seem, it will be a sorry day for our scheme of government when a department created by the legislature shall assume to construe its statutory powers by abstract propositions of right and wrong as bearing upon a particular legislative act, rather than by the ordinary rules of law."

Commissioner Emmet in his dissenting opinion says: "The so-called Hughes Law of 1907—which, with slight changes is the law under which we are acting today—was a courageous and comprehensive effort by earnest men to deal with a great and complex problem in a spirit of fairness to all the interests involved. If my associates are right in their view, we now have upon our statute books precisely the kind of a law which the framers of our present regulatory system were obviously doing their very best to get away from. That is to say we have a law which, in dealing with the delicate problem of railroad rates, permits of no really discriminating exercise of judgment by the Commission, but instead perpetuates all the old evils of clumsy and ill-considered legislative domination—this in relation to the question which, of all others connected with the business of railroading, most requires expert handling if it is to be settled with any degree of fairness or justice. We have a law which only takes one side of a complicated problem into account and only aims at giving relief to one of the classes of people interested in the proper solution of this problem.

"If it was really the intention of the legislature and Governor Hughes to give us such a law as my associates seem to think the present law is, then it was apparently their intention that these Commissions should really be very much the sort of public bodies that certain demagogues have always said they ought to be—bodies organized not primarily for the purpose of dispensing even handed justice as between the corporations and the people, but organized primarily to give an odor of sanctity and a color of right to repressive attacks upon private capital and enterprise engaged in the public-utility field."

Upon the question of the legislature's right to go over the heads of the Commissions and fix rates for public utility corporations, Mr. Emmet points out that every governor since 1907 has vetoed such rate bills when they were passed holding, that the intent of the Public Service Commissions Law was that all rates should be fixed by the tribunals there created.

"The keynote of the whole scheme was completeness in the jurisdiction of the Commissions over whatever regulatory functions were entrusted to them at all," Mr. Emmet says of the Hughes Law. "It was intended that the Commissions should, in the interest of careful and scientific handling, deal with this subject as the sole representative of the state of New York.

"I do not mean to say, of course, that when the law was passed the legislature consciously and permanently divested itself of all rights to intervene in the future in rate-making cases. It at least indicated a plain intention not to exercise this right again until the newly created regulatory machinery had been tested.

Mr. Emmet concludes his opinion as follows:

"I am not partial to the idea that governmental officials should ordinarily seek to read larger powers for themselves into the law than are explicitly stated there. The tendency should be in the other direction. But here, it seems, the whole underlying purpose and spirit of the Public Service Commissions Law is at stake—imperilled by what I can only regard as a trivial technicality. In such a situation the Commissions themselves should certainly—whatever the courts do afterwards—construe doubtful points in the law in accordance with what they know to be the underlying spirit and purpose of the law. I feel that we are not, as a Commission, doing our full duty when, through an excess of lawyerlike caution, we invoke narrow and technical principles of statutory construction as a reason for refusing to perform an act of simple justice to a railroad corporation—merely because the wording of the law is, at worst, slightly ambiguous, although the spirit of the law is plain."

Commissioner Carr, also in a dissenting opinion, says:

"In my opinion Section 40, read in connection with sub-division 4 of Section 33 of the Public Service Commissions Law, gives the Commission

Digitized by Google

the power to increase mileage-book rates notwithstanding the provisions of Section 60 of the Railroad Law (mileage-book law) and that this latter section was left unrepealed for the specific purpose of providing that the mileage-book rates therein set forth should be the prevailing mileage-book rates for new railroad corporations subject to the act in the first instance but that such rates should nevertheless be subject to an increase by the Public Service Commission if, after investigation, it should determine that the rates ought to be increased. The trend of the times being to give the Commissions full power to regulate the corporations under their jurisdiction, and this includes the fixing of fair and reasonable rates, I cannot agree that the legislature of the great State of New York has withheld from this Commission the power to fix a mileage rate for a railroad corporation in this state which will aid it in performing the service which is required by the public."

OHIO.

Annual Report. The second report under the organization of the Public Utilities Commission has been issued, containing decisions issued during the year and statistics for the companies under its jurisdiction for the year ending June 30, 1914.

OREGON.

Bend Water, Light and Power Company. Upon petition of the City of Bend, the Commission made an investigation to determine reasonable rates for water and electric service of the Bend Water, Light and Power Company. The Commission found that, from the records available, it was impracticable to determine the original cost of the property. The reproduction cost new of the property, lessened by depreciation, was found to be $84,118, as of December 31, 1914.

The Commission makes the following holding in regard to certain property not at present "used and useful."

"Over and above the plant reasonably used and useful in the production of electricity, the defendant has installed and owns other physical electric production equipment and land, to reproduce which, in normal new and usable condition, would have required on December 31, 1914, the expenditure of approximately $47,500. Such electric production equipment and land, although its construction and acquisition was apparently warranted by good engineering practice and business management, was not justified in the realization of expectations and the Commission finds is not now reasonably used and useful to the community served. The amount of capital represented thereby should be carried into Account 105, of the Commission's Uniform Classification of Accounts, 'Property Devoted to Other Operation,' there to remain until such time as the defendant shall show the Commission that such property, either in whole or in part, is devoted to the accomplishment of the principal purposes of the business of the utility, at which time the Commission will determine, and by its order fix the amount which shall be credited to such account which shall be charged into the fixed capital account, and make such other and further order as may be proper in the premises."

The Commission finds that the present rates yield 11.5 per cent on the fair value of the property of the electric utility. These rates are higher than rates in effect for such service in other towns and cities of like population and "the rate of return yielded thereby is greater than the rate of return ordinarily expected and received on investments generally, and in the particular class of utility service in which the defendant is engaged."

Lower rates are ordered.

Among the Supply Men

Novel Method of Shopping.

There are two very common ways of shopping, either by going personally to the store, or by telephoning the order to the store. A novel combination of these two methods has been worked out successfully at Newark, N. J. Experts in selling goods to the public often say that if a dealer can only get people inside his store, he will sell goods. That is why so many bargain days are conducted. People come for the bargains, but also buy other goods. Just to try out the psychology of this claim, Benjamin Hurd, the Western Electric Company's local manager at Newark, decided to find a way to sell goods and take orders without his customers coming inside at all. An increase in sales at this supply store, which is at 64 Park Place, has resulted.

Here is the way Manager Hurd has worked out his new electrical seller: A desk equipped with order books, Interphones and electrical devices has been placed just inside the window. One of the office force, H. M. Burnett, sits at the desk in plain view of the passing throngs. He is a very busy young man. His desk telephones are connected up to lines which reach to the outside. A customer comes along, sees some electrical appliance that he needs, picks up the outside Interphone, speaks quickly to the clerk in the window, who is there to take down orders, and asks the clerk for further details about cost, etc., of devices in the window. Usually a crowd stands about waiting for a chance to ask questions. Addresses are obtained and a mailing list improved by the arrangement.

Intermoutain Electric, of Salt Lake, Branches Out.

The Inter-Mountain Electric Company, of which C. B. Hawley is president and general manager, has purchased the stock and business of the Bertram Motor Supply Company of Salt Lake City, and is adding an automobile supply department to its rapidly expanding business. Finding its present quarters too small, the company has leased the entire frontage of the Newhouse Block on Fourth South Street between Main Street and State Street, having a total frontage of 125 feet, and a floor space of 11,375 square feet. It will occupy the new quarters on August 15. In announcing the proposed extension by his company, Mr. Hawley says: "We have been conducting a motor supply department in connection with our electric business for some time and find that it fits nicely with our electric supply business. Our salesmen who cover the intermountain territory regularly can handle this business without any conflict with their electric line. Our new location is practically the automobile center of Salt Lake City and we will be admirably equipped to take care of our automobile and electric supply business."

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 292.—Sunspots, Magnetic Storms and Weather.—A short time ago a statement appeared in the newspapers that an exceptionally brilliant display of the aurora borealis was connected with great activity in the sun spots and that it also produced serious disturbances on telegraph circuits and magnetic compasses and accounted for our prolonged rainy weather. Has any definite conclusion been reached by astronomers, meteorologists and other scientists as to the interconnection of these phenomena? Is there any basis for ascribing an electrical or magnetic relation between them?—F. L., Beloit, Wis.

No. 293.—Bell-Ringing Transformers and Lightning.—Recently we installed several bell-ringing transformers and a number of them have already been burned out during a lightning storm. Is there any simple and yet positive way of protecting them against lightning? We will be much pleased if some one will answer this through your Questions and Answers columns.—H. P., Hillsboro, Ill.

No. 294.—Alarm for Air-Blast Transformers.—A railway substation has a bank of air-blast transformers that are now unprotected against failure of the forced ventilation at times of heavy load. What is the simplest and most reliable alarm system for this purpose?—N. P. C., Indianapolis, Ind.

No. 295.—Supply Voltage.—Is it customary in the franchises of electrical central-station companies to stipulate what the supply voltage shall be for residence and power customers, or is this left to the option of the company?—K. F. T., Cheyenne, Wyo.

No. 296.—High Cost of Rendering Bills.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

Answers.

No. 286.—Static in Press Room.—In the press room of a large printing establishment much trouble was experienced during the dryest part of last winter from static electricity causing paper sheets to stick. Attempts were made to take the static from the driving belts, but without entirely relieving the trouble. A suggestion was made that a humidifying apparatus be put in to keep the air more moist, it being claimed this would immediately stop the trouble. Is this a reliable solution? If not, what is the best way to get rid of the static?—C. A. C., Omaha, Nebr.

Humidification will, to a considerable extent, relieve you of trouble due to static electricity, the results depending upon how much humidification your work and product can stand. In any case it is not necessary to humidify the room air up to the point of saturation, i. e., the point where condensation of water appears. If sufficient moisture is present, the static will be diffused or dissipated instead of being retained on the surfaces charged. The writer's experience embraces five years' study of this interesting subject in the paper and textile fields. The theory that a metallic collector usually employing a series of points similar to a comb installed near the charged surface, preferably near where the static is generated, and connected to earth by a metallic conductor will discharge the surfaces by virtue of the earth being at zero potential does not work out satisfactorily in practice, because it is impossible to discharge static completely in this manner when its potential is below 4,000 volts. In the case of a fast-moving belt the potential generated is considerable and is dependent upon the speed and friction and, as the quantity depends upon the area, this factor is usually low. In your case, however, the friction and speed are not very great, but the area presented by the paper surface is relatively great. Consequently, the charges experienced are of low potential and of considerable quantity. There is a device on the market, known as the Chapman Neutralizer, made in Portland, Me., which is designed to neutralize static charges by producing an alternating-current field, and is based upon the theory that an intentionally generated impulse of one sign has an affinity for, and will neutralize, an impulse of equal quantity and of the opposite sign; charges of both signs are produced by the device, it being alternating, thus charges of both signs are neutralized. This device has a peculiarity which, for lack of a better term, might be called a suction effect and, therefore, affects low-potential as well as high-potential charges.—M. K., Passaic, N. J.

Apparatus for overcoming this difficulty is manufactured by the Chapman Electric Neutralizer Company, Portland, Me. This apparatus is not very complicated, but must be handled with care after being installed, owing to the high voltage used for this purpose. It is possible that the humidifying apparatus would aid to a certain extent, but the above equipment is by far the most practical way of solving the problem.—G. W. C., Roslindale, Mass.

No. 287.—Powdered Coal as Central-Station Fuel.—Recent experimental trials with powdered coal as steam-boiler fuel are said to have given almost ideal results from the standpoint of combustion efficiency. Has this fuel been tried on any extensive scale under the boilers of any large or medium-sized central station? Is the method applicable advantageously to all kinds of coal? Is the cost of the crushing plant offset by the increase in efficiency?—B. A. M., Toledo, O.

The use of pulverized coal as a fuel is not new. As early as 1831, J. S. Dawes used it in England, in a blast furnace, by injecting it with the air through the tuyeres. Though powdered coal is used to some extent today for steam-raising purposes the amount so used is relatively very small. The chief use of this kind of fuel is in industrial and metallurgical furnaces. For the last 20 years powdered coal has been used as a fuel by cement makers and probably four-fifths of the cement manufactured today is calcined in furnaces using this kind of fuel. About ten years ago the experimental use of powdered fuel in metallurgical furnaces was begun and has proved commercially successful in furnaces for heating and puddling and for the basic open-hearth processes. For this service it is rapidly gaining in favor.

It is more than 20 years since work was begun on the adaptation of this method of using coal to the firing of steam boilers but the process seems to be still in the experimental stage. During these years many patents have been issued for powdered-coal apparatus and one of the most important devices brought out seems to be the Bettington steam boiler. This boiler was designed to overcome the difficulties encountered when powdered coal is burned under ordinary boilers. These troubles have been chiefly due to the intense heat produced destroying the brickwork of the furnace, and the ashes being carried up with the flue gases filling up the flues. A test of pulverized fuel with this type of boiler is reported in the *Proceedings* of the Institution of Mining Engineers of England, Vol. 43, pages 112-121. In this report it is shown that pulverized fuel lends itself to high thermal efficiency, smokeless combustion, quick steaming, flexibility in output, small ground space, elimination of banked fires, and the use of low-grade fuels. In this plant, supplying power to a colliery and developing about 600 horsepower when operating at approximately 85 per cent of its normal capacity, 9.6 pounds of water was evaporated per pound of dry coal and the thermal efficiency of the boiler was 76.43 per cent. The largest power plant using pulverized coal of which I can find any record is the Lake Waterford power house of the Dominion Coal Company, of Nova Scotia. This plant is also equipped with Bettington boilers.

The powdered-fuel method of firing is applicable to nearly all kinds of coal,

Digitized by Google

but most authorities agree that the coal should contain 20 per cent or more of volatile matter and have a very low moisture content. One of the greatest advantages claimed for this mode of firing is the ability to use fuels high in ash. H. R. Barnhurst says (*Bulletin* American Institute of Mining Engineers, December, 1913) that he has successfully used fuels containing 52 per cent of ash. In an article in *Engineering News* for February 19, 1914, Prof. R. C. Carpenter, of Cornell University, says that he doubts very much whether the cost of properly pulverizing the fuel would be warranted by any increased efficiency which could be obtained above the efficiencies now secured with stokers. He estimates the cost of a complete pulverizing plant capable of grinding and feeding 100 tons of coal per day at from $15,000 to $20,000, which is much more than stokers of the same capacity would cost. In this same article the cost of the drying and pulverizing operations in the large cement plants is said to run from 30 to 75 cents per ton. This agrees very well with data given by other authorities. An examination of the many articles on this subject which have appeared in technical papers during the past three years indicates that Professor Carpenter has expressed the general consensus of opinion. The only case where satisfactory operation extending over a considerable period is recorded is that of the English plant mentioned above, which had been in operation 19 months when the article referred to was written. It should also be borne in mind that this coal dust forms a highly explosive mixture with air. This has led some cities to pass restrictive ordinances limiting the use of this fuel. As a large part of the ash contained in the coal goes up the chimney and floats away to settle on the surrounding district the dust nuisance would probably also arouse much antagonism if a large plant were located in a city. At present the most promising field for the use of powdered coal for steam raising seems to be in locating the plant at the mine where it can utilize the low-grade fuels which have no market value, the energy being electrically transmitted to the point where it is to be utilized.—F. E. V., Madison, Wis.

No. 288.—Brush-Brass Finish.—Kindly explain through the Questions and Answers Department, how the brush-brass finish now so popular on fixtures is applied. Why is it not so durable as polished brass? What conditions affect the durability and value of this finish?—G. C. N., Terre Haute, Ind.

For this finish the so-called "low brass" which contains four parts of copper to one part of zinc has the desirable greenish color so much admired for this finish while the "high brass," containing two parts of copper to one of zinc, gives a yellowish color that is not so pleasing. The "low brass" is more expensive than ordinary brass and is not so stiff, so it is often desirable to use common brass as the foundation and plate it heavily with the low brass so as to combine the wearing quality of the one with the finish of the other. The method of producing the brush-brass finish is the same for plated or cast brass and consists simply of the production of innumerable fine scratches upon the surface, all running in the same direction. If the lines do not run in the same direction, or if they are too coarse, or some are deeper than others, the effect is not satisfactory. Various types of abrasives and wheels have been used, but the most satisfactory method has been found to be the use of pumice of the proper fineness, on a wet tampico wheel or scratch brush running at a slow speed. The use of oil or grease in producing the finish is not recommended as it necessitates a subsequent extra cleaning.

The first step in producing a satisfactory brush-brass finish is to obtain a good surface on the article. This is done exactly as if the piece was to be buffed to a high "color." In other words, all scratches, dents and pits must be removed by the use of a buff and tripoli. It may seem unnecessary to remove all scratches or roughness when the surface is again to be scratched, but it is necessary because for the brush-brass finish all the scratches must be of the same character. If some are deep or coarse or they vary in direction, the effect is injured. Having obtained a good surface the brush-brass treatment may then be given. This is done by means of a small tampico wheel. One from three to five inches in diameter and running at from 300 to 500 revolutions per minute will be found satisfactory. If allowed to run too fast, the pumice and water will be thrown off the wheel. The best material for a fine brush-brass finish is F. F. pumice. This is mixed with water to a paste and applied to the wheel. The work is held against the wheel and the scratches allowed to run in the same direction, generally lengthwise of the article to secure the best effect.

As soon as the brushing is finished the article is ready to be rinsed, dried, and lacquered, care being used to avoid abrasion or staining. Lacquer manufacturers now make a special grade of lacquer for this class of work. The choice of a lacquer is important for a lacquer not adapted to the work may spoil an otherwise excellent job. If the articles are allowed to remain for some time after the brush-brass treatment has been given before lacquering they frequently stain. This stain can be removed by dipping the articles in muriatic acid or cyanide solution. The muriatic acid is recommended, as it will not cause spotting-out, which the cyanide frequently does. The muriatic acid dip is composed of two gallons of water to one of muriatic acid. This will usually remove any slight stains and if a stronger dip is needed it can be made by dissolving one pound of cyanide in one gallon of water. After using one of these dips the piece must be rinsed, dried and lacquered.

Polished brass having a hard smooth surface is not so easily abraded as the scratched surface of the brush brass and an abrasion is also not so conspicuous; hence the greater durability of the polished brass.—F. E. V., Madison, Wis.

No. 289.—Combination Electric Radiator.—I have just heard of a newly patented electric radiator which resembles a hot-water radiator and has an electric coil heat the water in the pipes; it is said to be more economical than a straight electric radiator. I fail to see this and would like to have it proven.—W. T., Cleveland, O.

There are two reasons why the combination radiator described may be more advantageous in some cases. First, it has a larger radiating surface; second, it has a much larger heat-storage capacity. Where it is desired to warm a medium-size room to a moderate temperature, it is necessary to have a greater heat-radiating surface than most of the electric radiators consuming less than 1,000 watts possess. The use of the auxiliary water coils provides the necessary moderate-temperature surface to give a better heat distribution through air convection currents than is possible with the restricted high-temperature surface of the ordinary electric radiator. More important, however, is the heat-storage property of the combination outfit. If it is desired to use the radiator for providing a practically uniform room temperature throughout, or most of the day, the heat-storage principle becomes valuable, because it permits using a relatively low current at all off-peak hours and shutting it off entirely during the time of the central-station maximum load, so as to get a much more favorable rate than is possible where the current may be used to any amount and at any time for direct heating. The low rate obtained by the excellent load-factor and off-peak character of such a load will greatly diminish the operating cost and quickly make up for the higher first cost of the combination radiator over the straight electric. In Norway efforts are being made to load up some hydroelectric systems with electric house-wiring equipment employing the heat-storage principle so as to fill up the large valley in the load curve due to comparative scarcity of power load, except on systems with electrochemical load. While the efficiency of such heat-storage radiators may be very slightly lower than that of the straight electric, the net economy under these conditions is decidedly higher.—J. S. C., Seattle, Wash.

Digitized by Google

ELECTRIC WELDING.—I.

By Gordon Fox.

Welding, as a means for combining the component parts of devices or structures, is gaining in prominence. The limitations of blacksmith welding have long been realized, but autogenous and electric welding processes are opening new fields. As knowledge of the art increases and processes are developed we shall probably see welding in various forms employed more extensively.

Electric welding presents a promising field both for the manufacturer and for the central station, but a goodly amount of application engineering is required in adapting it to special cases. In the welding field there are different classes of work which can be accomplished best by different means. Electric welding does not replace blacksmith welding except in isolated cases. Electric welding does open new possibilities of its own. It accomplishes results which a blacksmith cannot attempt. The field for electric welding lies largely in developing practical ways and means of applying new methods.

There are two distinct electric welding processes, namely, arc welding and incandescent or resistance welding. We will consider arc welding first. There are a number of similar arc welding methods, the most common being the Bernardos process and the Slavianoff process.

For electric arc welding, one terminal of a source of direct current is connected to the article to be welded. The other terminal is connected to an electrode held in the hand of the operator. An arc is drawn by touching the electrode to the article, thus establishing the current flow, then withdrawing it a short distance, striking and maintaining the arc. The heat of the arc fuses the metal at the point of welding. This metal unites with that adjacent to it, and, upon cooling, forms a solid piece.

In the Bernardos arc-welding method the electrode manipulated by the operator is a carbon pencil. These pencils can be obtained in sizes from 0.25 to 1.5 inches in diameter and 6 to 12 inches long, the size depending upon the nature of the work. Uncored graphitic carbon is best for the purpose. Special pencils for welding work can be purchased from carbon manufacturers. Long pencils are usually clamped near the working end to reduce resistance within them. The pencil should be ground to a point and should be maintained fairly sharp so that the position of the arc can be better controlled. This carbon is held in an insulated holder fitted with a hilt or shield to protect the operator's hand. Fig. 1 shows a typical holder.

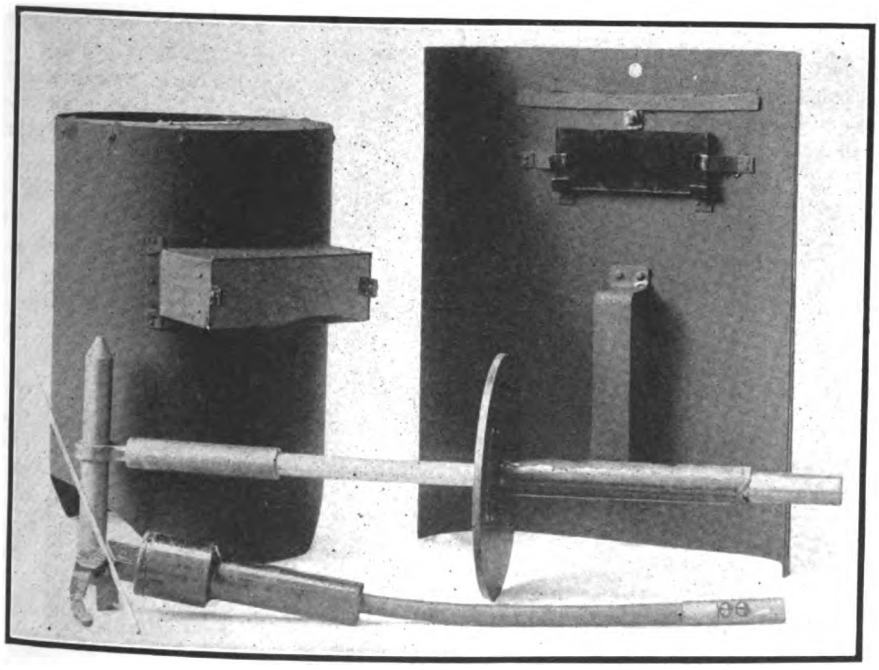


Fig. 1.—Accessories for Electric Arc Welding.

Since the arc is very dazzling in intensity, it is necessary to provide the operator with a shield or hood. It is injurious to look at the arc except through heavy glasses, a combination of red and blue glass being most effective in reducing the violet rays while still allowing the operator to see the work. The arc also has an effect like sunburn upon the skin. The operator should wear heavy gauntlet gloves and use a screen or hood for the face. The illustrations show this protective apparatus.

The other equipment required, aside from a proper source of current and a means for controlling it, are a suitable inclosure for the work, bars of filler material, fire clay or asbestos for molding and damming purposes, and a good flux. These requirements will be discussed in order.

The electric power, which must always be direct current, may be obtained from available power lines of suitable capacity or from a special motor-generator set. About 50 volts is required across the arc and it must be possible to short-circuit the arc without causing too severe a rush of current from the feeder circuit. The current required for welding by the Bernardos method depends upon the nature of the work, amounting usually to 300 or 400 amperes, or more upon very heavy work. If power is taken from 110-volt or 220-volt direct-current mains it is necessary to insert a resistance in series with the arc. This resistance serves the double purpose of reducing the arc voltage and preventing a heavy short-circuit current when the pencil is placed against the work to draw the arc. It is then a balancing resistance. The resistance may be in grid form or a water barrel may be used, the latter arrangement being more flexible and easily obtained. Fig. 3 shows the connections for this method.

Fig. 2.—Repairing Crack in Locomotive Frame.

In the Bernardos process it is desirable to make the piece to be welded the positive side of the circuit. This is done because the positive side of the direct-current arc is the hotter side, about 80 per cent of the heat of the arc occurring at this point. This arrangement therefore concentrates the heat upon the casting where it is needed.

If only alternating current is available for the welding work, a motor-generator set is required. The use of such a set is also warranted for use upon 220-volt direct-current circuits to

Digitized by Google

reduce the voltage, provided work is done continuously. There is a considerable power loss in reducing from 220 volts to 50 volts by the resistance method. The motor-generator set does not do away with resistance altogether. The generator is usually wound for 75 volts and a series of resistance grids is placed in series with the arc as a balancing means and to cut down the short-circuit current. The connections of the generator and welding outfit are shown in Fig. 4.

It is desirable that arc-welding work be done in an inclosure so that passers by will not be blinded by the dazzling light. Also, the arc is very sensitive to air currents and will be blown out by a draft. It is difficult to direct if blown about. The welding room should be provided with some form of heating furnace for annealing or preheating work before welding, as will be later mentioned.

Arc welding by the Bernardos process requires the use of a filler bar to be melted into the weld. The filler may best be of Norway or Swedish iron when the work is a steel casting. Upon cast or malleable-iron work either of the above may be used, or it is permissible to use copper wire or rods of special cast iron high in silicon. The filler bar should be 0.1 to 0.5 inch in diameter according to the nature of the work. Sections about three feet long are most easily manipulated.

It is not always considered necessary to use a flux when welding steel or wrought iron. It is almost always used when welding cast iron, however, Borax alone makes a good flux. A little better perhaps, is the flux consisting of red oxide of iron (F_2O_3) about 20 per cent, pulverized borax 80 per cent. The fluxes may be used either dry or wet. The most satisfactory results are obtained by making a paste of the flux and coating the filler rods with this paste. As the rods are melted into the weld the flux is thus automatically and proportionately introduced.

In preparing to weld, the casting or object piece is laid upon or clamped to the welding table in such a manner that a good contact is obtained. The point of welding should preferably be at the top. If it is not possible to secure good contact by simply laying the piece upon the table, the lead may be clamped directly to it. The point of welding should be properly cleaned and shaped. If a joint is to be made between two parts it is best to recess them to form a groove at the weld, into which the filler may be fed. If a crack is to be repaired it should first be chipped out to a V shape. If it is difficult to prepare for the weld by chipping, the surface scale

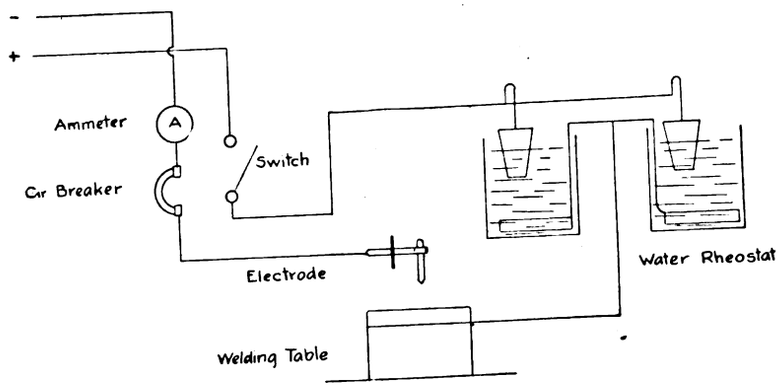


Fig. 3.—Connections for Welding Using Water Rheostat.

and dirt may be removed by first burning away this metal at the point of the weld with the piece tilted so that impurities will run off. The piece may then be tilted back and the welding started. When two pieces are to be welded together they must first be carefully alined and clamped into position in such a manner that in heating they will not become dislodged. If it is desired to "build up" metal, such as a lug, upon the piece, it is usually necessary to form a mold to retain the metal as it is melted and fed into the weld. Fire clay or asbestos may be used for this purpose. If thin plates of metal are to be welded, the intense heat of the arc is likely to "burn through" unless the thin metal is backed up by something to carry away the heat. Therefore, thin pieces should be clamped against larger blocks when preparing to weld.

All being in readiness, the arc is sprung. The arc should be as long as possible, two or three inches being the usual length. Too short an arc concentrates the heating too much and also tends to cause a harder weld. Inability to maintain a long arc is an indication of too much series resistance. The arc is given a rotary motion over the surface of the piece in order to cause uniform, distributed heating. When a melting temperature is reached the filler bar is brought into play, being slowly fed into the weld just as solder is fed into a joint. If the filler is not coated with flux it is necessary to shake a little flux into the weld from time to time. After the welding is stopped the new metal must be thoroughly hammered in order to prevent sponginess and the presence of blow holes. If possible, the work should be done at one continuous heating in order to prevent the formation of oxide upon the surfaces. If this is not possible the oxide may be removed with a wire brush or similar means.

Considerable difficulty is sometimes experienced in arc welding due to cracking while the piece is cooling. The crack is most likely to occur at the weld, although it sometimes occurs at an adjacent weak section. Cracking may be caused by a dirty weld, an oxidized weld, too hard a weld due to carbon from a short arc, the weld being unable to withstand the shrinkage stresses incident to cooling. Even a perfect weld may be unable to withstand these cooling stresses, particularly if the weld be at an unfavorable point. Shrinkage cracks at weak sections near the weld are not uncommon. For such work it is desirable to preheat the piece to be welded, in a muffle or temporary furnace, to a dull red heat. The welding is then performed and the piece allowed to cool slowly. It is sometimes best to leave the piece in the muffle while proceeding with the welding.

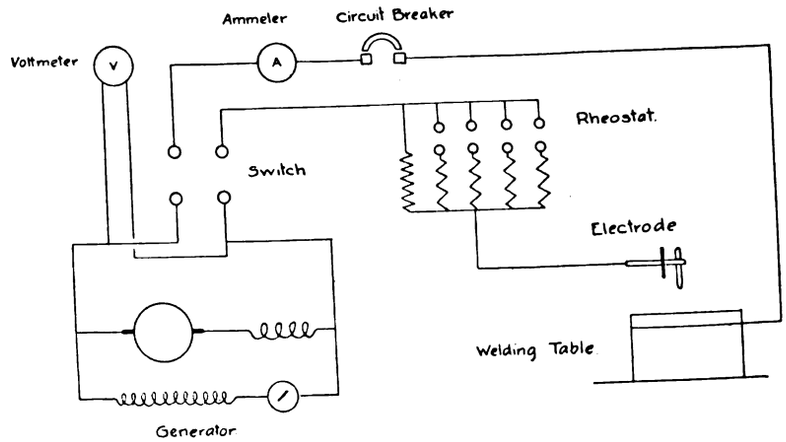


Fig. 4.—Connections for Using Motor-Generator Set.

Digitized by Google

The Slavianoff or metal-electrode process of arc welding is similar in most respects to the Bernardos process. A metallic pencil replaces the carbon electrode, the pencil being manipulated in the same general manner. As the welding progresses the metal pencil is melted away and fed into the weld. No filler bar is required.

The arc for this method of welding is very short, from one-eighth to three-sixteenths inch in length. The voltage at the arc is less than for the Bernados system, being from 25 to 30 volts. The current runs from 125 to 200 amperes, according to the size of the pencil and the nature of the work. As in the Bernardos system, the pencil is connected to the negative terminal, concentrating the heat upon the object piece which forms the positive terminal. The arc is less intense with this method, but a hood or screen is still required, together with protection for the eyes and skin. The electrodes or pencils should be of Norway or Swedish iron, one-eighth to one-quarter inch in diameter, the smaller size for lighter work, lengths of about 12 inches being most convenient. Some welders use steel pencils when welding steel. Both methods have been successful at different points, the best material being as yet a matter of personal preference. The same fluxes are used for welding by this method as were mentioned in connection with the Bernardos method. The most convenient way to introduce the flux into the weld is by coating the pencil. In overhead welding the coating around the pencil is of advantage in retaining the molten metal at the tip.

The procedure in welding with a metal electrode is similar to that utilizing the carbon electrode. Considerable skill is required to maintain the short arc necessary. A steady hand is required, the arm being best supported. Care should be exercised that the pencil and the piece where being welded are both melting hot and of about the same temperature. Lengthening the arc slightly increases the heat at the piece. It is not generally advised to hammer the weld made with a metal electrode, since the metal introduced is less porous. The pencil must be moved along as the material is added, inasmuch as metal is being constantly melted into the weld. To secure the right heat and right amount of metal simultaneously requires some little practice. It is not necessary to heat the object piece except at the immediate point of welding. Preheating is often resorted to, however, to prevent shrinkage cracking. Although considerable skill must be acquired in order to perform arc-welding work successfully, the fact must not be overlooked that smith welding also is highly skilled work. Arc welding is the easier of the two to master.

The strength of welds made through the use of the electric arc compares very favorably with the strength of the piece welded. To be sure, the metal which goes into the weld is really in cast form but it is often worked by hammering while still hot. The strength of the weld may be safely considered as equal to the strength of the material of the filler bar in cast form. If rolled steel is to be welded and the strength of the weld is dubious, it may be possible to build up or leave extra metal at the weld, to make up in quantity of metal what may be lacking in quality.

The Bernardos process was originally the most extensively used of the electric arc-welding methods, but the Slavianoff process is now coming into greatest favor. The Bernardos method is best suited for heavy work where speed is desirable and finish is unimportant. The Slavianoff process gives a better weld, leaves the metal less porous, can be more neatly executed, requires less power and, after skill is acquired, lends itself to better control and surer results. The Bernardos method is used almost exclusively where a piece is to be melted or cut off, while the Slavianoff method is essentially a welding, filling-in or building-up method.

The field for arc welding is extensive. In the past it has found wider application in repair work than upon new work. In marine work, for repairing propellers, stern frames and many internal breaks this service is invaluable. In the railroad shop arc welding is becoming extensively used for welding up cracks and breaks in locomotive frames and cars, where the work can be done without dismantling. Worn parts are frequently "built up" by the addition of new metal. Welding the ends of flues is becoming recognized as much superior to beading or expanding. Cracks in boilers, leaks at staybolts and the like are readily remedied by electric arc welding. In the foundry, arc welding is excellent for reclaiming defective castings, adding broken-off parts or filling blow holes. The Bernardos process is also used in foundries for melting off heavy risers and sink heads. In machine shops and manufacturing plants arc welding is becoming popular both for repair work and for new processes. Shafting may be welded together, keyways filled in, new metal added to gears from which teeth have been broken. The number of applications and opportunities for use is surprising when once realized.

Arc welding is also being adopted to some extent for civil-engineering work, being used to replace riveting. In a notable instance, that of the Catskill Aqueduct, N. Y., arc welding was used for connecting the sections of the steel bore, proving extremely successful.

(To be continued.)

Summer Outing of Cedarmen.

Friday, June 25, saw the departure from Minneapolis, Minn., of members of the Northern White Cedar Association on their annual midsummer outing, traveling north *via* the Northern Pacific Railroad in a private sleeper to Beaudette, Minn., some 450 miles north of Minneapolis. At Duluth and way points, additions to the party were made until the party grew to 58 men affiliated in some way or other with the northern white-cedar industry.

From Beaudette the party was conveyed by a fleet of six launches to a camp on Savaskong Bay, Lake of the Woods, approximately 60 miles north, a place of truly wondrous natural grandeur. Here for four days ensued enjoyment charactertisic of Cedarmen meetings. Under the chaperonage of Guides Riley, Koots, Trip and McGarry, long trips to points of interest throughout the lake were taken, including Nestor Falls, the Fisheries, Crow Portage, the home of numerous Indians, Lake Obabokin and others where fish and frolic aided in passing a most pleasant time and one not easily forgotten.

Here was found nature undisturbed in all her glory with deer, moose and other wild game in abundance. Fishing was unexcelled through every part of the hundreds of miles of lake dotted at close intervals with islands, which seem to rise like flowerbeds out of the vast sheets of blue. The stay was made immeasurably pleasant by the excellent fare of Chef Jack Everett, assisted by a corps of competent aids.

As usual contests were conducted, with honors at pea shooting taken by Secretary Boucher from Guide Riley, whose reputation in that most difficult accomplishment extends far and wide among the whites and Indians of the vicinity. Napoleon LaPointe administered defeat to Derricks of Rainy River, in a nut-swallowing game.

On Monday evening, the last in camp, a round-up was held, with T. M. Partridge officiating as ringmaster. All within reach were requested to show cause for their presence and contribute to the joy making. No executions were necessary because of business affairs being merged with the frolic.

Camp was broken on Teusday morning and a landing made at Beaudette after a pleasant journey through the lake. The evening was spent inspecting adjoining cedar yards. The majority of the party regretfully left on Tuesday evening after a sojourn thoroughly enjoyed by all.

Digitized by Google

Electrical Prosperity Week.

At the meeting of the Electrical Prosperity Week Advisory Committee, held at the offices of the Society for Electrical Development, New York City, July 1, the following questions were taken up, discussed and decided.

Poster Stamps.—It was realized that these would be a very effective means of bringing Electrical Prosperity Week to the attention of the public and it was decided to get up a poster stamp of the design of the Week, printed in four colors, for free distribution. The quantity to be ordered was discussed and it was the unanimous opinion that one or even two million would be insufficient for the purpose and it was left to the members of the staff who were on the Committee to decide, the consensus of opinion seeming to be that five million stamps should be ordered.

Bill Posters.—As 24-sheet posters would cost at least 90 cents each and as comparatively few of them would be used because of the cost of posting, it was decided to use 8-sheet posters only. If a member wishes to use a 24-sheet space he can do so by using two 8's, filling in the space between with the name of his own company. These 8-sheet posters to be furnished free to members only. Initial order to be 5,000.

Street-Car and Window Cards.—Quotations on cards lithographed in six and eight colors indicate that the cost would be too high and the members of the staff are now securing quotations on street-car and window cards lithographed in four or six colors, also printed in four or six colors, the ordering of these cards being left to the members of the staff. It was decided that the street-car cards and window cards should be the same size; in the case of the street-car cards the design and wording to be printed horizontally, the window cards to be used upright with the design at the top and the wording below. Window cards to be furnished free to all. Street-car cards to members only.

Window Lithograph.—This to be printed and furnished free to all, and to be 24 by 32 inches, carrying the design of the Week; to be lithographed in six colors; the initial order to be 5,000, with the privilege of increasing to 10,000 if necessary.

Muslin Signs.—A number of these (depending upon the cost) to be produced for use on delivery wagons, etc., and to be distributed free to members only. Quotations to be obtained and order placed by the staff.

Folders for the Public.—It was decided to produce a six-page folder 3.1 by 6.2 inches with contents as follows: Cover to contain the Week design with suitable wording under it. Back page blank (all but a few lines at top) for imprinting dealer's name and special proposition he may offer for the Week; this space to be surrounded by a border to indicate more clearly that something is to be printed in it. The last outside page to contain a simple chart showing lowering cost of electricity as compared with rising cost of other commodities. On the three inside pages a nice two-color line illustration of a very attractive, modest home; also thumb-nail sketches of the various members of the family; the word appeal to urge the readers to "Do It Electrically" and the Week of course, to be brought in. Folder to be printed in two colors, on coated stock, which allows a cost of less than $1.75 per 1,000 on the initial order of 2,000,000 decided upon. To be free to members only. To be sold at cost to non-members wishing to distribute them. Manufacturer and jobber members not to get them in quantity except a number of them for distribution in their own mail, imprinted to the effect that more may be obtained from the S. E. D. This to prevent non-member dealers getting folders free from manufacturers or jobbers and thereby preventing their joining the Society.

Imprinting.—As the Society is not in a position to imprint cheaply small quantities of folders, etc., it was decided that no imprinting should be done except of street-car cards.

Picture Puzzles.—The manufacturers (Pamos) quoted a price of about three cents each on 10,000 of each of seven designs (70,000). As we have not sufficient funds to purchase and distribute these free but would be obliged to sell them imprinted at about five cents each, and it had been determined not to *sell* anything connected with Electrical Prosperity Week to members, it was decided not to order any. The manufacturers have the designs prepared and the Society is to give them reasonable assistance in selling the puzzles.

Program of Ohio Convention.

The twenty-first annual convention of the Ohio Electric Light Association will be held at the Breakers Hotel, Cedar Point, O., July 20 to 23 inclusive.

The first session will be held on the afternoon of Tuesday, July 20. Col. C. V. Hard will deliver the presidential address, and reports will be made by the Executive Committee, the Secretary, the Illuminating Committee, and the Insurance Committee.

At the session on Wednesday morning, E. J. Bechtol, of the Hodenpyl, Hardy Company, New York City, will present a paper entitled "Every-day Problems Confronting the Central-Station Manager." The report of the Transmission and Distribution Committee will be presented by M. H. Wagner, and the election of officers will take place. In the afternoon a lecture will be given by R. H. Grant, sales manager of the National Cash Register Company.

At the session on Thursday morning, E. B. Fenton, of Sandusky, O., will present a paper "Snuggling up to John Smith." The report of the Meter Committee will be presented by A. H. Bryant and there will be a discussion of proposed meter rules. In the afternoon B. W. Waltermire, chairman of the Ohio Public Utilities Commission, will make an address.

At the session on Friday morning, Thomas F. Kelly will present the report of the Committee on New Business Co-operations, and C. W. Chappelle will present the report of the Committee on Electric Vehicles. A talk on Industrial Electric Heating will be made by H. O. Loebell, of Henry L. Doherty & Company.

The usual entertainment features have been arranged for the convention. The Association banquet will be held on Wednesday evening and balls will be held in the dancing pavilion on Tuesday and Thursday evenings. On Thursday afternoon there will be a bathing party with contests of various kinds. Musicales, card parties, a bowling party, and a launch ride have been provided for the ladies during the time occupied by the sessions of the convention.

The secretary of the Ohio Electric Light Association is D. L. Gaskill, Greenville, O.

Electric Club-Jovian League Picnic Arrangements.

The outing to be held by the Electric Club-Jovian League of Chicago at Ravinia Park, Ill., on August 5, promises to be the most elaborate and enjoyable event ever held by electrical men in Chicago. Two special trains will be run over the Chicago & North Western Railroad to the grounds, one leaving about 10 a. m. and one shortly after noon. Athletic events will start immediately upon the arrival of the early train.

Special attention is being given this year to aquatic events, and a very interesting program is being arranged. For the convenience of the picnickers "jitney" bus service will be established between the picnic grounds and the beach.

The usual concert by the Chicago Symphony Orchestra will be held in the afternoon and a grand opera performance will be given at night. Dancing will be held in the new open-air ballroom.

H. A. Mott is chairman of the general picnic committee and F. M. Rosseland, secretary. William Taussig is in charge of aquatic events; R. I. Phillips and O. B. Duncan in charge of sports on terra firma; and Morgan P. Ellis will be in charge of the rejuvenation which will be held in the open air between 5 and 8 o'clock p. m.

C. W. Forbrich, 608 S. Dearborn Street, is in charge of ticket disbursements. Tickets, including train fare, are $1.00.

Digitized by Google

Service at Any Cost.

The extent to which a public utility will go to maintain service, regardless of the expense or work involved, was strikingly illustrated by the Chicago Telephone Company during the recent strike of street and elevated railway employees in Chicago. Service had to be maintained because of the dependence of the public on the telephone for the transaction of its business and it is interesting to note that in this connection the traffic during the two days of the strike increased fully 50 per cent.

The greatest problem of the Chicago Telephone Company was the transporting of its 6,000 operators from their homes to the down-town exchanges. Every available conveyance was pressed into service and in addition several hundred of the day operators were quartered in the down-town hotels.

The employees entered into the spirit of the occasion and co-operated with the company to their fullest extent, frequently enduring hardships without complaint. One of the accompanying illustrations shows a group of operators at dinner in the Hotel La Salle and a truck load of employees en route to their homes after a day's work is shown in another view.

Truck Carrying Telephone Employees During Car Strike.

Production of Electrical Porcelain.

The annual report of the United States Geological Survey for 1914 shows that there was produced in this country during that year a total output of porcelain insulators and other porcelain electrical supplies valued at $4,130,270, compared with $5,737,741 in 1913. There were reported 37 firms engaged in this manufacture. The largest production was in Ohio, with a total of $1,472,359; then followed New York with $940,029, and New Jersey with $905,878. Electrical porcelain constituted 11.67 per cent of the total output of pottery products.

In 1914 the mines of Indiana yielded 16,641,132 tons of coal having a value of $18,290,928.

Group of Telephone Operators Quartered at Hotel La Salle During Car Men's Strike.

Digitized by Google

New Electrical and Mechanical Appliances

Porcelain Keyless Socket for Use in Husks.

A new type of porcelain socket particularly designed for use in husks on ornate fixtures has been placed on the market by Harvey Hubbell, Incorporated, Bridgeport, Conn. The accompanying illustration shows this new socket as it fits into a husk, thus demonstrating its special suitability for this purpose. This keyless socket is built along the lines of an electrolier socket, providing a compact and practical porcelain socket for fixtures where socket coverings are deemed to be desirable.

Metal caps for these sockets are obtainable with either one-eighth, one-quarter or three-eighths-inch bushings.

New Socket for Husk Work.

To facilitate attaching the cap to the husk a special wrench is furnished upon application with standard package quantities. On account of the special design of the socket interior, all wiring connections are easily and quickly made.

New Device to Eliminate Accidents Due to Phase Failure and Reversal.

When a motor-driven machine starts off in a direction opposite to that which the operator is expecting, serious accidents are liable to happen. An elevator may be dashed to the pit or through the top of the shaft, and costly machines, pumps, cranes, hoists, etc., may be seriously damaged if the direction of rotation is unexpectedly reversed when the starting device is closed. With alternating-current polyphase motors this may happen, due to reversing of the phases, and engineers have turned their attention to the problem of eliminating this source of accident. Failure of one phase may also cause burning out of the motor.

A new compact type of phase-failure relay, shown in the accompanying illustration, has been developed in the engineering department of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This device is similar to a vertical motor having a two or three-phase stator winding and a squirrel-cage rotor winding. The rotor shaft extends at the top, and to this extension a casting is secured, carrying contacts designed to close a pilot circuit which controls the motor starter. This phase-failure relay provides against abnormal drop in voltage, against failure of one of the phases, and against reversal of the phases.

If the supply voltage falls below about 70 per cent of the normal, the relay opens the control circuit of the motor controller and keeps it open until the line voltage returns to at least 85 per cent of normal. These limits can be adjusted before shipment to suit special conditions.

In case of phase failure, caused by the opening of one of the supply lines at any point, the relay opens the control circuit if the motor is under appreciable load, and keeps it open until the fault is corrected. If the load on the

Phase-Failure Relay.

motor is very light, so that no harm would result from its running single phase on acc[illegible] of the phase failure, the device [illegible] operate until the load is inc[illegible] motor shut down. If [illegible] at the time of phase failure the relay will act immediately. Thus the motor is allowed to run as long as no damage can result.

In case of phase reversal the relay opens the control circuit immediately and keeps it open until the phases are reconnected in the proper order. Accidents due to the motor running in the wrong direction when started up are, therefore, avoided.

New Interchangeable Attachment Plug.

A new type of separable, interchangeable, composition attachment plug of simple but sturdy design has

Interchangeable Attachment Plug.

been placed on the market by the Chelten Electric Company, 314 Armat Street, Philadelphia, Pa. The accompanying illustration of the body of the plug shows its compact and neat form. The edges of the plug are knurled, so that it may be readily screwed into lamp sockets or screw-type receptacles. The terminals are made of strong spring brass, giving excellent contact, and the electrical rating is 660 watts, 250 volts; the plug is really capable of carrying considerable overload if necessary.

The caps for these plugs are interchangeable with similar caps now on the market, thus furthering the movement for more general interchangeability of plugs and receptacles. Caps are made both in composition and with brass cover.

Unique Generator Set for Country-House Lighting.

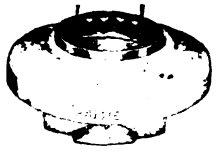
The duplex generator set for rural lighting plants described and illustrated on page 82 of our July 10 issue has attracted much attention among our readers. This machine is manufactured by Roth Brothers & Company, Adams and

Digitized by Google

Loomis Streets, Chicago, Ill. Through an oversight the name of the makers was omitted in the article referred to.

New Socket Base.

A new socket base is being offered by the H. T. Paiste Company, which fits all the shells for its "Multipo" or "New Wrinkle" types of sockets. This base is designed to fit on the 10-ampere openings of round-base pipe taplets, both those with a single opening and the gang types with two, three or four openings.



Pipe-Taplet Socket Base.

To install these socket bases, it is necessary merely to remove the switch bar and ring which are used for fastening switches and other surface fittings. The base entirely covers the opening of the pipe taplets, making a neat-looking fitting. No tap wires are required to fasten these socket bases to the main wires. The latter are bared for half an inch and slipped under the heads of the binding-screws.

Socket Shells That Fit New Base.

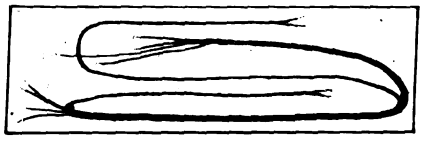
The key, keyless and pull-socket shells can be used on the same base. Paiste socket shells are now furnished with threaded bead, so that the "Uno" (one-piece) shade-holders can be screwed on them. This is much the quickest and easiest method of shade-holder fastening and secures a very rigid support. Uno shade-holders can be ordered at the same time, thus helping to bring the order up to the weight necessary to secure free delivery.

Uno Threaded Shade-Holder.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent for this as well as all other Paiste products.

Cable Assemblies for Motor Cars.

The Standard Underground Cable Company, Pittsburgh, Pa., is now furnishing its automobile cables in assembled or "harness" form, as shown in the illustration, complete with terminals and ready for installation. This method of selling cable was adopted by the company as a convenience for the buyer and it is said to possess also the advantage of economy, and to make for neatness, since a good assembly makes the best-looking installation on the finished car. The assemblies are made up to suit the dimensions of the cars on which they are to be installed and, since the necessary terminals are already attached, there is nothing to be done in installing the cable but to make the connections.



Assembled Motor-Car Cables.

New Caps for Attachment Plugs and Receptacles.

To the already large assortment of attachment plugs made by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., there have recently been added two caps in which the distinctive feature is a unique type of cord-strain relief which eliminates the need for knotting the cord and therefore produces a quicker assembly and a more durable combination. Fig. 1 shows an exploded view of the new cap that has standard contacts. At the top of the cap is a threaded ring which swivels around a split bushing that grips the cord when the ring is screwed into the depression in the upper end of the cap. The cord is first passed through the outer ring and its ends connected to the binding screws inside the cap. It is then drawn taut, the split bushing applied and the ring screwed about the bushing into the cap. This firmly clamps the cord so that the strain of pull on the cord does not come on the binding screws and the likelihood of a wire thereby breaking connection is eliminated.

These new caps may each be provided with a special strain-relief bushing adaptable to armored cable. These caps are interchangeable with the entire line of Hubbell wall and flush receptacles equipped with T slots, also with the respectively corresponding separable attachment plugs. The cap shown in Fig. 2 has the small-type contacts. This view shows the compactness of the completed cap with the bushing and threaded ring in place.

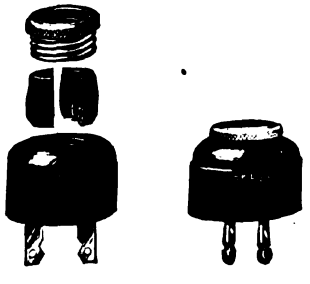
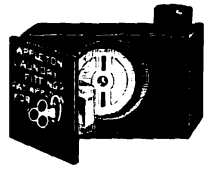


Fig. 1.

Fig. 2.

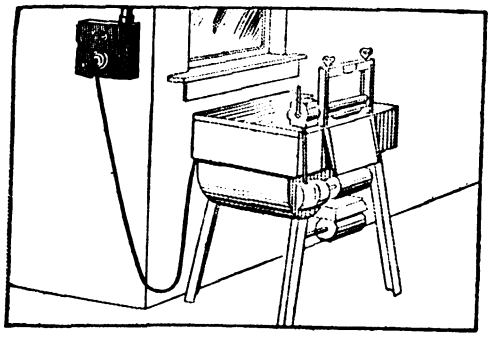
Special Fittings to Facilitate Liberal Use of Electricity in Apartment-House Laundries.

Despite the active campaigns for popularizing the electric washing machine and iron, these convenient labor-saving appliances have not been very extensively used by the residents of apartment houses because the laundries in such buildings have seldom been equipped so as to permit the different tenants to use electricity under proper conditions. Each tenant should have available a branch circuit from his meter for this special purpose, the outlet on this circuit being kept locked while not in use to prevent theft of current by other parties.



Special Laundry Fitting.

Three-Gang Laundry Fitting.



Use of Fitting in Laundry.

To meet this requirement there has been placed on the market a line of special fittings by the Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill. As shown in the

Digitized by Google

accompanying illustration, these fittings are made in single, two and three-gang style. These fittings are provided with one, two or three locked hinged doors, so that each tenant holds a key to his particular outlet. Where there are more than three tenants in the building, as many gang boxes as necessary are installed. The manner of installing a two-gang box and connecting it to a washer is shown in the line cut herewith.

Each of these fittings is made of drawn steel finished either in sherardized or black-enamel finish. The gang fittings are furnished with partitions forming separate compartments. The back of each compartment is drilled and tapped for the supporting screws of a receptacle for receiving the attachment plugs of the washer and iron. The fittings are easily installed and have a neat appearance. They should find a ready market because of the great need of a device of this kind that really promotes liberal use of electricity in laundry work.

New Ralco Plugs and Receptacles.

The great convenience of using small portable electric tools and appliances is steadily leading to the growing use of larger portable devices with which equal, if not greater, advantages can be obtained. Thus in industrial plants of all kinds the value of bringing the tool to the work in many cases is being appreciated and results in the use of even fairly large portable electric tools mounted on wheels or trucks. All this has called for a line of dependable plugs and receptacles capable of conveniently supplying currents of, say, 15 to 50 amperes. This growing demand has been met by the line of Ralco plugs and receptacles marketed by the Central Electric Company, 326 South Fifth Avenue, Chicago, Ill. Several of the Ralco devices have been described and illustrated in these columns in previous issues. To keep abreast of new requirements, however, several new plugs and receptacles have recently been added to the Ralco line and others improved.

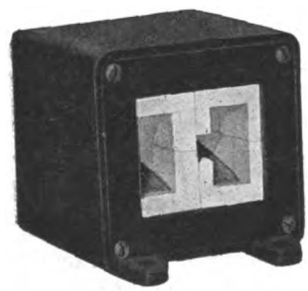


Fig. 1.—Ralco Two-Phase Receptacle and Plug.

Fig. 1 shows a two-phase receptacle with non-reversible plug. The box is of heavy cast iron with two lugs at the top and two at the bottom for mounting. The receptacle within has substantial porcelain blocks with phosphor-bronze contacts of liberal size. The plugs are built for heavy service and provided with easily wired contact plates. For two-phase service a non-reversible plug is used, as shown. A reversible plug is also made for this outfit for use on single-phase lines, although the one shown can, of course, be used in this case also.

A three-wire receptacle with non-reversible plug is shown in Fig. 2. This is much like the three-phase outfit, but is especially designed for use on three-wire direct-current circuits where the plug must be non-reversible. These sets are made for indoor and for outdoor use.

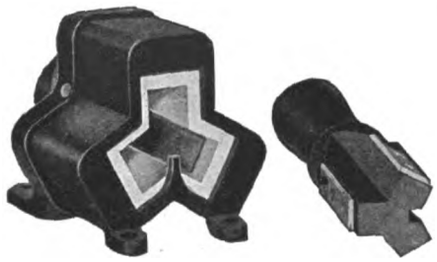


Fig. 2.—Three-Wire Receptacle and Plug.

The latter, or weatherproof type, is made fused or fuseless and is rated as high as 60 amperes, 220 volts or 30 amperes, 440 volts.

A swiveling receptacle with plug is shown in Fig. 3. This set consists of a special cast-iron swivel support below which is a standard two-wire Ralco receptacle. The conduit is brought in at the top. This device makes it possible to turn the plug and cord through nearly 180 degrees and avoids bending the cord near the plug. A single-pole outfit for 600-volt railway systems is also made of this type that finds favor in car barns and car shops.

A special flush receptacle, plug and box are shown in Fig. 4. This set is especially suited for use where the conduit is laid in concrete walls as a permanent wireway for portable lamps, tools, stereopticons and portable battery-charging outlets where space is valuable. This outfit is waterproof, which makes it peculiarly suitable for railway motor and locomotive pits, basements, etc. The mounting bases for the receptacle proper are set back in the box so as to be one inch from the face of the concrete to eliminate the liability of accidental breakage. The floor of the box slopes downward slightly, so that when set with its face flush with the wall there is a downward drainage toward the entrance. A spring door covers the receptacle opening. The cast-iron box has knockouts for three-fourths-inch conduit on all sides and rear.

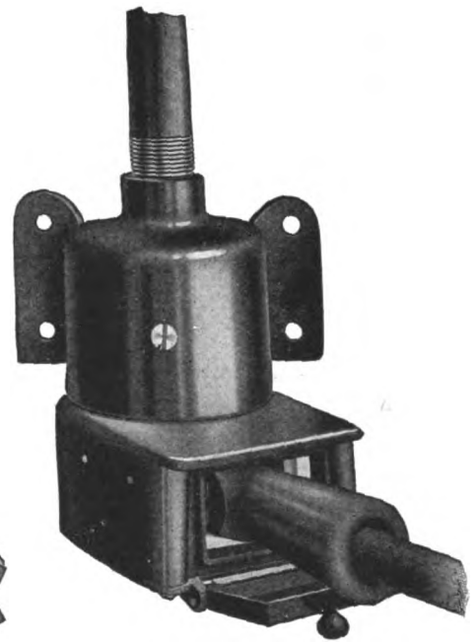


Fig. 3.—Swiveling Receptacle with Plug.

All these sets are built for severe service such as equipment of this type is likely to receive at the hands of brawny shop men.

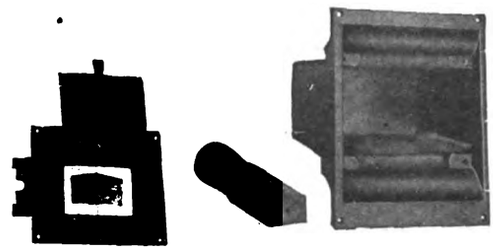


Fig. 4.—Flush Receptacle, Plug and Box.

Exhibit of Rectifying Apparatus for Motion-Picture Work.

One feature of the exhibit made by the Westinghouse Electric & Manufacturing Company at the Panama-Pacific International Exposition that attracted attention at the motion-picture convention held in San Francisco beginning July 12 was the display of motor-generators and rectifiers for supplying direct current to the projecting lamps used in the several motion-picture theaters about the exposition grounds.

A 4.5-kilowatt set supplies the picture machine used in the Pennsylvania Railroad Company's new steel exhibit car; this is in operation eight hours a day. A mercury-arc rectifier set is used to supply direct-current to the picture theater of the American Telephone & Telegraph Company. Four motor-generator sets are used in con-

Digitized by Google

nection with Simplex projection machines in the four picture theaters forming part of the exhibits of the United States Bureau of Education, the Precision Machine Company, the United States Steel Corporation, and the United Shoe Machinery Company. Another set is used with a Power projection machine in the exhibit of the Nicholas Power Company.

The various rectifying sets together with their simple control equipment are demonstrating the ease with which the direct current needed for satisfactory picture projection may be obtained from alternating-current supply systems.

New Adjustable Portable Lamp.

A new type of convenient portable lamp with cord-slack reel and general adjustability as prominent features has been placed on the market by the Rose-Strauss Company, 209 West Forty-Eighth Street, New York City. The lamp is provided with ten feet of connecting cord which can be readily coiled up to any extent on the automatic cord reel in the base by pressing a button. By having exposed only just enough cord to meet the need in any case, the difficulties from slack cord are avoided.

A strong steel clamp, rubber-covered, is inserted into the bottom of the base to enable the lamp to be hung or clamped to any hook, upright or other object. The lower surface of the base is protected so that it will not scratch or mar highly polished surfaces when used either as a stand or clamped lamp.

The main patented feature provides for swinging the lamp in any direction and on its pivot at will, but it is impossible to twist the cord, no matter in which position the lamp is turned. The base and section from the swing joint up also always remains stationary, while pulling out the length of cord desired for connecting onto the lamp socket. The lamp shade has a patented clamp attachment, which fits snug on any size bulb and is made in the form of a four-point spring that prevents the shade after being put into one position from dropping into another position.

This outfit is provided with an attachment plug that requires only a quarter turn to insert it in the socket or receptacle, thus avoiding twisting of the cord. A Cutler-Hammer push-button socket is supplied. In upright position, the outfit stands 11.5 inches high. For shipment or traveling, it can be folded up into a compact box five inches square.

New Delta Electric Lantern.

A new electric lantern which operates on two ordinary dry cells is being announced by its manufacturer, the Delta Electric Company, Marion, Ind. It is claimed by the makers that the new lantern will actually surpass the oil lantern in service and durability. This claim is made on the basis that the lantern is designed to throw a light through half a sphere and that its rugged construction will permit of its being used in every place an oil lantern is used.

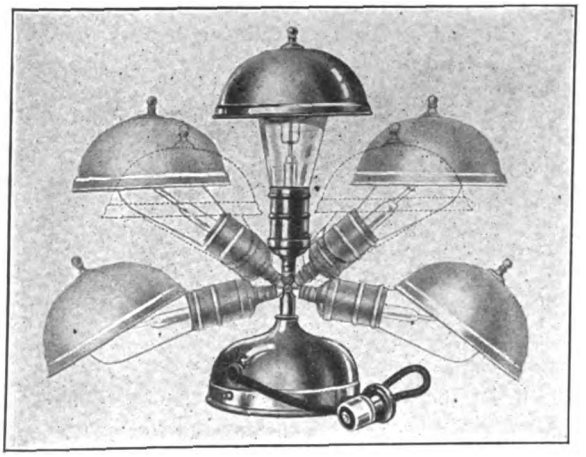
The case is constructed of heavy cold-rolled sheet steel, formed and ribbed in a manner to give great strength with a minimum weight. The base is flanged in the same way as oil lanterns, so that when the lantern is set down on hay or rough ground it will not upset. The lantern has a heavy drop-bail handle keyed to the battery case so it cannot possibly come out when in use. This bail handle is large enough to receive the arm of a big man in a big overcoat. In addition to the bail handle, there is a grip handle conveniently placed in the back. It can be folded back flush with the back of the lamp when not in use. There are thus no projections in the back of the lamp, so it can be hung on a nail without tilting to one side or another. The entire case is given a fine gloss-enamel finish, thoroughly baked. The trimmings are nickel-plated and highly finished.

A drawn-brass reflector is used, which is ribbed in such a manner as to give a broad spreading light. It is heavily silver-plated and polished to a mirror finish, making the reflector very efficient as well as attractive in appearance. A convex-concave lens made out of fine lens glass is supplied.

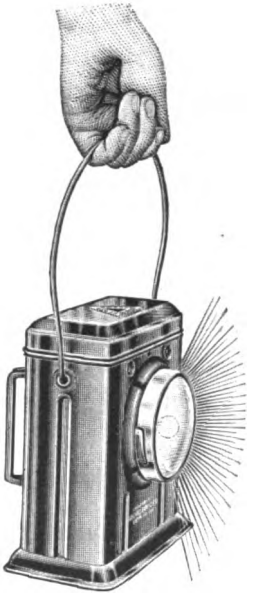
The switch is located in a protected place on the back of the lamp. It has German-silver contact points which are always under firm spring tension, assuring a good connection. A high-grade three-volt lamp with a drawn tungsten-wire filament is used. As all Delta bulbs are made, this one is sealed off with pure platinum wire, eliminating possibility of leakage. The seal is made through a glass stem and not through the thin wall of the bulb.

A recent visitor to the Delta factory reports there was a very large amount of equipment for making these lamps. Elaborate dies and tools are used which eliminate expensive process of manufacture, and as the Delta company makes every part of its lamps, it is enabled to make an unusually high-grade product at reasonable prices. The Delta Electric Company announces that this is only one of five new lanterns and lamps it is placing on the market.

Adjustable Portable Lamp.



View Showing Adjustability.



Delta Electric Lantern.

New Westinghouse Electrical Equipment for Gasoline Automobiles.

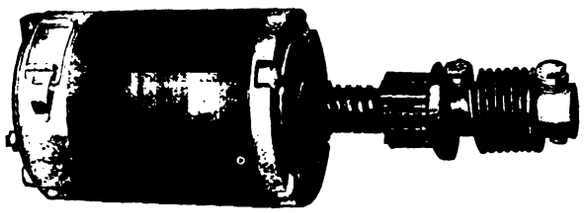
In preparation for 1916, the Westinghouse Electric & Manufacturing Company has added to its line of electric starting lighting and ignition equipment for automobiles, a round type of starting motor and lighting generator. Both

Digitized by Google

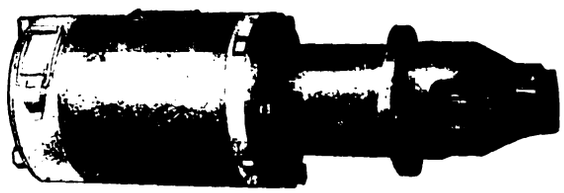
reduction in weight and increased compactness have been obtained in this new design.

Several methods of pinion shift are available in these new machines. The illustrations show the round type motors with automatic screw shift which can be arranged either for inboard or outboard mounting to suit the space requirements of the car.

When this form of shift is used full battery voltage is impressed on the motor when the starting switch is closed, and the motor starts immediately. The pinion, when the motor is at rest, is entirely away from the flywheel gear. The



Inboard Starting Motor Complete With Single-Reduction Screw Pinion Shift.



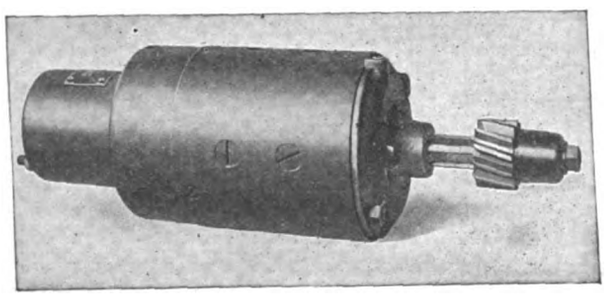
Outboard Starting Motor With Single-Reduction Automatic Screw Pinion Shift.

threaded shaft is connected to the reduction-gear shaft by a spring which thus forms a flexible coupling. As the load is not large enough to compress the spring when the motor starts, the threaded shaft is immediately revolved by the spring in released position. The pinion moves on its shaft by virtue of the revolving threads, until it reaches the flywheel. If the teeth of the pinion and flywheel meet instead of meshing, the spring allows the pinion to revolve until it meshes with the flywheel. When the pinion is fully meshed into the flywheel teeth, the spring compresses, and the pinion is then revolved by the motor as though a continuous shaft, turning the engine over. When the engine fires and the flywheel peripheral speed continuously exceeds that of the driving pinion, it forces the latter out of mesh, and it is returned to its original position in the screw-shaft housing. During the periods immediately after the engine has passed over any one of the points of maximum compression, the spring offers an elastic cushion between the flywheel and the reduction gear, so that the pinion will not be thrown out of mesh.

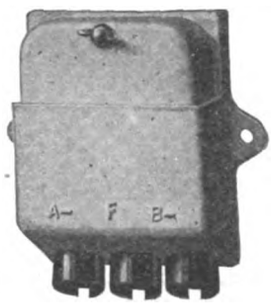
Another form of shift furnished is operated by an electromagnetic device mounted directly on the motor and operating through a hollow shaft, as shown in one of the illustrations. When the starting switch is closed, the circuit is completed through the switch and the shifting magnet and the motor, which is of the series type. The current flowing through the magnet circuit causes the armature and shaft and the pinion to rotate.

As the motor takes a relatively higher current at starting, the shifting magnet is energized sufficiently to overcome the force of the return spring and draws the shifting rod through the shaft, thus sliding the revolving pinion into mesh with the gears on the flywheel. Diagonal teeth are used on the flywheel and the pinion so that they mesh very easily. When the pinion meshes with the flywheel gear, the current required to turn the engine over is enough to hold the pinion in mesh until the engine fires, but as soon as the engine picks up and tends to drive the motor the current falls off immediately and the return spring of the pinion shift throws the pinion out of mesh to its original position. This method of starting requires a very small switch.

The round-type generators are furnished either with or without ignition auxiliary. They can be operated by chain or by gear drive directly from the engine.



Starting Motor With Magnetic Pinion Shift.



Automatic Voltage Regulator.

While the engine is not running or is running at very low speed, the lights are supplied entirely by the battery. At a predetermined speed the generator is "cut in" on the battery circuit by a separately mounted regulator and the generator supplies some of the current used by the lights or begins charging the battery if the lights are not turned on. On further increase of speed the voltage rises and it, together with the battery-charging current, is controlled by the automatic voltage regulator.

Two functions are performed by the voltage regulator. The first is to disconnect the generator from the circuit at speeds below that at which battery voltage is generated; the second, to maintain constant voltage at all speeds above the cut-in speed. This regulator is a small and compact device generally mounted on the back of the dash requiring no adjustment.

For ignition, a Westinghouse vertical ignition unit can be mounted directly on the generator, or mounted separately at some other point convenient for connecting mechanically to the engine. This ignition unit contains a low-tension interrupter or timer, ignition coil, condenser and a plate-type distributer. It is very compact and yet has all parts readily accessible. The core is designed particularly for high efficiency and low coil lag.

Special insulation and treatment are used in these small outfits as in the larger Westinghouse equipments. All windings become after treatment a solid mass that does not soften under heat, cannot work loose under vibration and is absolutely impervious to water, oil or gasoline. It is this treatment that has eliminated the possibility of open circuits in this line of automobile apparatus.

Everything has been done to make these outfits as light as possible. Not only has the size been reduced practically to a minimum, but everywhere possible the lighter metals have been used in the construction. End frames of the motors and generators are made of magnalium, a very strong aluminum alloy. Magnetic circuits have been so condensed as to use a minimum weight of material and the metal in all parts has been so distributed as to give ample strength without unnecessary weight.

New Magnetite Arc Lamps for Street Lighting at Charleston, W. Va.

One of the first installations of the new type of pendent magnetite or luminous arc lamps was recently made at Charleston, W. Va. The lamps were manufactured by the General Electric Company and are equipped with prismatic glass refractors. The system of

Digitized by Google

lighting in this city may be divided into three classes: "White Way" or ornamental lighting in the business section, intermediate lighting in the residential section, and suburban lighting.

In the business section are installed 62 four-ampere ornamental luminous arc lamps, using high-efficiency electrodes and equipped with fine-texture Alba globes. The lamps are mounted on ornamental brackets manufactured by the Electric Railway Equipment Company. The brackets are supported on steel trolley poles with overhead line construction. The poles are spaced approximately 120 feet apart on each side of the street and are staggered.

New Four-Ampere Luminous Arc Lamp.

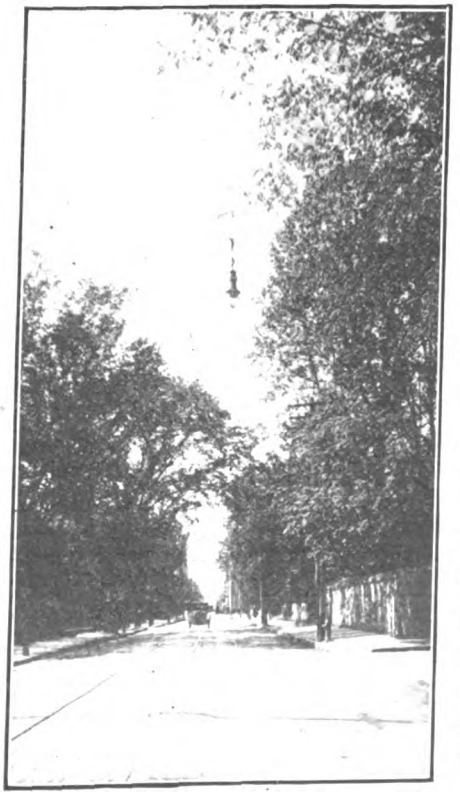
The elevation of the lamps is 16.5 feet from the curb to the arc.

With this spacing a wonderfully well diffused and brilliant daylight effect is produced with an almost entire absence of shadows. On account of the peculiar shape of the globe, considerable light is projected upward, which illuminates the front of the buildings from the pavement to the cornice. This soft and well diffused distribution of bright light is particularly effective and practical for business sections.

In the residential sections and throughout the greater part of the city, pendent luminous arc lamps with refractors and operating at four amperes are employed. These are hung from 22 to 25 feet above the street, at street intersections, which spaces the lamps from 300 to 400 feet apart. The refractor type of lamp, on account of its extensive distribution of light, is especially adapted to such spacing, and an exceptionally even illumination is produced on the street surface. Both the center-span and mast-arm suspension are used, in conformity with the physical requirements of different localities.

Ornamental Luminous Arc Lamps on Charleston Business Streets.

In the remaining outlying portions of the city and in suburban sections, where the use of large units is not warranted, low-wattage series incandescent lamps are employed, mounted on brackets and equipped with radial-wave reflectors. The entire system is operated from General Electric fifty-light, double-tube, series rectifier sets.

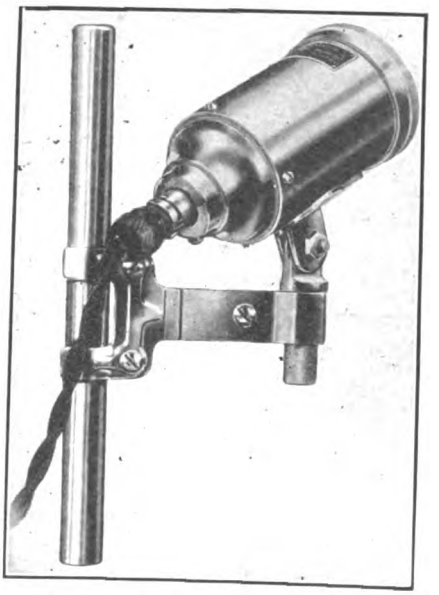


Pendent Luminous Arc, Center-Span Suspension, in Charleston Residence Street.

Dirigible Searchlight for Automobiles.

An improved searchlight for automobiles, known as the Pittsburgh Dirigible Searchlight, is illustrated herewith. This is a small compact lamp for wind-shield mounting, equipped with two high-power lenses and a Mazda bulb. It operates at six volts and gets its supply of current from the lighting system or can be used with a dry-cell battery, if desired.

It is cylindrical in shape, 6 inches in length by 2.25 inches in diameter, and is attached to the wind shield by means of a universal joint, which permits it to be turned in any direction desired.



Dirigible Automobile Searchlight.

The beam of light which it throws enables the driver to read sign-boards and house numbers without moving from his seat. It also affords him a light for backing the car, for illuminating short turns and for picking out objects that are out of the range of the ordinary headlight. This lamp on the wind shield saves the tourist a great deal of inconvenience and annoyance when traveling over strange roads. It is also a very valuable accessory for doctors' cars and delivery trucks.

The outfit is easily removable from the wind shield and when detached becomes a convenient lamp to use as a trouble-finder and in the garage It is manufactured by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

Digitized by Google

Latest Approved Fittings

FUSED ATTACHMENT PLUGS.—The Bryant Electric Company, Bridgeport, Conn.

Separable attachment plugs for use with glass-tube-inclosed fuses.

Bryant or Perkins, 2 amperes, 250 volts, catalog No. 3386.

Listed June 2, 1915.

GROUND CLAMPS.—Atlas Electric Company, 307 South Fifth Street, Philadelphia, Pa.

Ground clamp for use with No. 10 B. & S. gauge ground wire. A single-piece clamp of tinned copper, provided with suitably spaced holes and with galvanized bolt, nut and washer for clamping to rigid conduit. Adjustable for use with conduit up to and including one inch in size. One end of clamp is channeled to form equivalent of lug for soldering to ground wire.

Listed June 8, 1915.

RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. Flush type.

Disappearing door type, 25 amperes, 250 volts, catalog Nos. 446, 447, 448.

Listed May 29, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. Keyless, porcelain shell.

Sign, 660 watts, 250 volts, catalog No. 4099.

Bryant or Perkins metal-shell, closed or slotted boxes.

Pull, 250 watts, 250 volts. For use with metal molding, catalog No. Mldg. 486, Mldg. 487, Mldg. 587.

Listed June 10, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal-shell, closed or slotted bases.

Conduit box, catalog Nos. 4102, 4103.

Conduit box, 1,500 watts, 600 volts, catalog Nos. 4095, 4097.

Listed June 15, 1915.

RECEPTACLES, Standard. — The Tregoning Electric Manufacturing Company, 418 Prospect Street, Northwest, Cleveland, O.

660 watts, 250 volts.

Sign, catalog No. 311.

Listed May 22, 1915.

RHEOSTATS. — General Electrtic Company, Schenectady, N. Y.

Motor starters, types CR-1001 and (panels) CR-2201-2206 inclusive.

Speed controllers, types (panels) CR-1300, 1310, 1311, 1321, 1324, 1325.

Resistance units, types CR-9142-9145 inclusive.

CR-1001 starter is standard only when circuit-breaker or fuse is installed in connection with it.

Listed May 27, 1915.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

SIGNAL APPLIANCES. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

A special flush switch controls a 125-volt signal-lamp circuit which can be opened by a button and closed by a solenoid, these forming parts of switch. The circuit of solenoid can be closed by a special pendent push-button switch or push-botton flush switch, catalog No. 487, and includes a small single-pole glass-tube fuse in a special casing. The closing of circuit by flush switch is designed to open circuit of solenoid and pendent switch.

An auxiliary audible signal device consisting of a three-inch single-stroke bell designed for connection in series with coil of solenoid switch and including a push-botton switch whereby bell may be shunted if desired.

Listed June 8, 1915.

SOCKETS, Standard.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

C. E. M. 660 watts, 250 volts.

Key, catalog Nos. 11010, 11050, 11052.

Keyless, catalog No. 11060.

Listed June 1, 1915.

SOCKETS, Standard.—Wirt Company, Armat and Lena Streets, Germantown, Philadelphia, Pa.

Dimalites: Extension sockets, Fig. 23 with pull cords; Fig. 24 with turn shade 40 watts, 125 volts.

Fixture sockets: Fig. 27, with turn shade 40 watts, 125 volts; Fig. 31, with two pull chains, 25 watts, 125 volts.

Listed June 3, 1915.

SWITCHES, Authomatic.—M. & O. Automatic Switch Company, Michigan City, Ind.

Automatic time switch.

This device consists of a cast-iron case inclosing an 8-day, 24-hour clock mechanism, arranged to operate a standard double-pole snap switch, 30 amperes, 250 volts.

Listed June 8, 1915.

SWITCHES, Combination Cutout.—The Johns-Pratt Company, Hartford, Conn.; H. W. Johns-Manville Company, sole agent, New York, N. Y.

Noark service-entrance switches.

Cast-iron boxes, each containing two-pole, porcelain plug-fuse cutout bases mounted on the inside of the box cover and provided with blades making contact with terminal clips, on porcelain bases secured to the bottom of the box, when the cover is closed. 30 amperes, 125 volts, catalog Nos. 3667 and Special No. 6081.

Listed June 1, 1915.

SWITCHES, Surface Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. (With metal covers.)

Double-pole, 10 amperes, 250 volts, catalog No. 2050-Special.

Listed May 24, 1915.

SWITCHES, Surface Snap. — The Trumbull Electric Manufacturing Company, Plainville, Conn.

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 325-328, inclusive.

Double-pole, 10 amperes, 250 volts, catalog Nos. 355-358½ inclusive, 458½.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 368, 369.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 378, 379.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 430-433 inclusive.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 434-437 inclusive.

Also the above types with lock attachment (catalog No. 398) and key (catalog No. 399).

Listed June 7, 1915.

TOGGLE BOLTS.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Cone-head toggle bolts consisting of soft-steel, case-hardened, electrogalvanized toggle nuts having three prongs and screwing on to No. 8 soft-steel electrogalvanized machine screws of 2-inch, 3-inch, and 4-inch lengths, catalog No. 420.

Standard for use only in supporting metal molding.

Listed June 8, 1915.

WIRE CONNECTORS. — Sharfink Electric Manufacturing Corporation, 84 Walker Street, New York, N. Y.

No-Torch connector consists of a brass clamp inclosed in a steel sleeve with set-screws for tightening jaws of clamp upon conductors. For splicing wires without solder.

This device is considered suitable for joining wires of No. 12 B. & S. gauge, or smaller, where such joints are accessible for inspection at all times.

This connector must be insulated as required for soldered joints.

Laboratory tests indicate that this connector will not hold more than three No. 14 B. & S. gauge, more than two No. 12 B. & S. gauge conductors, nor wires of different sizes placed in same end.

Listed May 26, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

PLYMOUTH, MASS.—Ornamental street lights, numbering 32 units, and about 2,500 feet of underground conduit, will be installed by the Plymouth Electric Light Company. W.

HAGERSTOWN, MD.—A company is being organized to take over Shepherdstown Electric Light and Power Company and to construct a water works at Shepherdstown. A large electric power house will be built on the Potomac River at mouth of the Antietam Creek.

NORTH CENTRAL STATES.

LIMA, O.—The Western Ohio Railway Company has disposed of its interests in electric plants in nine towns in this section, to the Standard Power and Equipment Company, and a new company, under the same name as the former, is to be organized, with a capital stock of $1,000,000, for the purpose of operating the plants and extending their service. L.

WASHINGTON, O.—The City Council, which is preparing to enter into a new contract with the Washington Light and Power Company, involving the installation of a new ornamental street-lighting system, has retained H. Whitford Jones for the purpose of assisting the city in designing the work. L.

VERNON, IND.—The Vernon Hydro-Electric Company has been incorporated with a capital of $1,000, by George C. Ale, F. T. Semon and others, to manufacture and sell electricity.

BLOOMINGTON, IND.—Residents of South College Avenue are making a junket to Noblesville, Ind., and other cities, where they are looking into the subject of lighting clusters. They announce their intention to install the best cluster-lighting system in Indiana. It is stated that iron standards and five lamps will be used. The junket committee is composed of Dr. C. E. Harris, Dr. Leon Whetsell, Carl Breeden and Fred Beck.

KALAMAZOO, MICH.—A special election will be held shortly to submit two municipal gas and electric bond issues. The latter is to extend the municipal lighting plant to furnish commercial power and light to the entire city. Address Mayor James B. Balch.

JANESVILLE, WIS.—A petition is being circulated for the installation of an ornamental lighting system in the business district.

HALLOCK, MINN.—Bonds to the amount of $15,000 have been voted for the purpose of establishing an electric light system in this village. Work will not be started until fall.

LAKEFIELD, MINN.—Bids will be received until July 28 for improving the water and light system. The specifications include one 125-horsepower fire-tube boiler, four feet by 100 feet concrete chimney, one 75-kilovolt-ampere belted alternator for present engine, one 100-kilovolt-ampere engine-generator unit, switchboard, etc., for the electric lighting plant, and erecting poles, wire, street lamps, transformers, etc., for the electrical distribution system. Address E. C. Anderson, village recorder.

MEIRE, MINN.—Business enterprise in this little village has asserted itself in a demand for an electric lighting system. A system which will cost in the neighborhood of $3,000 is to be built.

ST. PAUL, MINN.—A plan is under consideration to build a central electric light plant to supply light and heat to the city hall, the public library, the police station and other public buildings. Data relative to the cost of such an installation, and the saving that may result to the municipality from it, are being secured by G. O. House, superintendent of the Water Department.

BANCROFT, IOWA.—Bonds to the amount of $10,000 will be issued for an electric light plant. Address City Clerk.

HAZELTON, IOWA.—The proposal for an electric light plant voted and carried. Address Town Clerk.

RICEVILLE, IOWA.—The Riceville Electric Light and Power Company plans to purchase within six months, one 100-horsepower Diesel-type crude-oil engine; also within next 12 months, 12 meters and 24 flat irons. Address L. E. Markham, manager.

SPRINGVILLE, IOWA.—F. M. Hahn, owner of the local light plant, plans to make extensive improvements to plant within six months; also, to purchase transformers, poles, lightning arresters, insulators, meters, etc., also vacuum cleaners and washing machines.

INDEPENDENCE, MO. — Additional machinery will be purchased for electric plant. Address Christian Ott.

ELKTON, S. D.—Decision has been made to install an electric light and power plant adequate to supply the needs of this village.

MARION, KANS.—The City Commission will expend $25,000 improving the light and water system. Address City Engineer.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—General contract for the construction of the new Y. W. C. A. has been let to the George H. Rommel Company, of Louisville, at approximately $130,000. The electrical contract, yet to be let, will be handled through the architect's office, John Bacon Hutchings.

SOMERSET, KY.—Equipment for a "white way" to extend seven blocks on both sides of the street, is the subject of inquiries for data made by Fred Hunt's machine shop here. Prices and descriptions are wanted on "white way" posts, fittings, fixtures, wire, globes, etc.

MUSKOGEE, OKLA.—A committee of five prominent business men and bankers of the city of Muskogee has been appointed by the Greater Muskogee Association to work out a feasible project for building a dam across the Grand River between Muskogee and Fort Gibson, to generate hydroelectric power. Several plans for financing the project have been submitted by financiers and promoters, and some offers to build the dam under various concessions to be granted by the city of Muskogee have been received. A complete survey has been made, and plans and specifications containing profiles and estimates are in the hands of the committee. The approximate cost of the dam as projected will be $750,000 when complete.

WESTERN STATES.

DILLON, MONT.—The city lighting committee is interviewing property owners with a view to installing a new lighting system, the plans for which call for eight posts to a block, those on the business streets bearing a cluster of three 60-candlepower lamps and the others one lamp.

FLAGSTAFF, ARIZ.—A movement is on foot here for the installatioin of ornamental lamps in the downtown business district.

ARTESIA, CAL.—An election has been called by the Supervisors of Los Angeles County for the formation of a public highway lighting district embracing this city.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded the contract for improvement work in the Angeles-Mesa Lighting District.

PATTERSON, CAL.—The Board of Supervisors of Stanislaus County has called an election for the establishment of the Patterson Lighting District.

RIVERSIDE, CAL.—The City Council has received a recommendation from the Board of Public Utilities for the installation of a lighting system on North Orange Street.

TEHACHAPI, CAL.—Material for the electric light system has arrived and actual construction work will be started immediately.

BURNS, ORE.—The City Council has passed an ordinance providing for an amendment to the city charter authorizing the city to issue and sell bonds in the sum of $110,000 for the construction of a light plant, waterworks and sewer system.

SALEM, ORE.—Application for permission to use waters of the Wallowa River for the purpose of developing

Digitized by Google

current for power and domestic purposes, at Joseph, Ore., has been made by the Wallowa Lake Amusement Company. This company operates an amusement resort at Joseph, and the current to be developed will be utilized in lighting the buildings and grounds and in operating power plant, etc. Active construction will be started as soon as permission is granted. O.

BREMERTON, WASH.—The Bremerton-Charleston Light and Fuel Company, of Bremerton, has applied to County Commissioners of Kitsap County, for a permit to establish and maintain electric transmission lines, and accessories, over and along the county roads, highways and streets on Bainbridge Island. R. E. Gordon, county auditor, states the franchise will be granted. O.

REPUBLIC, WASH.—The Ferry County commissioners, here, have been petitioned by George S. Bailey, for the right to construct, operate and maintain transmission lines for electric current over and along public highways in this county. Bailey states if the franchise is granted, construction work will be inaugurated as soon as materials can be placed on the ground. Q.

TACOMA, WASH.—The City Council has passed a resolution providing for the installation of a street lighting system, consisting of a cast-iron standard with a single globe.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 17,428. ELECTRIC BICYCLES AND ACCESSORIES.—The Bureau of Foreign and Domestic Commerce is in receipt of a letter from a manufacturing firm in the United States stating that one of its correspondents desires to be placed in touch with manufacturers of electric bicycles and accessories.

NO. 17,433. POCKET LAMPS.—An American consular officer in Brazil transmits the name and address of a firm of commission merchants which has indicated a desire to receive descriptive literature, etc., relative to small pocket electric flashlights.

NO. 17,453. ARC-LAMP GLOBES.—An American consular officer in England reports that a firm in his district desires to communicate with American manufacturers of heat-resisting inner and outer globes for arc lamps. Prices should be quoted c. i. f. British ports, if possible.

FINANCIAL NOTES.

Dividends.

	Term	Rate	Payable
Brooklyn City R. R.	Q	2%	July 15
New Hampshire Elec. Ry. pf.	—	2%	July 31
New York State Rys. pf.	S	1.25%	July 30

Reports of Earnings.

AMERICAN POWER & LIGHT.
(Consolidated Earnings of Subsidiaries.)

	1915	1914
May gross	$537,918	$526,745
Expenses and taxes	298,022	289,678
Net earnings	239,896	237,067
12 months gross	7,070,030	6,409,425
Expenses and taxes	3,732,700	3,458,277
Net earnings	3,337,330	2,951,148

AMERICAN PUBLIC SERVICE COMPANY.

	Yr. Ended Apr. 30, '15	Yr. Ended Dec. 31, '14
Gross earnings	$502,910	$411,775
Expenses and taxes	330,712	274,870
Net earnings	172,198	136,905
Interest charges	93,006	71,472
Balance	79,192	65.433

MISSISSIPPI RIVER POWER.

	1915	1914
May gross	$ 139,445	$134,063
Net after taxes	110,168	110,519
Surplus after charges	2,881	24,272
Twelve months' gross	1,604,289	.....
Net after taxes	1,261,063	.....
Surplus after charges	98,588	.....

CUMBERLAND COUNTY POWER & LIGHT.

Cumberland County Power & Light Company for the eleven months ended May 31, 1915, reports as follows:

	1915	1914
Gross earnings	$2,318,604	$2,219,745
Net after taxes	1,114,300	1,036,138
Surplus after charges	304,916	249,522

COLUMBUS RAILWAY, POWER & LIGHT.

	1915	1914
May gross	$ 245,947	$ 254,559
Net after taxes	94,777	87,979
Surplus after charges	56,956	44,306
12 months gross	3,065,554	3,052,154
Net after taxes	1,219,210	1,086,602
Surplus after charges	751,235	597,494
Balance after preferred dividends	466,112	312,371

CHATTANOOGA RAILWAY & LIGHT.
(Tennessee Railway, Light & Power Subsidiary.)

	1915	1914
May gross	$ 90,009	$ 94,761
Net after taxes	31,891	35,650
Surplus after charges	1,812	6,810
12 months gross	1,045,731	1,172,194
Net after taxes	340,806	463,035
Deficit after charges	6,625	*147,229

*Surplus.

WISCONSIN PUBLIC SERVICE COMPANY.

Earnings for ten months ended April 30, 1915:

	1915	1914
Gross earnings	$417,335	$363,356
Expenses and taxes	227,388	216,220
Net earnings	189,947	147,137
Bond interest	86,875	79,258
Balance	103,072	67,878

CUMBERLAND COUNTY POWER & LIGHT.

	1915	1914
May gross	$ 294,546	$ 197,885
Net after taxes	86,744	83,750
Surplus after charges	16,418	20,246
12 months gross	2,550,473	2,429,876
Net after taxes	1,109,321	1,031,525
Surplus after charges	339,540	283,838
Balance after preferred dividends	201,540	145,838

PORTLAND RAILWAY, LIGHT & POWER.

	1915	1914
May gross	$ 446,149	$ 538,473
Net after taxes	192,411	251,185
Surplus after charges	3,971	67,542
12 months gross	5,794,271	6,739,779
Net after taxes	2,644,825	3,386,535
Surplus after charges	437,538	1,282,782

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 12	July 5
American Tel. & Tel. (New York)	119¾	120½
Commonwealth Edison (Chicago)	135	135
Edison Electric Illuminating (Boston)	237	237
Electric Storage Battery common (Philadelphia)	52	53¼
Electric Storage Battery preferred (Philadelphia)	52	53¼
General Electric (New York)	161½	168½
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	5	5½
Massachusetts Electric preferred (Boston)	34½	35½
National Carbon common (Chicago)	———	137
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	131	129
Philadelphia Electric (Philadelphia)	23¾	23¾
Postal Telegraph and Cables common (New York)	75¾	75
Postal Telegraph and Cables preferred (New York)	64	66¼
Western Union (New York)	65¾	66⅛
Westinghouse common (New York)	97	99⅜
Westinghouse preferred (New York)	122	123¼

PERSONAL MENTION.

MR. C. A. YARRINGTON has been appointed manager of the South Boston Electric Light and Power Company, South Boston, Va., assuming charge on July 15.

MR. CHARLES W. EMBURY has been appointed chairman of the Electric Lighting Committee of the Chicopee Mass., city government. He is a local banker, and not being a politician it is confidently expected his appointment will tend to keep the municipal plant out of politics.

MR. HENRY FLOY, consulting engineer, New York, N. Y., has been retained by the Department of the Interior, Washington, D. C., for the purpose of visiting, inspecting and reporting on the plant and property of the Mt. Whitney Power and Electric Company, situated within the Legnoia National Park.

MR. W. S. GREENAWALT, of Steelton, Pa., assistant superintendent of the Pennsylvania Steel Company's open-hearth furnaces, has been appointed superintendent of the new $2,000,000 electric steel plant of the American Iron and Steel Company, of Reading and Lebanon, Pa., which is about ready to begin operations.

MR. EDWIN M. HERR, president of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., received the honorary degree of Master of Arts from Yale University at the two-hundred and fifteenth commencement, June 23. Mr. Herr became assistant general manager of the Westinghouse Air Brake Company in 1899, later becoming general manager of that company. In 1905 he was appointed first vice-president of the Westinghouse Electric and Manufacturing Company, which position he occupied until his election as president in 1911.

MR. THOMAS A. EDISON, it is announced, has responded to the invitation of Secretary of the Navy Daniels to head a board of civilian inventors to advise a new branch of the service—the Bureau of Invention and Development. Mr. Edison has been quoted at some length recently with regard to the importance of the United States being thoroughly in touch with inventions which might lead to its supremacy in time of war. The definite plan of organization has not been worked out, but it is understood that Mr. Edison's associates in the new effort will be conspicuous for the contributions already made to the development of American art and industry.

OBITUARY.

MR. BASEL D. CHILDERS, secretary and treasurer of the Childers & Waters Electrical Company, of Louisville, Ky., aged 52, died at a Louisville infirmary after a long illness. He was unmarried and is survived by three brothers, C. C. Childers, president of the company, Henry H. and S. Y. Childers.

Digitized by Google

MR. EMIL RATHENAU, managing director of the Allgemeine Elektricitäts Gesellschaft, of Berlin, Germany, died recently, at the age of 76. According to the London *Electrician*, "after serving a four years' apprenticeship at the Wilhelmshutte in the mechanical engineering shops, Herr Rathenau finished his training at the Hanover and Zurich Polytechnics. After leaving Zurich he entered Messrs. A. Borsig's locomotive factory at Berlin, and later he came to London, where he entered the firm of John Penn & Son as technical draughtsman. To gain further experience in machine design he subsequently took an appointment with Messrs. Easton, Amos & Sons, and later on joined the staff of the English & Continental Steam Engines Improvement Company. Herr Rathenau returned to Germany in 1865, and, with a friend, bought the mechanical engineering works of M. Webers in Berlin. In this he was very successful, especially during the 1866 and 1870-71 wars, when several contracts were placed with the firm for war material. In 1876 he visited the Philadelphia Exhibition, where he saw the first telephone, but on his return to Germany he was unsuccessful in securing a concession for telephony in Berlin. The Paris Exhibition of 1881, however, incited him to a more successful move, for, having seen Edison's incandescent lighting system, he acquired the German Edison patent rights from the Continental Edison Company, succeeded in interesting rich banking firms in the matter and founded a pioneer company. The latter company developed into the German Edison Company for Applied Electricity, with a capital of five million marks, was formed in 1883, Herr Rathenau being the first director. Out of this company grew the world-famed Allgemeine Elektricitäts Gesellschaft, and also the Berlin Electricity Works, of both of which companies Herr Rathenau has been managing director from the commencement. In July, 1900, the Emperor conferred upon him the title of Geheimer Baurat. Various other honors and distinctions were conferred upon him, including that of officer of the French Legion of Honor, honorary Doctor of Engineering of the Berlin Technical High School, and honorary Doctor of Philosophy of Berlin University."

DATES AHEAD.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 20-23. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Fifteenth annual convention, San Francisco, Cal., July 21-24. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

American Association for the Advancement of Science. Summer meeting, San Francisco, Cal., August 2-7. Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23, 24 and 25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-20. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York City.

With the Electrical Manufacturers

The Barber-Dwinnell Electric and Manufacturing Company, Kansas City, Mo., has been appointed district sales agent for the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Territory assigned covers Kansas, Oklahoma, Nebraska and the western portion of Missouri. The company will carry a large stock of starters, controllers and rheostats at Kansas City headquarters.

Royal Electric Manufacturing Company, 556 East Fortieth Street, Chicago, Ill., has ready for distribution a bulletin on its new triple-pole trolley-contact outdoor disconnecting switch. This switch has a distinctive, non-freezing, rolling-wedge contact. It is furnished for a variety of voltages and either with or without chemical fuses, horn-gap lightning arrester, choke coils, and automatic grounding device.

Wheeler Reflector Company, 156 Pearl Street, Boston, Mass., has issued Bulletin R, describing and illustrating Wheeler "Para-Steel" reflectors for industrial lighting with Mazda lamps of the vacuum and gas-filled types. These reflectors are made in a great variety of forms and sizes to suit practically every requirement. Each type is illustrated with one or more views or diagrams.

National Metal Molding Company, Pittsburgh, Pa., has ready for distribution a leaflet that describes and illustrates the use of its No. 377 single and double-clamp bushings. Use of these bushings is required according to the National Electrical Code in making entry of metal molding into various fittings having "twistouts." These bushings serve both to protect the wires and to make a proper connection of the molding and fitting.

The Columbia Products Company, 1012 Garfield Building, Cleveland, O., has assumed the exclusive sale of the whiting and filler formerly handled through the offices of the Columbia Chemical Company and the National Whiting Company. These products will hereafter be known under the trade names of Columbia Whiting and Columbia Filler. These have established a reputation wherever used and the same high standard will be maintained as heretofore.

Hubbard & Company, Pittsburgh, Pa., has ready for distribution circular No. 755, describing its Universal lightning arrester for line or station service on central-station lines of from 500 to 13,200 volts. The company also has available a leaflet on the Hubbard Steelwing anchor; this is a drop-forged steel screw anchor, which, according to the manufacturer, combines dependability with low first cost and low labor cost. Copies of these circulars will be sent to those interested upon request.

Digitized by Google

The Bristol Company, Waterbury, Conn., has prepared a 24-page booklet (Bulletin 200) giving an illustrated description of its fine exhibit at the Panama-Pacific International Exposition, San Francisco, an account of which appeared in one of our recent issues. Some 40 general and detailed views of the display are shown, giving an excellent idea of the great variety of recording instruments made by the Bristol Company and of some of the characteristics of each. A brief history of the company's development is also given.

The Chelten Electric Company, Incorporated, Philadelphia, Pa., has ready its 1915 catalog of electrical specialties. It describes and illustrates push-button flush switches, lock switches, switch plates, special plates, receptacles and attachment plugs, indicating heater and switch receptacles, sectional switch and conduit boxes and adjustable ground clamps. The catalog is attractively illustrated. A handy freight and parcel-post table is included, also two indexes. The company also has issued in leaflet form a price list of the new Chelten non-arcing inclosed fuses, which are made in a variety of forms and sizes.

Detroit Fuse and Manufacturing Company has let contracts and started work on a new three-story concrete and steel addition to its plant at 1400 Rivard Street, Detroit. The new building will have 35,000 square feet of floor space which will give a total of 60,000 square feet for the manufacture of "Square D" steel-inclosed switches, ironclad fused switches, induction-motor starters and "Arkless" inclosed fuses. This is the second addition made necessary by the company's increased business. The first building was erected in 1909 at 1400 Rivard Street, the first addition being built in 1912. The new building will embody the latest ideas in factory construction, and will be equipped with the most modern machinery obtainable. President Bryson D. Horton, in speaking of the rapid advance the company has made, stated that in June, 1915, the largest month's business in the history of the Detroit Fuse and Manufacturing Company was placed.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued bulletin No. 1632 devoted to centrifugal pumps and centrifugal pumping units. This is a 44-page publication containing much valuable information on pumping with centrifugal units, for which electric-motor and steam-turbine drives are peculiarly adapted. The various types of centrifugal pumps manufactured by the company are described and illustrated in great detail. These pumps are made for a great variety of conditions and in each case a type and size that will give the highest possible operating efficiency can be selected. Data and characteristic curves of value in selecting the proper pump are given. Many views are shown of typical installations of centrifugal pumping units, thus giving a good idea of the variety of services for which they can be used; among these services are: boiler feeding, mine pumping, underwriters' fire and city fire service, domestic and city water supply, irrigation, sewage pumping, etc. The cover of the bulletin shows a fire test where twelve high-pressure hose steamers were supplied from a centrifugal pumping station.

The Esterline Company, Indianapolis, Ind., announces that the value of graphic-meter curves is rapidly being appreciated as is evidenced by the fact that the company has just closed a record-breaking month for graphic-meter sales. Amongst others, the following purchased such instruments during June: St. Paul Gas Light Company, St. Paul, Minn., utility wattmeter; Trumbull Electric Manufacturing Company, Plainville, Conn., two wattmeters; Eli Lilly Company, Indianapolis, Ind., ammeter; Pennsylvania Railroad Company, Altoona, Pa., wattmeter; Public Service Commission of Indiana, utility wattmeter and voltmeter; Martien Electric Company, Cleveland, O., three switchboard meters; Northern Electric Company, Toronto, Ont., wattmeter and voltmeter; Terre Haute, Indianapolis & Eastern Traction Company, ammeters; Sears, Roebuck & Company, Chicago, three speed recorders; Electric machinery Company, Minneapolis, Minn., voltmeter; Edison Illuminating Company of Detroit, utility wattmeter; Mechanical Refrigerator Company, Chicago, utility wattmeter; Philadelphia Electric Company, Philadelphia, Pa., two wattmeters; Utah Power & Light Company, Salt Lake City, wattmeter; H. C. Frick Coke Company, Pittsburgh, Pa., two voltmeters, two ammeters and utility wattmeter; Department of Wharves, Docks and Ferries, Philadelphia, Pa., utility wattmeter; Davis Manufacturing Company, Milwaukee, Wis., three wattmeters; Virginia Railway & Power Company, Norfolk, Va., wattmeter; Dodge Brothers, Detroit, Mich., voltmeter and ammeter; Des Moines Electric Company, Des Moines, Iowa, utility wattmeter; Cutler-Hammer Manufacturing Company, Milwaukee, Wis., wattmeter. Many large concerns appreciate the value of these efficiency records, as is proved by the unsolicited repeat orders that have been received from such concerns as Armour & Company, Pacific Portland Cement Company, Des Moines, Electric Company, Springfield Light & Heat Company and the Edison Illuminating Company, of Detroit.

Record of Electrical Patents

Issued by the United States Patent Office, June 22 and 29, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

Patents of June 22, 1915.

1,143,611. Headlight Dimmer. F. G. Christensen and T. W. Fuller, Racine, Wis. Tubular guard may be interposed between lamp and reflector.

1,143,632. Illuminated Clock. H. Kienzle, New York, N. Y. Arrangement of battery and lamp to illuminate dial.

1,143,633. Means for Securing Contacts. C. J. Klein, Milwaukee, Wis. Particular structure of co-operating contact and insulating base.

1,143,650. Non-Glare Reflector. J. F. Scribner, Chicago, Ill. Generally concave reflector has flat center of higher reflection than surrounding parts.

1,143,662. Electric Generator. C. A. Stickney, St. Paul, Minn. Mounted on pump; clutch permits operation by hand or by explosive engine.

1,143,663. Lighting System for Cinematographs. R. Straubel, assignor to firm of Carl Zeiss, Jena, Germany. Arrangement of lenses and cooling chambers in arc-light system.

1,143,664. Self-Winding Electric Clock. C. L. Sundblad, New Haven, Conn. Circuit of motor driving spring barrel controlled by condition of spring and barrel.

1,143,666. Commutator for Dynamo Machines. C. A. Vandervell and A. H. Midgley, Acton Vale, England. Has teeth in the slip ring and commutator segments therebetween and insulated therefrom.

1,143,676. Circuit-Closer. F. Williams, assignor to Acme Register Co., Somerville, Mass. Encased and operated by inserted key.

1,143,680. Telephone System. W. Aitken, Liverpool, England. Line connecting switches manually closed and electromagnetically opened by subscribers.

1,143,682. Apparatus Applicable for Illuminating Cavities or Surfaces. R. Biquard, Paris, France, assignor to himself, to H. Cheron and H. Dominice. Water-jacketed quartz tubes contain electrically illuminating refractory oxides.

1,143,686. Printing-Press Controller. C. E. Carpenter, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Speed-governing means controlled by feeder clutch.

1,143,722. Photographic Device. H. Van R. Palmer, Dumont, N. J. X-Ray apparatus.

1,143,755. Railway Signaling System. C. F. Dingman, Jersey City, N. J. Block system valve in train pipe opened and light extinguished when a train is in block ahead.

1,143,775. Holder for Lighting Fixtures. N. B. Oppen, Stoughton, Wis. Crow-foot structure.

1,143,799. Receiver for Wireless Telegraphy. R. B. Avery, South Bend, Ind. Has local circuit for the signal instrument energized through step-up transformer. (See cut.)

1,143,806. Headlight. F. Buchanan, Dayton, O. Arrangement of lamps and lenses in combined incandescent and arc light.

1,143,809. Fire-Alarm System. C. F. Christman, Winslow, Ariz. Closing of alarm circuit operates motor-driven air compressor to blow whistle.

1,143,810. Compression Rheostat. E. L. Clark, assignor to National Carbon Co., Cleveland, O. Resistor plates having grooves for passage of cooling fluid.

1,143,818. Charging Storage Batteries. T. A. Edison, West Orange, N. J. For charging signal batteries distributed along railway from vehicle moving along track.

1,143,820. Telephone Trunking System. E. D. Fales, assignor to Automatic Electric Co., Chicago, Ill. Automatic interlocking connecting switches with busy test.

1,143,828. Process for Manufacturing Anodes. P. C. C. Isherwood, Busney Heath, England. From manganese-dioxide ore.

1,143,845. Automobile Horn. R. H. Manson, assignor to Garford Mfg. Co., Elyria, O. Duplex push-button for operating.

1,143,869. Electric Time Switch. A. W. Voedisch, Aberdeen, S. D. Particular structure for controlling switch by time element.

1,143,874. Trolley Retriever or Safety Device. M. A. Yeakley, assignor to J. E. McLain, Canton, O. Spring device is locked against rotation according to whether or not rope is attached.

1,143,875. Trolley Retriever. M. A. Yeakley, assignor to J. E. McLain. Drum has variable power connections with operating spring.

1,143,876. Snap Electric-Light Switch. J. Yuill, Toronto, Canada, assignor of one-third to W. H. T. Stevens, and one-third to L. Rahne. Rotary; frictionally held closed and retarded spring opening means.

1,143,880. Trolley Wheel. J. W. Anderson, assignor to American Trolley Wheel Co., Buffalo, N. Y. Improved lubricating structure.

1,143,883. Electric Stove. R. F. Boettiger, Aberdeen, Wash. Particular structure of heating plate and resistor.

1,143,909. Metallic-Filament Lamp. H. J. Jaeger, Weehawken, N. J. Conically coiled tungsten filament.

1,143,916. Method of Making Pipes for Electrical Conduits. N. H. Raymond, assignor to Clifton Mfg. Co., Boston, Mass. Scale, etc., loosened by hammering and oxide, etc., removed by sand blast.

Digitized by Google

1,143,937. Snap Lock for Electric-Socket Shells. T. A. C. Both, assignor to Zee Socket & Mfg. Co., Boston, Mass. Locking ring in cap expands and locks to cap upon insertion of shell.

1,143,940. Electric Furnace. J. W. Brown, assignor to National Carbon Co. Has condensing chamber into which volatilized impurities are drawn.

1,143,948. Control System for Gun Mountings and Other Mechanism. A. T. Dawson and J. Horne, assignors to Vickers Limited, Westminster, England. Power-driven mechanism distantly controlled.

1,143,955. Control System for Electric Motors. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Switch electromagnetically tripped in response to current conditions, has electromagnetic reset.

1,143,956. Control System for Electric Motors. A. J. Hall and L. G. Riley, assignors to Westinghouse Electric & Mfg. Co. Electromagnetic means for automatically adding parallel resistances in motor circuit during period of locomotive acceleration.

1,143,963. Universal Load Box. J. L. Herman, Fort Wayne, Ind. For testing meters; has primary and secondaries of different load capacities and ranges of power-factor.

1,143,966. Flashlight. H. T. Hipwell, Pittsburgh, Pa. Special arrangement of lenses, reflector and lamp in familiar tubular form.

1,143,969. Circuit-Controlling Element. C. H. Kayser, assignor to Ideal Fire Detector Co., West Orange, N. J. For fire-alarm systems; circuit connections operated by expanded air in closed chamber.

1,143,970. Fire Detector Apparatus. C. H. Kayser and W. H. Hampton, assignors to Ideal Fire Detector Co. Different structure for carrying out same operations as above.

1,143,978. Speedometer. W. G. Leathers, assignor to Stewart-Warner Speedometer Corporation, Chicago, Ill. Drive shaft magnetically drives member having flexible connection with retarded rotatable indicator.

1,143,983. Insulator Support. C. E. Miller, Pittsburgh, Pa. Wire spiral forms threaded top of supporting pin.

1,143,998. Line Switch. J. G. Roberts, assignor to Western Electric Co., New York, N. Y. Sets of bars transverse to each other co-operate to operate contacts at their intersections.

1,144,011. Power-Transmission Mechanism. J. G. P. Thomas, Holywell, Wales. Electromechanical connection.

1,144,012. Speed-Controlling Device. A. Walton, assignor to Westinghouse Electric & Mfg. Co. Motor has single rotor and two automatically adjustable stator members.

1,144,016. Magneto Driving Mechanism. J. A. Williams, assignor to K. W. Ignition Co., Cleveland, Ohio. Spring driving connection for momentarily increasing speed of armature over driving shaft.

1,144,017. Railway-Traffic-Controlling Apparatus. W. P. Allen and G. R. Scattergood, assignors to Union Switch & Signal Co., Swissvale, Pa. Electric block system.

1,144,028 and 1,144,029. Protective Device. E. E. F. Creighton, assignor to General Electric Co., Schenectady, N. Y. First patent, arrester spark gap in partially evacuated chamber having gas at pressure greater than critical but making equivalent needle gap substantially minimum. Second patent, modification.

1,144,032. Automatic Temperature-Regulating System. H. G. Geissinger, assignor to Geissinger Regulator Co., New York, N. Y. Air heating electrically controlled by thermostat.

1,144,034. Process for the Treatment of Steel. F. Giolitti, assignor to Societa Anonima Italiana Gio. Ansaldo & C., Genoa, Italy. Piping prevented by cooling ingot from bottom upward, upper part being kept liquid by electric currents induced in it.

1,144,038. Electric Switch. E. H. Jacobs, assignor to General Electric Co. Lever-operated inclosed switch with spring connection for quick movement.

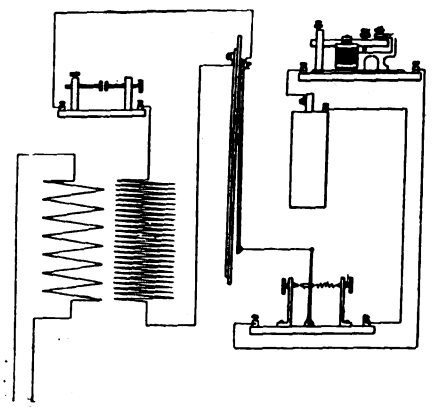
1,144,047. Electric Switch. E. B. Merriam, assignor to General Electric Co. Contacts in compressed insulating gas.

1,144,051. Game Apparatus. K. Okamoto, San Francisco, Cal. Electric lamps controlled by contacts in ball runways.

1,144,063. Magnetically Operated Device. C. H. Rippl, assignor to Electric Controller & Mfg. Co., Cleveland, O. Electromagnet with armature having rolling motion about longitudinal axis eccentric to the supporting means.

1,144,084. Call-Distributing System. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Automatic selection of idle operators' cords.

1,144,087. Adjustable Holder for Pocket Electric Lamps. DeW. S. Adler, assignor to The Metalyte Co., New York, N. Y. For usual tubular pocket flashlight.



No. 1,143,799.—Wireless Receiver.

1,144,095. Support for Indirect or Semi-Indirect Lighting Fixtures. H. A. Bauer, Lansdowne, Pa. Arrangement of bowl and pull sockets with provision for drop light.

1,144,097. Starter for Gas Engines. V. Bendix, Memphis, Tenn. Automatic gearing between starting motor and engine shaft.

1,144,101. Safety Device for Gasoline Motors. R. J. Bradbury, Denver, Colo., assignor of two-fifths to A. Jackson. Electric lights indicate level of oil in crank case.

1,144,107. Switch Plate. W. H. Burt, assignor to Waterbury Mfg. Co., Waterbury, Conn. Particular hinge construction for double doors.

1,144,114. Process of Mounting Metallic Filaments on Filament-Carriers of Incandescent Lamps. O. Feuerlein and M. Von Pirani, assignors to General Electric Co. Filaments tensioned by rigid means and expanded by passing electric current, then mounted on pliable holders.

1,144,135. Ignition Timer. W. Kaisling, assignor to Kellogg Switchboard & Supply Co. Contact element on shaft can be adjusted while shaft rotates.

1,144,149. Alternating-Current System. L. C. Marburg, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Stores and returns energy to variably loaded circuit.

1,144,153. Insulator. W. H. Nichols, Bennington, Vt. Structure of cleat.

1,144,167, 1,144,168 and 1,144,169. Means for Controlling the Operation of Gas Retorts. H. A. Carpenter and A. W. Warner, assignors to Riter-Conley Mfg. Co., Pittsburgh, Pa. Circuit of motor-operated retort tools controlled by retort closure.

1,144,172. Combined Dash Light, Trouble Light and Cigar Lighter. W. H. Collier, Nashville, Tenn. Conductors wound on reel permit movement of lamp to different points.

1,144,201. Portable Flashlight. H. H. Hipwell and H. T. Hipwell, Pittsburgh, Pa. Particular structure of tubular pocket type.

1,144,210. Tool. R. Kincaid, Youngstown, O. Dry cell and lamp in handle to illuminate work.

1,144,224. Cable Tap. C. B. Mills, Baltimore, Md., assignor of one-fourth to A. J. Carr. Structure having conductors and insulators arranged to tap conductors and insulate joint.

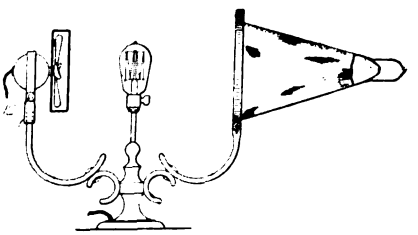
1,144,225. Cable-Connector. C. B. Mills, assignor of one-fourth to A. J. Carr. Same object in structure connecting cable ends.

1,144,226. Electroplating Process. C. B. Mills, Baltimore, Md. For electroplating non-metallic substances.

1,144,233. Time-Limit Circuit-Breaker. M. F. Owens, assignor to Automatic Refrigerating Co., Hartford, Conn. Automatically locks for predetermined time to permit starting of motor.

1,144,236. Transmitter or Reproducer. W. E. Peirce, San Francisco, Cal. Telegraphic contactor operated by embossed tape.

1,144,246. Driving of Vehicles. J. Rebstein, assignor to Brown, Boveri & Cie, Baden, Switzerland. Counterweighted cranks for locomotive driving motors.



No. 1,144,358.—Fly Catcher.

1,144,252. Electrical Conductor. L. Roebel, assignor to Brown, Boveri & Cie. Particular structure and arrangement of strips to prevent deleterious induction within conductor.

1,144,255. Electric Testing Instrument. H. Schade, Albany, N. Y. Arrangement for testing lamps, fuses and batteries.

1,144,264. Controlling System for Electrical Apparatus. S. K. Thompson, Jenkintown, Pa. Charging set for batteries started at will and automatically stopped.

1,144,271. Apparatus for the Continuous Production by Synthesis of Hydrogen Peroxid. W. Weber, assignor to Henkel & Cie, Dusseldorf, Germany. High-pressure metallic vessel, coated inside with cathode material, surrounds anode covered with diaphragm.

1,144,281. Process of Making Terminals. H. B. Andrews, assignor to H. B. Sherman Mfg. Co., Battle Creek, Mich. Metal terminal lug for cable.

1,144,290. Telegraphy. B. L. Bobroff, assignor to Universal Indicator Co., Milwaukee, Wis. Structure of dial telegraph.

1,144,299. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Automatic, electromagnetically operated, compression resistance.

1,144,311. Storage-Battery Element and Method of Making the Same. J. Redding, Malden, Mass., assignor of one-half to E. Parker. Electrolytically depositing lead and alkaline metal on support and hydrating and removing alkaline metal, leaving spongy lead.

1,144,318. Cable Hanger. J. Blackburn, Webster Groves, Mo. For suspending from messenger.

1,144,330. Telephone Busy-Signal Apparatus. G. E. Kimball, assignor to First Trust & Savings Bank, Chicago, Ill. Buzzer in signal circuit which is opened periodically by relay.

1,144,335. Excess Indicator. H. O. Swoboda, assignor to Excess Indicator Co., Edgewood, Pa. Device for flickering and dimming on excess current.

1,144,339. Means for Synchronously Displaying Cinematographic Pictures and Reproducing Sound. L. Gaumont, assignor to Societe des Etablissements Gaumont, Paris, France. Synchronism indicator operated by phonograph and motion-picture machine located distantly from each other, through electric transmission.

Electrical Patents of June 29, 1915.

1,144,350. Electric Welding. E. F. Collins, assignor to General Electric Co., Schenectady, N. Y. Two members of different heat-radiating and conducting capacities joined by a third member.

1,144,351. Dynamo-Electric Machine. E. F. Collins, assignor to General Electric Co. Joining of bars to end rings in short-circuited winding.

1,144,354. Storage-Battery Charging System. F. E. Fanning, Woodland, Ill. Arrangement for cutting generator in and out on battery and light feeders.

1,144,358. Insect-Capturing Apparatus. K. G. Gyllstrom, Richmond Hill, N. Y. Electric light attracts and fan blows insects into trap. (See cut.)

1,144,362. Film-Winding Apparatus. F. L. Kempff and H. W. Smith, assignors of three-eighths to F. O. Horting and three-eighths to M. W. Pickens, Harrisburg, Pa., and one-fourth to said Kempff. Brake for paying-out reel controls motor driving take-up reel.

1,144,383. Magnetic Separating Apparatus. E. H. Rothert, Leavenworth, Wash. Material subjected successively to action of plurality of separator belts.

1,144,388. Motor Controller and Indicator. F. W. Smith, assignor to Sundh Electric Co., New York, N. Y. Shows on what resistance step motor is operating.

1,144,390. Electric Welding and Fusion Deposition of Metals. A. P. Strohmenger, assignor to Slaughter & Co., London, England. Electrode has metal core with aluminum wire along side and insulating covering about all.

1,144,391. Transmitter for Telephone and Other Sound-Transmitting Instruments. W. P. Stunz, Lansdowne, Md., assignor to Webb Talking Pictures Co. Has plurality of granule chambers and electrodes acted on by diaphragm.

1,144,396. Starter for Vapor-Electric Devices. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Incandescent filament supplements the spectrum of the mercury vapor.

1,144,399. Rectifying Detector for Wireless Systems. E. T. Turney, New York, N. Y. Has two contact elements, one adapted to rectify alternating current and the other is finely divided conductor.

1,144,401. Magneto Cord Circuit With Secret Service. R. I. Utter and H. P. Sonmidt,

Digitized by Google

assignors to Kellogg Switchboard & Supply Co., Chicago, Ill. Plug seat switches connect operator's telephone with cord on removal of answering plug and disconnect upon removal of calling plug.

1,144,407. Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co. Automatic switch connects subscriber with idle link circuit and places control of restoration with subscriber, if all links are busy.

1,144,419. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg Co., Milwaukee, Wis. Oscillating pivoted contact member operated by opposed push buttons.

1,144,427. Gas Control Valve and Igniter. C. J. Muehlmann, Detroit, Mich. Interrelation of gas valves and electric sparking ignition in gas lights.

1,144,431. Motor Controller. G. R. Radley, assignor to Cutler-Hammer Mfg. Co. Series-parallel control of series-field windings effected without opening motor circuit.

1,144,438. Electric Starter for Automobile Engines. A. W. Smith, Washington, D. C. Motor-driven roller engages flywheel and is pressed thereagainst by magnetism of motor field.

1,144,465. Railway - Traffic - Controlling System. A. V. T. Day, assignor to Hall Switch & Signal Co., New York, N. Y. Normal-danger, block-signal system.

1,144,466. Egg-Tester. F. W. Dobbel, Sonoma, Cal. Arrangement of lamp, mounting and shade.

1,144,479. Safety Device for Elevators. J. A. Keyes, New York, N. Y. Electric door lock controlled by operator and door.

1,144,491. Mechanism for Insuring Understanding of Signals from Bridge to Engine Room. W. Michael, assignor to Union Iron Works Co., San Francisco, Cal. Engine reverse lever electromagnetically locked against movement in wrong direction.

1,144,508. Humidor. J. Taylor, Jr., Kansas City, Mo. Water warmed by electric lamp to supply moisture.

1,144,509. Railway Signaling. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. On single track, separate sets of signals govern traffic in opposite directions.

1,144,517. Junction Box. P. J. Wittenberg, assignor of one-third to C. E. Downing and one-third to J. Aaron, Chicago, Ill. Sheet-metal box adapted for use in molded concrete walls.

1,144,538. Electrolytic Apparatus. W. E. Greenawalt, Denver, Colo. Tank divided into anode and cathode compartments has reciprocating cathode and anode composed of rotating rods.

1,144,552. Steering Apparatus. H. A. Lardner and G. F. Chellis, San Francisco, Cal. Steering rod rotated by special electric motor.

1,144,560. Indicating System. E. C. Molina, assignor to American Telephone & Telegraph Co., New York, N. Y. For displaying telephone-line designation, characters are selected by one system of impulses and displayed by another.

1,144,593. Pipe and Cable Hanger. J. B. Heiser, Williamsport, Pa. Transversely adjustable, for securing to I-beams.

1,144,595. Process for Manufacturing Incandescent Filaments. R. H. Henderson, assignor to Westinghouse Lamp Co., Pittsburgh, Pa. Filament material successively passed through chambers in which it receives different degrees of heat and chemical treatment.

1,144,596. Method of and Apparatus for Translating Electrical Variations. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Wireless system wherein signal waves are imposed on vapor conductor carrying independent current.

1,144,604. Voltage Regulator. E. Lehr, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Alternating-current induction regulator.

1,144,605. Annunciator. O. M. Leich, Genoa, Ill., assignor to Cracraft, Leich Electric Co., Genoa, Ill. For telephone switchboard; has two signals under its control.

1,144,614. Electric Sadiron. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Details.

1,144,618. Winding Head. W. F. Smith, assignor to Western Electric Co., New York, N. Y. For winding insulating tape on wire.

1,144,620. Overhead Line Construction. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. For tunnels; arms extend in both directions from center and support messenger wires to which the trolley wires are secured.

1,144,627. Adjustable Bearing for Dynamo-Electric Machines. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Arrangement of bearing sleeves, bushings and housings.

1,144,628. Battery Plate. A. S. Atwater and D. F. Selzer, Cleveland, O. Planté plate made porous by insertion in interior of swaged Z-shaped partitions.

1,144,629. Adjustable Sign and Lighting Post. G. Auer, White Plains, N. Y. Cast concrete post with sign arm, lamp at top and conductor conduits.

1,144,636. Electrical Measuring Instrument. P. A. Campbell, assignor to Westinghouse Lamp Co. Structure and arrangement of terminal devices.

1,144,648. Electric Apparatus. C. LeG. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Hollow insulating bushing in transformer casing has oil sucked into it by exhausting its air.

1,144,656. Flashlight Attachment for Guns. J. P. Hise and W. H. Moyers, Hightown, Va. Flashlight tube pivotally mounted on gun barrel.

1,144,672. Fused Test Clamp Insulator. G. Wheale, Meadowbrook, Pa. Pole insulator has separated terminal rings for wires and fuse between rings.

1,144,673. Advertising Device. W. B. Wheeler, Long Beach, Cal., assignor of one-half to R. S. Gilman. Driving connections of motor with reels of display ribbon controlled by timing device and ribbon.

1,144,676. Headlight. R. F. Wilson, Denver, Colo. Concave reflector has at rear two incandescent filaments, one above the other, and shield below upper to shut off rays from lower part of reflector.

1,144,680. Electroplating Apparatus. H. G. Allers, Buffalo, N. Y. Arrangement of tanks and anodes.

1,144,688. Thermoelectric Pyrometer System. R. P. Brown, Philadelphia, Pa. Main and auxiliary couples connected with indicator have their cold and hot junctions, respectively, in chamber of constant temperature.

1,144,705. Portable Electric Automatic Sawing Machine. W. Gralapp, Wittenberg, Wis. Relates to details of mechanical structure.

1,144,732. Fuse Device. E. O. Schweitzer and A. Herz, Chicago, Ill. Fuse compressed in cavity in block when softened and are prevented.

1,144,745. Relay. S. E. Witt, assignor to Automatic Electric Co., Chicago, Ill. Structural details of armature.

1,144,748. Horological Motor. B. A. Adler, assignor of one-half to P. A. Lorenz, Chicago, Ill. Electrically controlled pawl and wheel mechanism for clock.

1,144,752. Vehicle Drive Mechanism. W. E. Bock, Toledo, O. Gearing and mounting of motor armature.

1,144.776. Method of and Means for Measuring Temperature and Resistivity. E. F. Northrup, Princeton, N. J. Pyrometer method; tin is subjected to temperature and resistance measured.

1,144,781. Plug Switch. F. J. Ravlin and J. Lofgren, Chicago, Ill. Details of a plural circuit structure.

1.144,800. Apparatus for Manufacturing Carbureted Hydrogen Gas. B. Van Steenbergh, Goshen, N. Y. Electrically heated generator.

1,144,801. Electric Heater. B. Van Steenbergh. Insulating tube filled with resistance particles, has electrodes at ends and exterior coating of catalytic agent.

1,144,809. Electrically Heated Stenciling Machine. E. N. Chandler, Braintree, Mass. Vertical reciprocating carrier has electric heating means.

1,144,815. Magneto for Use on Internal-Combustion Engines. J. A. Cole, Leamington, England. Comprises contact-breaker and grounding connection.

1,144,834. Pressure Drop Alarm for Tires. F. P. Freeman, Richland, Wash. Electric alarm sounded by device on inflating stem when pressure drops.

1,144,843. Annunciator. L. C. Hodson, Winnipeg, Man., Canada. Details.

1,144,870. Code-Signal Device. A. L. Sohm, assignor to Sohm Electric Signal & Recording Co., Chicago, Ill. Signal coded by setting up pins in sockets in a metal drum, contacts being made by the pins as drum is turned.

1,144,871. Weatherproof Annunciator Case. A. Stern, Yonkers, and P. K. Stern, New York, N. Y. Details of structure of case.

1,144,872. Controller. A. Stern, Yonkers, N. Y. Particular structure of make-and-break type.

1,144,873. Signaling System. A. Stern and P. K. Stern. Automobile-direction annunciator exhibits different colored signs and with each sign a lamp of the same color is lighted.

1,144.876. Starting Box. M. Taigman, New York, N. Y. Resistance box for mounting on ceiling and operated by depending rod.

1,144,885. Electric Clock System. L. J. Aron, assignor to X. L. Electric Co., London, England. Master clock periodically closes circuit and reverses polarity to operate secondary clocks.

1,144,898. Fault-Finder for Internal-Combustion Engine. D. P. F. Ghadiali, New York, N. Y. Duplex visual indicator, connected to spark plug, comprises a sparking tube and a glow tube.

1,144,903. Motor-Vehicle Signal. E. B. Hopkins, Savannah, Ga. Foot-controlled shutter for tail light and signal circuit controlled by said shutter.

1,144,935. Machine-Tool Control. A. L. DeLeeuw, assignor to Cincinnati Milling Machine Co., Cincinnati, O. High-speed electric motor and low-speed mechanical drive alternately connected by electromagnetic clutch controlled by traveling work support in planers, shapers, etc.

1,144,941. Microscope Warm Stage. T. Lidberg, assignor of one-half to J. W. Morsbach, Chicago, Ill. Electrically heated, thermostatically controlled.

1,144,942. Incubator for Microscope Stages. T. Lidberg, Chicago, assignor of one-half to J. W. Morsbach. Constant temperature automatically maintained in electrically heated chamber.

1,144,946. Weft-Replenishing Loom. E. H. Ryon, assignor to Crompton & Knowles Loom Works, Waltham, Mass. Circuit of magnet controlling weft-replenishing mechanism closed when filling in active shuttle is exhausted.

1,144,948. Metal-Armor Circuit-Connecting Attachment. J. C. Stearns, Worcester, Mass. Outer casing incloses insulating block in which conductor ends are securely fastened and protected.

1,144,949. Electrical Fitting. J. C. Stearns. Tubular connector receiving lamp at one end and plug at other has rotatable insulating block for making and breaking connections.

1,144,954. Electric Hot-Water Heating System. W. L. Waters, Milwaukee, Wis. Water-heating jacket about stove has water further heated by electric heater immersed therein.

1,144,956. Lamp Socket. H. Aiken, assignor to Aiken Lamp Co., Franklin, N. H. Horizontal supporting arm has headlight frame rotatable about it and a lamp body is rotatably adjustable about vertical axis.

1,144,969. Radiotelegraphy and Telephony Receiver. G. W. Pickard, Amesbury, Mass. Received waves produce currents of two frequencies, producing beats of audible frequency; pick-up coil and sound-producer actuated by the beats.

1,144,973. Electric Apparatus for Driving Clocks or Similar Mechanism. H. E. Warren, assignor to Warren Clock Co., Portland, Me. Amplitude regulating circuit-closer closed at varying intervals according to swing of pendulum.

1,144,981. Electric Heater. E. N. Lightfoot, New York, N. Y. Number of heating coils in operation controlled by object placed in heating chamber.

Patents Expired.

The following United States electrical patents expired on July 12, 1915:

607,005. Apparatus for Manufacturing Ozone. E. Andreote, London, England.

607,018. Underground Electric Conduit. T. Connelly, Chicago, Ill.

607,036. Electric Controlling Apparatus for Switch Valves. E. G. Harris, Rolla, Mo.

607,070. Electric Cable for Driving Conveyances. A. Norman, Toronto, Canada.

607,078. Electrode Plate of Electric Accumulators. P. F. Ribbe, Berlin, Germany.

607,093. Electrically Heated Roll. F. P. Snow, Lynn, Mass.

607,124. Automatic Cutout for Secondary Batteries. W. L. Negbaur, Brookline, Mass.

607,125. Method of and Apparatus for Generating Electricity. W. L. Negbaur, Brookline, and J. J. Feely, Walpole, Mass.

607,176. Electric Break for Induction Coils. T. B. Kinraide, Boston, Mass.

607,177. Electric Break and Induction Apparatus. T. B. Kinraide.

607,185. Electric Meter. W. D. Marks, Philadelphia, Pa.

607,194. Trolley. W. H. Russell, Chicago, Ill.

607,233. X-Ray Apparatus. H. Green, Hartford, Conn.

607,239. Telegraph. L. W. Hildburgh, New York, N. Y.

607,247. Electric Motor. W. S. Johnson and H. Winkenworder, Milwaukee, Wis.

607,250. Electric Cutout. H. A. Lewis, Norristown, Pa.

607,251. Fuse Holder, Circuit Breaker and Lightning Arrester. H. A. Lewis.

607,302. Electric Locomotive. H. Van Hoevenbergh, New York, N. Y.

607,311. Electric Current Controller. E. E. Werner, Philadelphia, Pa.

607,315. Insulator. C. L. Wingard, Walla Walla, Wash.

607,343. Switchboard and Alarm Mechanism. J. P. Conway, New York, N. Y.

607,351. Electric Railway. W. W. Doty and C. Grauten, New York, and J. A. MacKnight, Mount Vernon, N. Y.

607,387. Trolley for Electric Railways. H. Van Hoevenbergh, New York, N. Y.

607,407. Alarm System. C. Coleman, Chicago, Ill.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 4. CHICAGO, SATURDAY, JULY 24, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Electrical Improvements in Small Towns..... 135
A Need for Greater Publicity..... 136
Injunction in Springfield Rate Case..... 136
Maintaining the List Prices of the Manufacturer..... 137
Electrical Prosperity Week..... 137

DEPARTMENTS:
Commercial Practice 146
Electrical Construction 150
Public Service Commissions..... 153
New Electrical and Mechanical Appliances..... 165
Latest Approved Fittings..... 170
Current Electrical News..... 171
Record of Electrical Patents..... 175

LEADING ARTICLES:
Electricity in Cotton Gins.—By J. H. Moseley..... 139
Office System and Forms for the Electrical Contractor.—By Clovis M. Converse..... 150
Simulating Old Illuminants.—By M. Luckiesh..... 161

BOOK REVIEWS..... 163

MISCELLANEOUS:
Convention Papers of Illuminating Engineering Society 138
Electrical Entertainment for Pan-American Delegates..... 138
Fifty-Mile Canadian Line to Be Electrified..... 138
Iowa Convention to Be Held at Dubuque..... 138
Obtaining the Good Will of the Public..... 146
Central Station Adopts Unique Advertising..... 147
Electric Motors Supplant Steam for Water Pumping at Wellesley..... 147
New Business Gains Made by Byllesby Properties..... 148
The Jumbo Electric Iron as Feature of Parade..... 148
Operating Statistics, Pacific Power & Light Company..... 148
Electric Sign Diverts Trade..... 149
Electric Guide Post at Biddeford, Me..... 149
T. I. Jones..... 149
Important Committees of Electrical Clearing House..... 152
Contractors Promote Installation of Exhaust Fans..... 152
Pennsylvania Officers Elected..... 152
Building Operations in the United States..... 152
Electrical Trade in South America..... 155
Philippine Hydroelectric Project..... 155
Chicago Telephone Company Gives Demonstration of Transcontinental Service..... 159
Accelerating Delayed Patents..... 159
Massachusetts Hydroelectric Plants..... 160
Flood Prevention, Water Power and Navigation..... 163
Plans for Electrical Prosperity Week..... 163

Copyright, 1915, by Electrical Review Publishing Company, Inc.

ELECTRICAL IMPROVEMENTS IN SMALL TOWNS.

In large cities the advent of improved electrical equipment tends to stimulate more business for the central station, but the magnitude of the installation is often the deciding factor in the amount of attention attracted from the public. It is worth realizing how much improvements mean on the smaller scale of the little town, where the introduction of one or two gas-filled lamps may be the talk of the main street for a week. If it can be so expressed, the proportional influence of a comparatively small installation strictly up-to-date may be greater in the small town than in the city. This is a real help to the manager of a small property, since his friends and neighbors in business can often be fitted out with the latest equipment on a small scale at a cost far below that required in a larger community, and the commercial "pulling power" of even a small but advanced device is remarkable in many little towns.

Central-station managers easily fall into the habit of regarding these improvements largely from the engineering standpoint, which is necessary and desirable, but in handling small properties, the individual-interest factor of an installation is very important. Thus, a druggist in a seaside town recently equipped his store with indirect lighting. The installation was the only one of its kind in the place, and although it consisted of only three inverted reflectors, each used in connection with a 100-watt tungsten lamp and a well whitened ceiling, the "tone" imparted to the establishment made the store a marked place in the eyes of the inhabitants. Here the expenditure of a modest sum put the store on an entirely different plane from all the others in the place, arousing a good deal of interest among the villagers and instantly attracting the patronage of the city visitor, accustomed as he was to trade at home in establishments paying scientific attention to modern illumination.

Of course, the preëminence of such a store lasts only a short time by the introduction of a comparatively inexpensive layout of equipment; but one thing leads to another in small-town central-station operations, and local feeling can be appealed to very effectively by inducing one merchant to install the latest equipment known to the industry. Others want the same thing soon, and the central station gets the benefit of such progress at a very small cost.

Digitized by Google

A NEED FOR GREATER PUBLICITY.

The cultivation of the good will of its customers is one of the most important duties of the central-station company, for upon this depends the success or failure of the enterprise. It seems impossible that any company which is familiar with the fundamental ethics of the central-station industry can ignore the principles and policies for which all progressive companies now stand, and while it is doubtless true that there have been electric companies, as well as others, which in times past have failed to recognize and meet fully their obligations to the public, still it is doubtful if the cases have been as numerous as indiscriminate criticism would imply.

However, today, practically without exception, all central stations are striving to carry out the "public-be-pleased" policy by rendering good service at reasonable rates and according the public fair and liberal treatment. Together with these cardinal principles emphasis has been placed upon the education of employees for their own welfare as well as their companies', and definite plans have been quite generally adopted for bettering the conditions of employees and increasing their loyalty and efficiency to their companies in the service of the public.

It is undeniable that a strong and efficient public utility in any community is a distinct asset to the entire community. It is invariably one of the largest taxpayers, and through its service promotes industrial development and general business activity. The progressive central-station manager of today will be found as a leader in all civic affairs, working faithfully for the improvement of the community and his company usually is found at the head of the list when contributions or support are needed for some civic event.

These facts are well known among central stations, but does the public know of them? We quote at some length in this issue from a paper presented by Mr. E. Burt Fenton before the Ohio Electric Light Association in annual convention at Cedar Point, dealing with public relations and discussing the very questions that are uppermost in the minds of central-station executives, namely, what is the visible effect of good-will advertising and does it pay? Mr. Fenton is emphatic in the assertion that if there is a feeling of dissatisfaction, distrust and unrest among the public—and there is some of this in almost every community—intelligent good-will advertising will bring about a better feeling, provided it is backed up by performance. This is proved ordinarily by the dropping off of complaints and the friendlier expressions regarding the company's activities heard from the outside.

There is no hard and fast definition of the term "good will," and there is no slide-rule method of checking the results of good-will advertising. Anything that will attract the attention of the customer, interest him, enlighten him regarding the service and prompt him to think better of the company is good-will advertising.

Too much emphasis cannot be placed on the value of intelligent and consistent newspaper advertising to cultivate the good will, providing, of course, that it is conscientiously backed up in every department of the business. But almost of equal importance is the gaining of favorable publicity through the newspapers and other channels that are found in every community. If free fan service is given the sick, if free energy is supplied for a civic federation, if heroic action on the part of employees averts a protracted interruption to service, etc., tell the public. These are legitimate news items which are of inestimable value in gaining the recognition and good will of the public.

The central-station industry is suffering from false modesty. The recognition of its just claims for public support lies in greater publicity of the policies which are now so uniformly adopted by progressive companies.

INJUNCTION IN SPRINGFIELD RATE CASE.

A little more than one year ago the Public Service Commission of Missouri issued an opinion and order making a large reduction in the electric rates of the Springfield Gas & Electric Company, which operates in Springfield, Mo. The maximum rate was placed at eight cents per kilowatt-hour. The estimated revenue was based upon a rate of return of seven per cent upon a valuation which the company claimed was absurdly low. The matter was taken into court and a preliminary injunction has recently been issued by the federal court for the Southern Division of the Western District of Missouri. The opinion of the court shows that no doubt exists in the minds of any of the sitting judges as to the propriety of issuing such an injunction, since the operation of a confiscatory rate will do irreparable injury to the operating company, whereas injury to the consumers can be entirely obviated by a return of excess charges in case the final decision of the matter goes against the company. To this end a bond is required and a temporary rate with a ten-cent maximum will be put into effect. The old maximum rate of this company was 15 cents per kilowatt-hour.

The opinion of the court calls attention to the indefiniteness of the allowance made for intangible values and questions whether the Commission has followed the requirements of the law in not itemizing these. It also indicates a serious doubt as to its agreement in the allowances for other items of the valuation. The attitude of the court shows clearly that the utility corporation will have its rights fully protected by the court, and it is this opportunity for review of commission orders that makes this method of regulation a feasible one, which, in the long run, can be depended upon to secure justice to both operating companies and the public.

Digitized by Google

MAINTAINING THE LIST PRICES OF THE MANUFACTURER.

Ever since the idea of establishing commercial departments in central stations for increasing the utilization of electrical energy took root, the question of maintaining manufacturers' list prices has received a lot of attention. The function of the central station is to generate electrical energy. The duty of the management which has accepted the responsibility of making an adequate return to the stockholders who have risked their money in the venture is to build up a profitable demand for the energy available. As station capacity increases and a more favorable control of the diversity through intelligent solicitation of connected load and advantageous local conditions allow, the central-station company is able to establish rates for service which will attract customers under all conditions of living to its lines. In attracting customers, the central stations, like the purveyors of every other form of service, have found it expedient to offer premiums in the form of considerable discounts for standard electrical equipment. The dealers in electrical merchandise consider this a particularly iniquitous practice, as it takes from them the opportunity for sale, at a profit, of these devices.

As the industry has developed there has been ample justification for the determination upon the part of the central station to build up its load at the sacrifice of ultimate profits upon the sale of electrical appliances largely because in many localities there have not been available the agencies of distribution and the means for a vigorous solicitation necessary to place in the hands of the prospective user the devices which under operation maintain an adequate demand upon the station capacity. As the utilization of electrical energy becomes more general, and the rates for service go down, the difficulty of selling electrical appliances becomes less apparent. Consequently, there is a growing tendency upon the part of central stations to maintain manufacturers' list prices and to establish special sales campaigns at less frequent intervals, and then only in connection with predetermined arrangements with local dealers, so that all may co-operate to the maximum advantage.

In this connection, the general letter sent from the executive offices of one of the big Pacific Coast electric light and power companies to heads of departments, district managers and district superintendents, as follows, will be of interest to the electrical industry and the working out of its suggestions eagerly watched:

"Effective July 1, 1915, electrical appliances will be sold at the list prices of the manufacturer, less a discount of five per cent for cash at time of purchase, with the exception of incandescent lamps, which will be sold strictly in accordance with the list prices of the manufacturer, as is now the practice.

"Newspaper advertising will not make reference to any particular make of appliance and will announce the fact that appliances may be purchased from local dealers as well as from the power company.

"Advertising matter in the form of booklets and circulars as furnished the company by the different manufacturers will be distributed only when same bears the following imprint: "For sale by your electric light and power company and by dealers in electrical supplies."

"Special sale campaigns which may be deemed advisable from time to time will only be conducted on special advices from this office."

These commendable instructions are indicative of the growing realization by progressive central-station men that the best interests of the entire electrical industry are best promoted by hearty co-operation between all its interrelated branches.

ELECTRICAL PROSPERITY WEEK.

The Society for Electrical Development is distributing a 20-page booklet revealing the plans for Electrical Prosperity Week to be held November 29 to December 4, 1915. Anyone in the electrical industry, whether members of the Society or not, who has not secured a copy of the booklet may do so by application to the executive offices in the Engineering Societies Building, 29 West Thirty-ninth Street, New York City. The booklet explains what Electrical Prosperity Week means and indicates the tremendous opportunity available for co-operation among central stations, electrical manufacturers, jobbers, contractors, dealers, local electrical organizations, department stores, non-electrical merchants, public schools, women's clubs, the Electric Vehicle Association of America, the Jovian Order, the National Electric Light Association and the public generally.

The propaganda which the Society will furnish and the methods which it will pursue in establishing nation-wide publicity should be carefully studied. While definite arrangements for the correlation of effort in the various localities have not been announced, strong committees composed of prominent electrical men in every locality have been formed. As these committees discover ways and means to co-ordinate the work of each department of the electrical industry interested in the promotion of Electrical Week, the machinery of operation will readily get under way. The impulse resulting from this aggregation of effort, properly directed and controlled, can move the nation to a realization of the benefits accruing from the utilization of electrical energy beyond any attempt made by any industry in the history of industrial and civic achievement.

If everyone waits for someone else to start something, the big possibilities of this movement will not be speedily revealed. The Society has thrown the switch. It remains to be seen whether the industry will generate a volume of energy that will keep the circuit alive. This is every one's job in the electrical industry and the Society is available to lead the way and explain the motions. Undoubtedly we all of us require definite instructions as to how we should make use of the opportunity the Society offers, and this being the case, one of the first things we should do is to deluge the Society with the slogan, "We are here and ready—how shall we go about it."

Digitized by Google

Convention Papers of Illuminating Engineering Society.

The preliminary program of the ninth annual convention of the Illuminating Engineering Society, which is to be held at the New Willard Hotel, Washington, D. C., September 20-23, inclusive, has been announced. The papers, which promise to be of an unusually high standard, are to be distributed over ten sessions. One of the sessions will be devoted especially to the subject of street lighting; commercial, general, and laboratory papers will each be given three sessions. Parallel sessions will be held on Wednesday morning and afternoon and Thursday morning. Inspection trips, a reception, and a banquet are among the entertainment features.

The following papers are to be presented:

"Tests and Experiments in Connection with the New Commonwealth Edison Company Building," by W. A. Durgin and J. B. Jackson, Chicago.

"Ship Lighting," by H. A. Hornor, New York Shipbuilding Company, Camden, N. J.

"Illumination Efficiency as Obtained in an Experimental Room," by Ward Harrison, National Lamp Works of General Electric Company, Cleveland, Ohio.

"Photometry with Portable Instruments," by W. F. Little, Electrical Testing Laboratories, New York, N. Y.

"New Test Plate for Illumination Photometers," by C. H. Sharp, Electrical Testing Laboratories, New York, N. Y.

"Incandescent Lamp Testing and Photometry," by G. W. Middlekauff, Bureau of Standards, Washington, D. C.

"Street Lighting," by F. A. Vaughn, Milwaukee, Wis.

"Arc Lamps for Street Illumination," by H. E. Clifford, Harvard University, Cambridge, Mass.

"New Types of Incandescent Lamps and Their Relation to the Street-Lighting Problems," by W. H. Rolinson, Westinghouse Lamp Company, Bloomfield, N. J.

"Ornamental Street Lighting," by T. I. Jones, Edison Illuminating Company of Brooklyn.

"How to Attack a Lighting Problem," by W. R. Moulton, Consolidated Gas, Electric Light & Power Company, Baltimore, Md.

"How Can a Combination Gas and Electric Company Render the Best Service to Customers?" by S. B. Burrows and N. H. Potter, Public Service Corporation, Newark, N. J.

"Small Incandescent Lamps and Special Illumination Problems," by R. P. Burrows, National Lamp Works of General Electric Company, Cleveland.

"Lighting of Office Buildings," by A. O. Dicker and J. J. Kirk, Commonwealth Edison Company, Chicago, Ill.

"Crova's Method of Colored-Light Photometry Applied to Modern Incandescent Illuminants," by H. E. Ives and E. F. Kingsbury, United Gas Improvement Company, Philadelphia, Pa.

"Differences in Threshold and Acuity Variations," by P. W. Cobb, Nela Research Laboratory, Cleveland, O.

"Visual Efficiency," by F. K. Richtmyer, Cornell University, Ithaca, N. Y.

"Yellow Screens," by M. Luckiesh, Nela Research Laboratory, Cleveland, Ohio.

"The Flame-Pilot Ignition of Incandescent Gas Lamps," by C. W. Jordan, United Gas Improvement Company, Philadelphia, Pa.

"Practical Illumination as Exemplified by Some Recent Installations of Incandescent Gas Lamps," by R. F. Pierce, Welsbach Company, Gloucester, N. J.

"Mercury-Arc Lamps for Industrial Lighting," by W. A. D. Evans, Cooper-Hewitt Company, Hoboken, N. J.

"Relation Between Proper Illumination and Accident Prevention," by R. E. Simpson, Travelers Insurance Company, Hartford, Conn.

"Retinal Sensibilities in Relation to Illuminating Engineering," by P. G. Nutting, Eastman Kodak Company, Rochester, N. Y.

"The Effect of Distribution of Light on Muscular Control," by H. M. Johnson, Nela Research Laboratory, Cleveland, O.

"Effect of Various Wave-Lengths of Radiation on Eye Cataract," by W. E. Berge.

"Artificial Illumination of Interiors," by David Crownfield, Pettingell-Andrews Company, Boston, Mass.

"Lighting of State, War and Navy Buildings," by W. E. Chapman, Washington, D. C.

"Lighting of Gymnasiums and Armories With Incandescent Lamps," by A. L. Powell and A. B. Oday, Edison Lamp Works, Harrison, N. J.

"The Effect of Surrounding Gas on an Incandescent Filament," by C. F. Lorenz, Nela Research Laboratory, Cleveland, O.

"The Parabolic Mirror," by F. A. Benford, Jr., General Electric Company, Schenectady, N. Y.

"Artificial Illumination in Practical Photography," by C. E. K. Mees, Eastman Kodak Company, Rochester, N. Y.

"Photographic and Visual Illumination Efficiencies," by L. A. Jones, Eastman Kodak Company, Rochester, N. Y.

"Production and Application of Ultra-Violet Light," by M. Von Recklinghausen.

"A Flux Method of Obtaining Average Illumination," by F. A. Benford and H. E. Mahan, General Electric Company, Schenectady, N. Y.

Information regarding the convention may be had upon application to the general office of the Society, 29 West Thirty-ninth Street, New York, N. Y.

Electrical Entertainment for Pan-American Delegates.

A number of the South American delegates to the Pan-American Financial Conference recently held at Washington, D. C., together with the consuls at New York City of the various South American countries, were entertained by the Western Electric Company at its New York office in the latter part of June.

The delegates, after being met by the company officials, were escorted through the engineering laboratories, where they were shown some experimental work. They were then taken to the Exhibition Room, where they had an opportunity to see and examine the various kinds of apparatus the company manufactures and sells. After partaking of an electrically cooked luncheon, the party talked on the transcontinental line with several consuls at San Francisco, through the courtesy of the American Telephone & Telegraph Company. The guests were visibly impressed by their experience and expressed their amazement at the enormous progress which has been made in the telephone art.

Fifty-Mile Canadian Line to Be Electrified.

Martin N. Todd, general manager of the Lake Erie & Northern Railway, Brantford, Ont., and president of the Galt, Preston & Hespeler Railway, has confirmed the report that the Lake Erie & Northern Railway is to be electrified for the whole 52 miles from Galt to Port Dover. Mr. Todd expects cars to be running on the Galt-Brantford line by October, and to Port Dover by November. It is likely that hydroelectric power will be used with substations at Galt, Brantford and Simcoe. It is stated that the two lines will shortly be amalgamated, with through electric railways service ultimately from Berlin to Port Dover.

Iowa Convention to be Held at Dubuque.

At the convention of the Iowa Section, National Electric Light Association, held at Keokuk last April it was voted to hold the next annual convention at Ames. This vote has subsequently been held unconsitutional and an additional vote by letter ballot taken which resulted in Dubuque being selected as the next meeting place. The convention will be held some time next April.

Digitized by Google

Electricity in Cotton Gins.

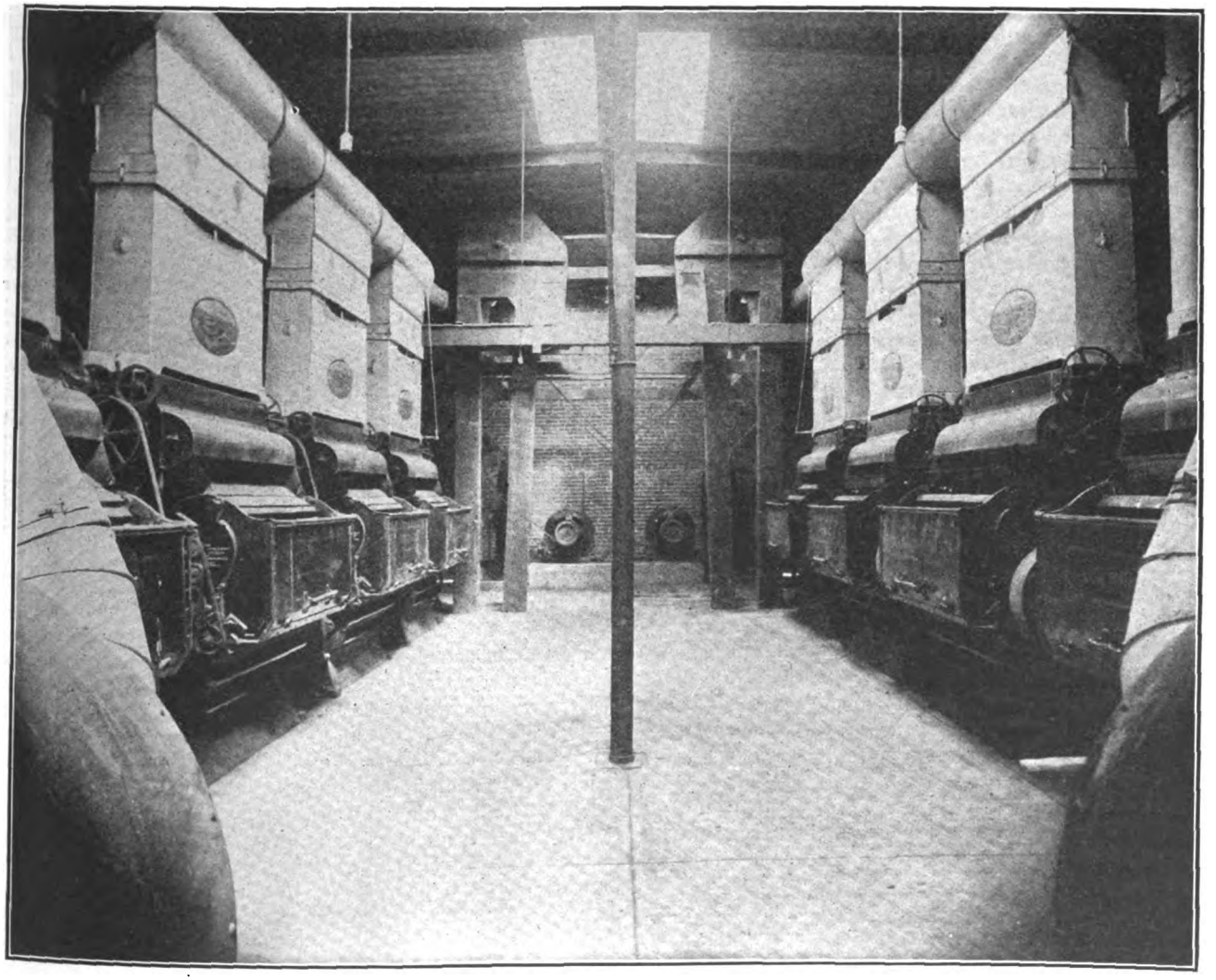
By J. H. Moseley.

This article treats fully of the processes involved in cotton ginning, with special reference to the application of electric drive. Characteristics of the motors adapted for the service are discussed and data given on the electrical operation in a number of typical plants supplied by a Texas central station. The cotton-gin field offers almost unlimited opportunity for central-station business in the South.

There are in the United States today more than 25,000 cotton gins which gin a total of 12 to 15 million bales of cotton annually. These gins represent an installed capacity of more than 2,500,000 horsepower of power-plant equipment of all kinds. This amount is almost staggering when it is remembered that the total horsepower of electric motors installed in this country is according to the census of 1912, only 4,130,619.

A standard process is involved in separating the seed from common seed cotton, the form in which it is brought to the gin. The wagon full of seed cotton is driven to the side of the gin, where a suction pipe operated by means of a fan-type blower conveys the cotton from the wagon into the gin. The cotton then goes to a distributor, and is carried into the several gin stands. From 2 to 6 gins stands are used, the usual number being 4 or 5, depending on the capacity of gin desired. The distributor may be of the pneumatic type, or of the belt-distributing type. In the former type the cotton is only taken from the wagon as fast as it is used, but in the latter type the time in which it is removed from the wagon depends on the size and speed of the fan used. The fan ordinarily unloads the cotton in about half the time required to gin same. A part of the cotton goes direct to the distributing belt, and all that this belt cannot take care of is deposited on the floor at one end of the gin stands. This cotton is then fed to the distributing belt by means of another suction pipe in the end of the gin. This suction pipe is operated by means of the same fan which unloads the cotton.

When the cotton goes into the gin stands it is fed by a mechanical arrangement onto rapidly revolving circular saws, set on a shaft close enough together so that the seed will just have room enough to drop between them. These saws, which vary in diameter from 12 to 16 inches, run at about 400 revolutions per minute, depending on the diameter. They tear the cotton away from the seed, which when it is finally cleaned drops into a conveyor directly below the saws, and is carried to the waiting wagon or to the seed house, in case the ginner has purchased



Two 75-Horsepower Motors (In Background) Driving four 80-Saw Gin Stands and Unloading Fans.

Digitized by Google

the seed. Air is sometimes used instead of conveyors for moving the seed, and comment will be made later on this point. The cotton is removed from the saws by means of a set of brushes, which rub against the saws, or by means of an air blast of about 10-ounces pressure. Both methods are in use at present. While the air method will give possibly a better sample there is a larger opportunity for waste of power. However, this latter difficulty can be overcome by using proper methods. When the cotton is brushed off or removed from the saws it is carried into a lint flue, where air is used to carry the lint cotton to the baling machinery. Before it reaches this part of the gin, however, it passes over a screen or cleaner, where as much as possible of the dirt is removed.

As the lint cotton comes from the gin stands or lint flue it falls into a rectangular opening approximately 3 feet wide by 4 feet long and 10 feet deep. This is built of heavy timbers, and the lower part revolves on a turntable. As the cotton falls in, it is tramped down by means of a mechanical piston or tramper, as it is called. The tramper pushes the cotton down into the lower part of the box, and iron dogs on each side of the box prevent it from rising back, due to its own elasticity. When all the bale has gone through the gin stands and the ginner calls: "All out!" the press man operates the turn table and brings the tramper box directly over a piston operated by a hydraulic pump. At the same time another tramper box on the other side of the turn table is brought under the tramper and another bale is started in. The hydraulic pump is then started and the bale pressed up to standard size, at which point the ties are put in place and the pump pressure released. The elasticity of the cotton then forces the ties to tighten and the bale is taken from the press, weighed and placed in the owner's wagon or in a nearby cotton yard.

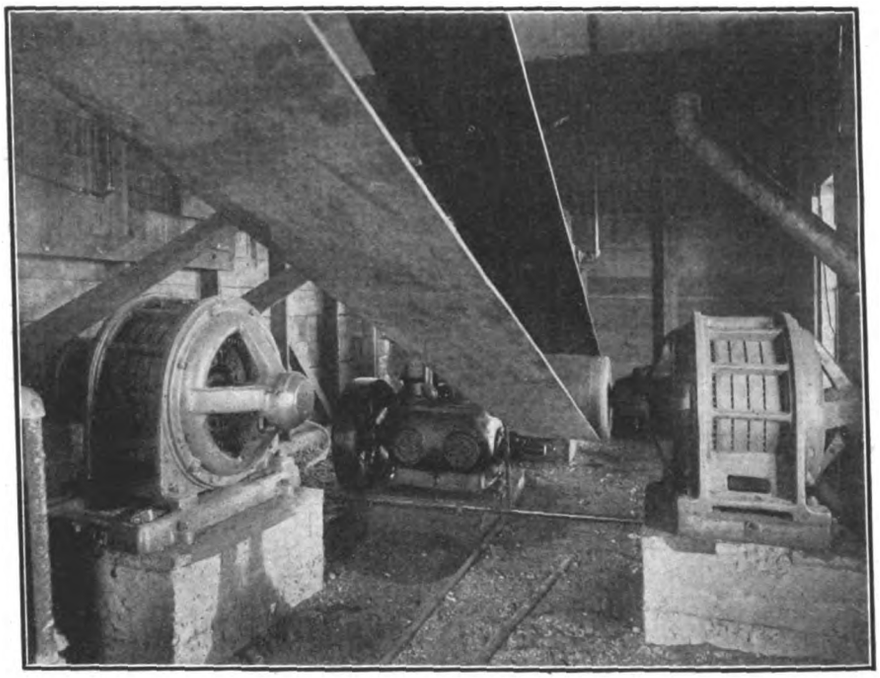
This, in brief, is the way all gins are operated. It will be noticed that there are three distinct stages involved: (1) Removing cotton from the wagon and putting it through the gin stands. (2) Packing cotton in the tramper box. (3) Pressing out the bale. It seems logical, therefore, that these three stages should be separately considered in the electrification of the cotton gin, and such is the case.

Some time ago in localities where good boiler water could not be secured the internal-combustion engine entered into the ginning field and introduced an evil which has only recently been satisfactorily overcome. When this kind of motive power was applied to the cotton gin it was necessary to find, first, a method of operating the tramper, since this had been operated in the steam-driven gin by means of a double-acting steam cylinder, and, secondly, a means of operating the press pump, which had formerly consisted of a direct-driven steam-hydraulic affair. Mechanical trampers were known at this time as were also belt-driven hydraulic pumps, but these required special clutches or tight and loose pulleys and led to consequent trouble. There was one thing, however, which could be used on both these parts of the gin, and which could be installed at a minimum expense, and that one thing was an air compressor. Hence the introduction of the air compressor into the gin plant. By operating an air compressor from the main line shaft the same tramper and the same steam hydraulic pump could be used. Of course a loss in efficiency occurred, but at this time little thought was given to operating costs, due to the inherent operating characteristic (short periods of operation) of the gin.

When electric power was talked of it naturally followed that the air compressor was also considered. Hence in most of the gins in operation in Texas today the following arrangement has been usually followed.

A high-speed motor is belted to the main line shaft driving the gin stands. To this line shaft is belted usually a 6-by-6 duplex or 6-by-8 duplex compressor, which operates the tramper and hydraulic pump. In many cases the fan is driven by a high-speed direct-connected motor, thus eliminating friction of belt and loss of power in possible jack shafts. A separate direct-connected motor-driven unloading fan is used in the cotton house for unloading cotton that is to be stored. An air drum 3 feet in diameter by 7 feet high is connected directly in the air line to insure a steady supply of air. This is necessary, especially on account of the operation of the air-driven pump, which requires a large amount of air intermittently at from 60 to 100 pounds pressure.

The Texas Power & Light Company, which operates in a section containing many gins, has advocated the use of a separate motor-driven hydraulic pump, in order to be able to use a lower air pressure. This has been found an economical proposition, as 30 or 40 pounds air pressure will operate the tramper, while 60 to 100 pounds is required to press out an ordinary size bale with an air-driven hydraulic pump.



Typical Motor Drive in Cotton Gin.

Motor Requisites.

It is rarely the custom to install more than five 80-saw gin stands in one battery. When more capacity is required two or more identical batteries are used. On this account the largest size motor usually used is not over 75 horsepower. Since the characteristics of gin operation require a simple source of power and a source capable of overloads, due to the varying grades of cotton ginned, the squirrel-cage induction motor is readily adapted to this class of service. Due to the loose lint, which collects around the gin plant, a brushless-type motor is essential. Simplicity of construction and operation makes the constant-speed squirrel-cage type motor an ideal unit for a cotton gin, and universal satisfaction has resulted where this type has been used.

In order to avoid transformer losses a primary voltage of 2,200 is used on all motors above 25 horsepower in the Texas territory. For unloading fans,

Digitized by Google

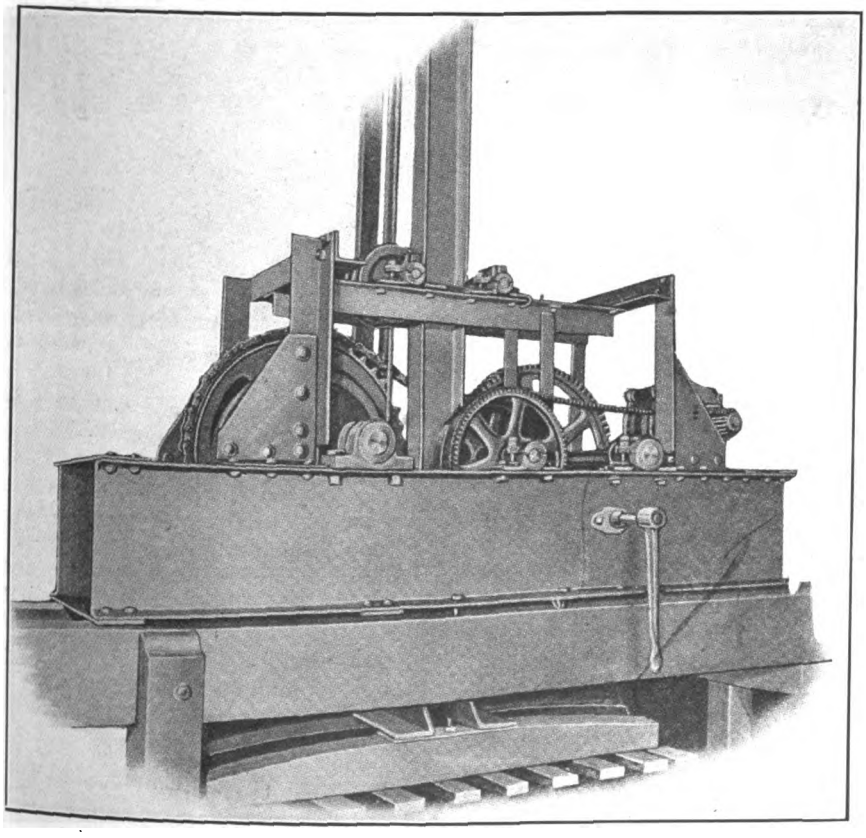
Electric Gin Advertising Quick Service as a Feature.

motor-driven hydraulic pumps, and electrical trampers, 220-volt motors are commonly used.

The only difficulty experienced in using induction motors is that of line regulation. During the first and last of the season the cotton gin runs only intermittently, and consequently it is necessary to start and stop the motor many times during the day. On a small isolated plant a 75-horsepower induction motor will practically destroy all attempts toward good regulation and on plants of small capacity it is advisable to use a wound rotor with a time-limit controlling switch for starting. It is also advisable to use wound-rotor motors on individual installations of 100 horsepower or more, in order to decrease the starting current.

The One-Motor Gin.

Undoubtedly the cheapest way of changing from a steam-driven to an electrically-driven gin is to replace the steam prime mover with one motor, a small air compressor being belted to the main line shaft, to furnish air for the tramper and hydraulic pump. No trouble whatever should be experienced with an installation of this character. However, when the bales are coming in slowly it is necessary with this type of installation to operate the entire gin plant, in order to furnish air for pressing out the bale. The large friction loss prevalent in the gin proper during this part of the operation causes a large power consumption and a correspondingly high cost per bale of cotton ginned.



New Type Electric Tramper for Baling Cotton.

Two-Motor Gin.

This installation can be greatly improved from the economical operation standpoint by using a hydraulic pump belt driven by a 7.5-horsepower motor. With this arrangement not only can a lower pressure be used on the air drum with consequently less power consumption, but the main gin motor may be cut off as soon as the bale has been put through the gin stands. The 7.5-horsepower motor can then be started and the bale pressed out with no loss in power. On one gin, where a record was kept, 287 bales were pressed with a motor driven hyydaulic pump for $1.08, or an average of less than two-fifths of a cent per bale.

The Logical Arrangement.

Still further economy can be effected by eliminating the air compressor entirely and replacing it with an individually motor-driven electrical tramper. In the ordinary four-stand 80-saw gin the electrical equipment would consist of one 75-horsepower 2,200-volt 60-cycle three-phase constant-speed squirrel-cage motor driving main gin stands and unloading and conveying fan (motor would operate at 900 or 1,200 revolutions per minute); one 7.5 horsepower, 220-volt, 60-cycle, three-phase, constant-speed, squirrel-cage motor, belted to hydraulic pump; one three-horsepower, 220-volt, 60-cycle, three-phase constant-speed squirrel-cage motor, driving by means of silent chain the electrical tramper.

If desired a 50-horsepower motor can be used instead of the 75-horsepower machine, and a separate 25-horsepower motor direct-connected to the fan equipment, thus eliminating some belt and friction loss. However, this is a matter of comparatively small economy and is hardly justified, due to the increased first cost of the motor equipment.

The three-motor installation is truly the logical arrangement, and the most economical installation, since it divides the gin plant into the three units, which really operate independently of each other. Maximum operating efficiency and economy are obtained by this method.

The electrical tramper mentioned has only recently been placed on the market, and has not had a thorough trial in practical operation. However, it is so simply constructed that there is small chance of trouble being experienced. One of the accompanying illustrations shows the main features of this device, which is operated by a

Digitized by Google

three-horsepower motor. This motor is connected by silent chain to a cog wheel operating the vertical member of the tramper, and is operated by means of the regular tramper-operating lever shown. Moving the lever in one direction starts the motor, and causes the tramper to move downward. When the tramper has reached a predetermined point, or has passed the press dogs the motor rotation is automatically reversed, and the tramper is caused to rise. The arrangement is very simple, and the travel of the tramper may be changed at will. The electric circuit is made and broken in a small oil tank, so that there is no danger of a spark being formed. It is not necessary for the operator to know the details of the tramper construction, as it is operated by simply moving the lever back and forth. This invention, besides doing away with the air compressor, and consequently lowering the power consumption and ginning cost, eliminates the possibility of "wet packed" bales, which frequently occur in steam-driven trampers, due to leaky cylinders.

Advantages of Electric Drive.

The electric gin has many advantages over the steam-driven gin, and already the ginner is beginning to consider this type first when contemplating the installation of a new gin.

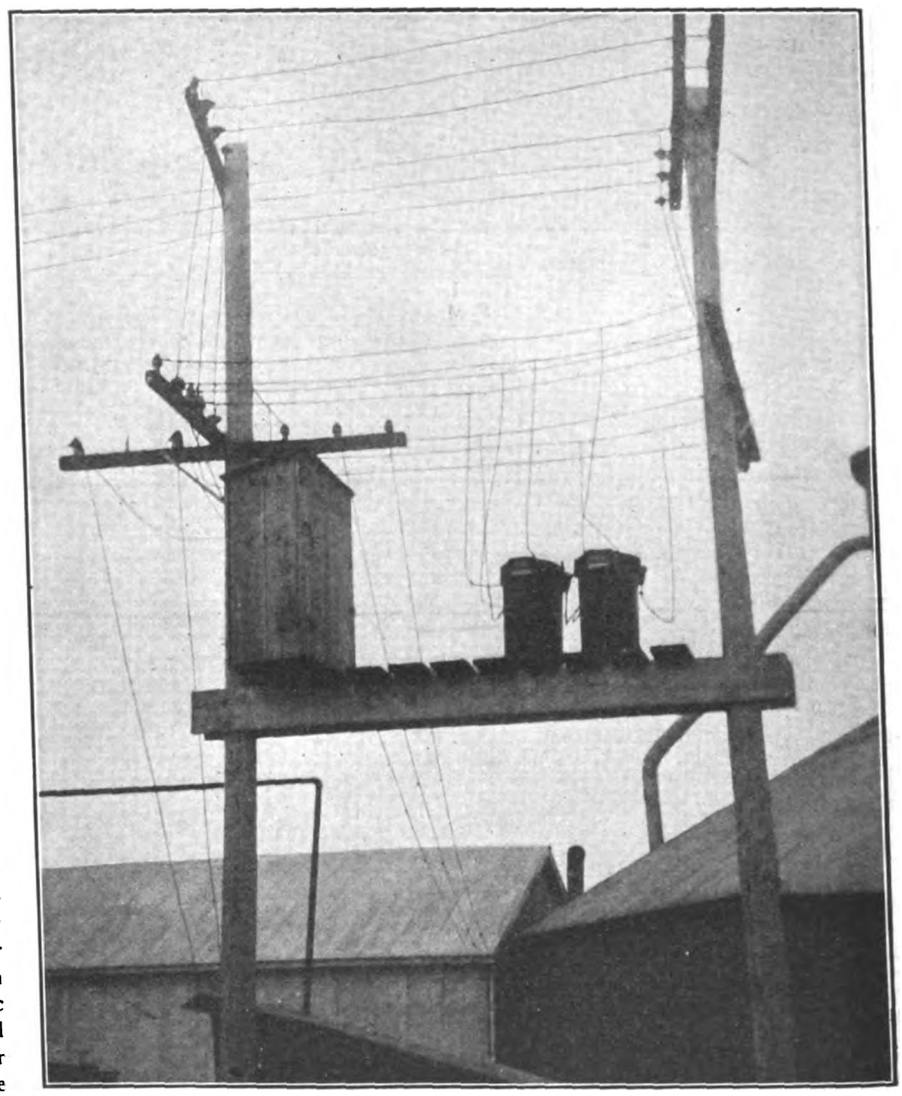
"Service," the keynote in every successful business of today, is the biggest feature embodied in the electric gin. It is always ready to operate. It is not necessary to fire up a boiler at 4 o'clock in the morning in order to be ready to do the day's ginning.

Economy is the second item of consideration. The characteristics of the gin business are such that frequently at the beginning and end of the season long periods elapse between the receipt of cotton. When it is necessary to keep a boiler fired and an engineer on the job all the time the waste in power can be easily seen. The electric gin consumes power while in actual operation, and requires no engineer or fireman at all. With a reasonable price for current the electric gin can compete with very low-priced fuel, and if it happens that the gin is located some distance from a railroad the increased cost of fuel, due to unloading and hauling, makes the operation of a steam-driven gin out of the question. Due to a lower cost of equipment the fixed charges are lower, and this is an important point when it is considered that these same fixed charges are distributed not over a year, but over a period of in most cases five months or less. Maintenance charges are also lower on the electric gin.

Elimination of the engineer and fireman is a great relief to the gin manager, not only from the standpoint of economy, but also from that of service rendered. Although the steam plant of a gin is ordinarily simple to operate, nevertheless, due to the shortness of the season, it is difficult to obtain efficient operators. The power costs in a steam-driven gin depend on the character of the operator, even more than on the price of fuel. Too much emphasis cannot be placed on this point.

Another important advantage of the electric gin is that it is absolutely independent of water supply. Alkaline water has caused many a ginner to lay awake nights wondering where the money would come from with which to replace a boiler or set of tubes which had been eaten away. In some cases, too, water has to be carried for miles, thus making the cost of this item almost as much as that of the fuel supply. While insurance companies penalize the electric gin (25 cents per $100 in Texas) on account of having no available water supply for fire purposes, nevertheless, such a large credit is allowed (50 cents per $100 in Texas) due to the lower risk, that this penalty is offset and a substantial saving effected. Small motor-driven pumps are sometimes used for fire purposes where no city pressure is available.

Simplicity is the final wedge which usually drives home the sales argument. A child can operate the power end of an electric gin. It is only necessary to take the prospect to see one electrically driven plant to impress this fact upon his mind. His eyes will take in the whole thing, and the sale will usually be consummated.



Typical Transformer and Meter Installation for Cotton Gin.

Operating Economies.

The efficient operation of an electric gin depends to a large extent upon the personal equation involved. Unless the air-blast, direct-connected gin is used a large number of auxiliary pulleys and belts are necessary. If each one of these belts are operated tighter than necessary the combined friction loss amounts to a considerable amount of the total power required to operate the gin.

Every gin should be gone over carefully at the beginning of each season. The line shaft should be carefully

Digitized by Google

Cotton-Gin Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for twenty-four hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Gin plant with six stands of 70 saws each. Capacity approximately five bales of cotton per hour. Daily operation varies from 2 to 18 hours. Number of months operated, 8.

Total connected horsepower, 127.5. Total number of motors installed, 4. Average kilowatt-hours per month, 4,612.

Kilowatt-hour consumption for 8 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,700	April	2,000	October	16,200
February	1,800	September	1,900	November	9,500
March	300			December	2,500

Load-factor, 6.6 per cent.

Approximate energy consumption per bale of cotton ginned is 19.2 kilowatt-hours.

Motor Installation.

Following is a list of motors installed with their respective drives. Source of supply is 220 volts, three-phase, 60 cycles with the exception of 75-horsepower motor which is 2,200 volts.

No.	Horse-power.	Speed, R. P. M.	Application.
1	75	900	Belted to main line shaft driving six 70-saw gin stands and one Gardner-Rix 6 by 6 vertical, two-cylinder air compressor.
1	25	1,800	Direct-connected to 40-inch multi-blade fan for unloading and conveying cotton to gin stands.
1	7.5	900	Belted to hydraulic pump.
1	20	1,800	Direct-connected to 35-inch unloading fan in cotton storehouse.

Gin plant with four 70-saw stands. Capacity approximately four bales of cotton per hour. Daily operation varies from 1 to 18 hours. Four men are employed. Plant operates seven months per year.

Total connected horsepower, 100. Total number of motors installed, 2. Average kilowatt-hours per month, 2,963.

Consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	311	May	0	September	4,400
February	2,610	June	0	October	6,980
March	400	July	0	November	4,350
April	0	August	0	December	1,690

Load-factor, 5.4 per cent.

Average kilowatt-hours per bale, 14.5.

Motor Installation.

Following is a list of motors installed with their respective drives. 220-volt, three-phase, 60-cycle current is used with the exception of the 75-horsepower motor which is 2,200 volts.

No.	Horse-power.	Speed, R. P. M.	Application.
1	75	900	Belted to main line shaft driving four 70-saw gin stands and one Gardner-Rix 6 by 6 vertical, two-cyclinder air compress.
1	25	1,800	Direct-connected to 40-inch unloading fan in cotton storehouse.

Gin plant with six 70-saw and five 80-saw stands, having a capacity of approximately 10 bales per hour. Daily operation varies from 1 to 18 hours. Plant operates six months per year.

Total connected horsepower, 192.5. Total number of motors installed, 5. Average kilowatt-hours per month, 4,937.

Kilowatt-hour consumption for six months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	580	September	11,400	November	5,010
February	121	October	12,050	December	460

Load-factor, 4.7 per cent.

The approximate energy consumption per bale ginned is 17 kilowatt-hours.

Motor Installation.

Following is a list of motors installed with their respective drives. Current is supplied at 220 volts, three-phase, 60 cycles.

No.	Horse-power.	Speed, R. P. M.	Application.
1	75	900	Belted to main line shaft driving six 70-saw gin stands and suction fan.
1	15	1,200	Belted to 8 by 6 Gardner vertical air compressor furnishing air for tramper.
1	75	900	Belted to main line shaft driving five 80-saw gin stands and 6 by 6 Gardner vertical air compressor.
1	7.5	900	Belted to hydraulic pump which operates the hydraulic ram on two presses.
1	20	1,800	Direct-connected to 35-inch unloading fan in cotton storehouse.

Digitized by Google

Cotton-Gin Data—Sheet No. 2.

Gin plant with four 70-saw stands having a capacity of approximately four bales of cotton per hour. Daily operation varies from 1 to 18 hours. There are four men employed. Plant operates five months per year.

Total connected horsepower, 95. Total number of motors installed, 2. Average kilowatt-hours per month, 7,815. Kilowatt-hour consumption for five months:

Kilowatt-hour consumption for five months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	3,960	May	0	September	11,580
February	0	June	0	October	16,280
March	0	July	0	November	6,630
April	0	August	0	December	620

Load-factor, 15 per cent.

Approximate energy consumption per bale of cotton ginned, 18 kilowatt-hours.

MOTOR INSTALLATION.

Following is a list of motors installed with their respective drives. Three-phase, 60-cycle, 2,200-volt current is used on 75-horsepower motor and 220 volts on 20-horsepower motor.

No.	Horse-power.	Speed, R. P. M.	Application.
1	75	1,200	Belted to main line shaft driving four 70-saw gin stands; suction fan and 6 by 8 Gardner vertical two-cylinder air compressor.
1	20	1,800	Direct-connected to 35-inch unloading fan in cotton storehouse.

Gin plant having eight 80-saw stands. Capacity approximately 10 bales of botton per hour. Daily operation varies from 1 to 18 hours. Plant operates six months per year.

Total connected horsepower, 235. Total number of motors installed, 7. Average kilowatt-hours per month, 11,820.

Kilowatt-hour consumption for six months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	0	May	0	September	12,411
February	10,100	June	0	October	26,300
March	700	July	0	November	18,100
April	0	August	0	December	3,311

Load-factor, 9.2 per cent.

The approximate electrical energy consumption per bale of cotton ginned is 18 kilowatt-hours.

MOTOR INSTALLATION.

Following is a list of motors installed with their respective drives. The source of supply is 2,200-volt, three-phase, 60-cycle current for the two 75-horsepower motors and 220-volt for the balance.

No.	Horse-power.	Speed, R. P. M.	Application.
2	75	1,200	Each belted to a line shaft driving four 80-saw gin stands and suction fan.
2	15	1,200	Each belted to an 8 by 6 Gardner vertical two-cylinder compressor furnishing air for trampers and hydraulic pumps.
2	20	1,800	Each direct-connected to a 35-inch unloading fan in cotton storehouse.
1	15	900	Auxiliary motor for seed conveyor.

Gin plant having four 70-saw stands. Capacity of plant is approximately four bales of cotton per hour. Daily operation varies from 1 to 18 hours. Plant operates six months per year.

Total connected horsepower, 107.5. Total number of motors installed, 4. Average kilowatt-hours per month, 3,671.

Kilowatt-hour consumption for six months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,290	July	0	September	10,320
February	600	August	0	October	10,300
March	0	May	0	November	2,150
April	0	June	0	December	1,340

Load-factor, 6.2 per cent.

The approximate electrical energy consumption per bale of cotton ginned is 17.2 kilowatt-hours.

MOTOR INSTALLATION.

Motors are installed as follows, 220-volt, three-phase, 60-cycle current being used except on the case of the 75-horsepower motor, which is 2,200 volts.

No.	Horse-power.	Speed, R. P. M.	Application.
1	75	900	Belted to main line shaft driving four 70-saw gin stands and suction fan.
1	15	1,200	Belted to Chicago Pneumatic 6 by 6 air compressor.
1	7.5	900	Belted to hydraulic press pump.
1	10	1,800	Belted to unloading fan in storehouse.

Digitized by Google

alined and all bearings examined for defects. Belts should be repaired where necessary and all unnecessary friction eliminated. The gin saws should be sharpened or replaced if necessary and all bearings on the gins stands should be inspected. Hydraulic pumps and trampers should be looked over for worn packing, and the air-compressor line should be tested for leaks. The suction air line should also be tested for leaks, as here is a point overlooked by many operators. A small leak will make an appreciable difference in the power required to operate a fan, and several of these leaks will interfere greatly with the plant operation, actually reducing the capacity unless the fan is speeded up.

No.	Stands	Saws per Stand	Horse-power Installed	Months Used	Bales Ginned	Average Weight	Kilowatt-hours Used	Average Kilowatt-hours Bale	Net Cost per Bale Cents
1	4	70	70	2	650	525	11,440	17.6	47
2	4	80	95	4	733	525	15,780	21.5	65
3	5	80	125	4	583	524	10,720	18.3	62
4	4	70	50	4	1,108	530	18,120	16.3	49
5	4	70	108	4	1,190	530	20,990	17.6	71
6	4	80	108	2	636	554	10,060	15.8	65
7	6	70	85	3	678	520	15,570	17.0	67
8	8	80	200	4	3,343	525	60,122	18.0	56
9	4	70	75	3	526	523	9,820	18.6	77
10	5	70	110	5	1,702	526	32,800	19.2	67
11	4	70	83	4	1,079	525	20,520	19.0	71
12	4	70	100	5	1,295	525	18,840	14.5	59
13	5	70	110	5	2,293	519	40,090	19.2	64
14	8	70	178	5	2,996	524	59,840	20.0	64
15	8	70	190	5	2,245	523	51,800	23.0	75
16	8	80	200	3	2,869	525	59,583	20.7	63
17	4	70	110	5	1,704	521	30,583	17.9	65
18	4	70	85	5	1,537	527	32,020	20.8	71
19	4	70	75	3	750	522	10,488	14.0	54
20	4	70	95	5	2,169	515	39,070	18.0	62
21	8	70	195	5	2,017	526	43,937	21.8	73
22	4	70	83	5	490	524	12,975	26.4	112
23	5	70	100	5	1,649	520	43,250	26.2	87
24	5	80	90	5	1,119	518	27,500	24.6	89
25	4	80	90	5	1,034	527	27,260	26.3	94
26	4	70	90	5	1,881	525	22,580	12.0	45
27	4	70	90	4	837	507	15,482	18.5	72
28	4	70	85	4	1,602	514	31,890	19.9	68
29	8	70	158	4	1,701	566	28,920	17.0	59
30	2	70	35	2	87	500	1,850	21.0	95
31	4	70	100	4	1,746	536	30,560	17.5	60
32	8	70	200	3	4,846	536	83,950	17.3	55
	Averages			4	1,540	525	29,450	19.0	65

Where possible it is advisable to place an adjustable gate valve in the suction line directly adjacent to the fan casing. This valve will serve to regulate the amount of air necessary for different grades of cotton, and will prove a big power saver. Precautions such as suggested will insure satisfactory and economical operation from a mechanical standpoint. It then remains for the foreman to see that his men do the work properly.

Perhaps the biggest economy dependent on the personal equation is that gained by making the bales follow one another as quickly as possible. The foreman should see to it that just as soon as one bale is "all out" there will be another wagon in place ready to unload. This will give increased output and a lower consumption of power per bale ginned. If only one bale is in the yard at a time he should see that the main gin motor is cut off as soon as the last of the cotton is dumped into the tramper. The press-room employees can then finish up the bale (in the case where a hydraulic belt-driven pump is used) with no waste of power in the main part of the gin.

The operation of the tramper should be entrusted to a man who will pull the cotton down out of the condenser slide and press it down into the tramper box as much as possible with a short stick. The tramper should be used with as few strokes to the bale as possible. From 10 to 15 strokes will usually suffice to tramp an ordinary size bale. It is not necessary to run the tramper below the press dogs.

It is well for the person operating the press to mark a certain spot to be used as a guide in stopping the ram. This will not only save power, but will assist him in turning out bales of a uniform size, a fact which is appreciated by all customers.

If an air-driven tramper is used in connection with a belt-driven hydraulic pump, a drum pressure of 30 to 40 pounds should be sufficient to tramp down the largest bales. The air compressor should be equipped with an unloading valve, so that the relief valve on the air drum will not be always blowing and wasting power. A three-way valve should be placed in the air line between the receiver and compressor, so that the compressor may be started without load and yet maintain the drum pressure.

Screw conveyors for carrying the seed from beneath the gin stands to the seed house are frequently neglected and can often be found dragging on the boxes in which they are installed. Such defects should be corrected, and plenty of oil or heavy grease used on the bearings. Lubrication is far cheaper than power. Some ginners will insist on blowing their seed with the air from the suction fan, arguing that this air goes to waste, anyhow, and that they might as well use it. Any obstruction, however, in the exhaust pipe will cause back pressure, and it is necessary to speed up the fan and overcome this back pressure in order to unload the cotton as fast as the gin stands will take it.

The data given in the accompanying table for a complete year's operation on 32 different gins, some of them having identical equipment, will give an idea of the variation of power consumption due to the personal equation.

These data were secured by the Texas Power & Light Company, which at present is furnishing electric service to 75 Texas towns. Little effort was made last year to secure gin business, as the company wished to determine first the general effect of this class of business on its load curve. However, during the last few months 23 additional gin contracts have been obtained. These gins, representing approximately 2,500 horsepower of installed motor capacity, will be served during the coming season.

The chief difficulty which has been met with in obtaining this business has been to overcome the prejudice of the gin owner who has been accustomed to using steam-driven power. Trial installations were first resorted to, and it is gratifying to note that only in one instance have motors been removed due to dissatisfaction. When it is considered that practically all the installations have been made in competition with an existing steam plant the record shows much aggressiveness on the part of the company organization.

The total cost of steam power in a gin plant varies from 50 cents to $1.00 or more per bale, depending on the type of equipment installed, the kind and cost of fuel used and the water supply. The average cost of steam power in this section is probably 70 to 80 cents a bale. Hence the actual saving shown with electric operation is not very large, due in great part to the shortness of the operating season. While cost, of course, enters into the discussion, "service" is the real factor which usually brings the ginner around to electric drive. This is exemplified by one of the illustrations shown where the gin is advertising "Quick Service."

Iron Campaign at Portsmouth.

The Rockingham County Light & Power Company, Portsmouth, N. H., is conducting a special sale of electric flatirons for the summer months. Any one of four makes—the Simplex, General Electric, Hotpoint or Universal iron, is obtainable for $3, 50 cents cash and 50 cents a month for five months. A large number of the company's customers have embraced this opportunity to solve the problem of ironing day during the heated term.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Obtaining the Good Will of the Public.

What is the visible effect of good-will advertising? How is one to know whether it pays or not? How are results to be checked? These questions were discussed in a paper before the convention of the Ohio Electric Light Association, July 20 to 23 by E. B. Fenton, publicity manager for W. S. Barstow & Company, who said that there is but one way of checking results. If there is a feeling of dissatisfaction, distrust and unrest among the public—and there is some of this in almost every community—intelligent good-will advertising will bring about better feeling, provided it is backed up by performance. You know this, ordinarily, by the dropping off of complaints, and the friendlier expressions you hear from the man on the street.

There is no hard and fast definition of the term "good will," and there is no slide-rule method of checking the results of good-will advertising. Anything that will make the John Smith you serve feel more kindly toward you; anything you can do that will accommodate or please him, anything that will prompt him to say to his neighbor, "Well, that was a decent thing for the lighting company to do,"—anything in short that will attract the attention of the customer, interest him, enlighten him about your business, and prompt him to think better of you, is good-will advertising.

It is not necessarily printed advertising.

The manner of your cashier toward customers when they pay their bills; the attitude of your complaint department toward those who bring in their grievances; the tone of voice you and your employees assume in answering the telephone; the actions of your meter readers, repair men and other employees on the premises of customers; all these little details of the daily routine of business are items of good-will or ill-will advertising, according to the policy you pursue.

When an intending customer calls up by telephone and ask you to furnish service, does your clerk answer like this?

"You will *have* to come to the office and sign an application."

Or does he politely inform the inquirer that there is a rule of the company requiring an application in writing before service can be given, with a hint that forms are kept at the office?

Each business must have rules and regulations governing its relations to the public and each company must be governed, in making these rules, by conditions peculiar to its community. As a general thing people are inherently resentful of corporation rules which put them to personal inconvenience. So the greatest care should be taken to make as few such rules as possible and to enforce those that are necessary with the view of reducing irritation to the minimum. In no place does politeness pay so well as in the office of a public utility. The average individual does not so much resent complying with a rule, as being told in a cross manner that he must.

Just a few examples of "good-will" advertising: About a year ago an "epidemic" of burglary broke out in an Ohio town. Promptly the public-service company published an advertisement under the caption, "Don't Shoot the Burglar."

It called attention to the fact that the prowling gentry are better shots than the average householder; that when the latter shoots he is more apt to hit a member of his own family than the marauder; and that in the dark, the advantages are all on the side of the burglar. Then it was pointed out that the one thing burglars actually dread is light. The advantages of electric light were exploited in a few words.

The value of that advertisement was the concern the company expressed for the safety of the people of the community it serves.

One day a customer called at the office to buy some lamps. He was urged to take Mazdas and it was explained that they were much more economical than the old-style carbon lamps.

"Any old time," sneered he, "this company tries to sell lamps that use less current, I'll make it good. Anything you recomend will use more current. You're in business to stick us poor devils as hard and as often as you can."

This remark was quoted in the advertising space of the company, the next week, with the following explanation of the company's attitude with regard to current saving devices:

"We are constantly reaching out for new business. Eventually we hope to have our electric service in every home, store, factory and out-building in Blankville. We hope to induce every consumer to use electricity, not only for light, but for the multitude of other purposes for which it can be used to the advantage of the customer.

"This goal can be reached only by making our service of value to our customers. It must be worth all they pay for it—and a little more. So it is good business to do all we can to prevent the waste of electricity—which is a waste of money. We want everybody to use our service to the largest possible extent, but we gain nothing when any customer wastes it.

"The good will of our patrons is our most valuable asset. We want to hold what we have, and add to it. If, by some sudden catastrophe, our entire plant should be destroyed, it could be replaced. That would be only a matter of money. But a lost or impaired good will can never be restored.

"Nobody ever gained or held good will by 'skinning' his patrons. But that is a sure way to lose it. We have been a long time building up ours. We cannot afford to lose any part of it. We are trying to earn more—by deserving it.

"So, when we advise our customers to use the service in such manner and with such devices as to get the largest results for the least expenditure of money, we are not 'knocking' the cash-drawer. We are investing in more good will."

The owner of an excellent residence property wanted to dispose of it. The house was built before the era of wiring all new structures for electric service, and had never been so equipped. Because of this fact, the property was a drug on the market. When it was finally sold, it was at a price several hundred dollars below its actual value. During the waiting period, the owner was willing to rent the house, but could not find a tenant, though modern houses were in great demand.

An advertisement headed "Why This Property Remains Vacant and Unsold," called the attention of other owners to the necessity for wiring their houses if they wanted to get good prices or desirable tenants. It was framed as a

Digitized by Google

friendly "tip" to landlords which, if acted upon, would benefit them.

Added to this sort of advertising, the policy was adopted of sending a friendly personal letter of thanks to each new customer—not a brief, terse business-like letter—a friendly letter, expressing the company's appreciation of the patronage bestowed upon it.

This policy was found to pay. It changed hostility and indifference to friendliness. The customer is human. Treat him with indifference or disdain and he will respond with hostility. Treat him as a friend and he will be your friend—and you never know at what moment you are going to need his friendship—and need it badly.

The preparation of good-will advertising is no task for an amateur. If you don't know your own public, inside and out—its desires, hopes, prejudices, processes of thinking, the construction it will put upon your published words—better turn the job over to someone who does. It is no reflection upon one's ability as an executive that he does not know everything—even everything pertaining to his own business. The public is a special study. How to deal with it in the acquirement of good will is a psychological problem. The average successful business man's powers in this direction are developed by dealing with individuals separately. To influence them in the mass calls for entirely different treatment.

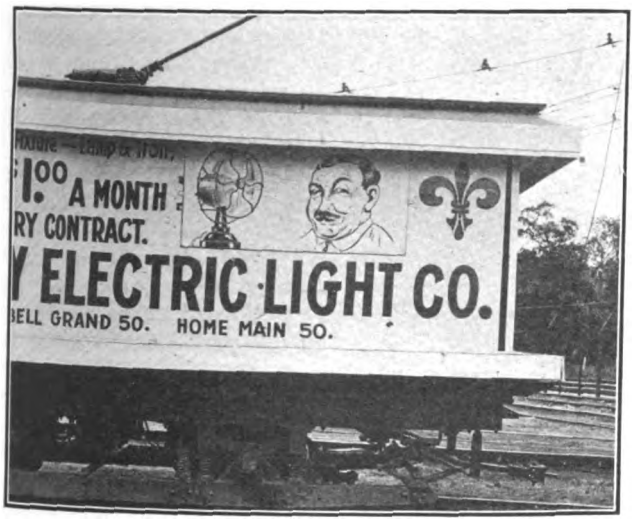
Appliance Campaign at Pueblo.

The Arkansas Valley Railway Light & Power Company has authorized a special electric appliance campaign in Pueblo, Colo., by salesmen employed by a manufacturing concern who are making a canvass of every house in the city selling appliances such as electric flatirons, toasters, table stoves, washing machines, electric cleaners, etc. The results during the first ten days of the work have been satisfactory and it is intended to continue it for 30 to 60 days. The appliances are sold at list price, the salesmen receiving a 20 per cent commission.

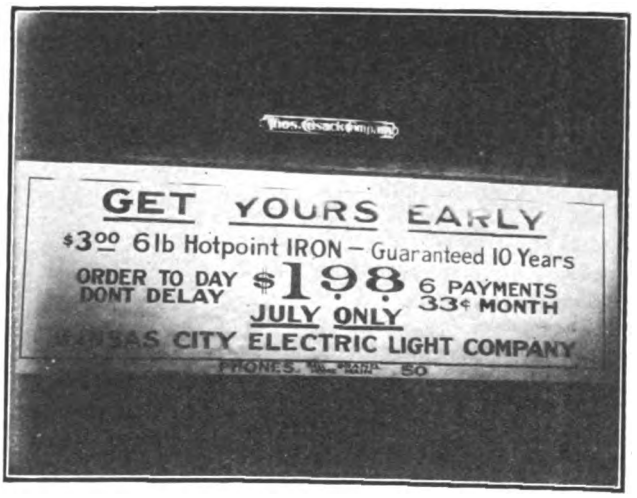
Central Station Adopts Unique Advertising.

The Kansas City Electric Light Company has been prosecuting a vigorous and successful campaign on its offer of wiring one room, supplying a lamp, an electric iron and an electric fan, for $12, payable $1 down and $1 a month. While many advertising devices are used, the company is not neglecting any that involve the use of electrical illumination. Several painted boards, all illuminated, are employed for the wiring offer; and the company also uses other illuminated boards to exploit its offer of a $3 Hotpoint iron for $1.98 in July. Both the wiring and the iron offers have met with large success.

The unprecedented wet and cool weather has somewhat hampered the fan campaign, but the higher temperature after the middle of the month stimulated the demand, and so assisted the wiring exploitation. One new feature of the advertising this month, which will be continued through the summer with different painted signs, is an illuminated, painted special street car. Within the car is a mechanical organ which attracts attention. The advertisements of the company's special offers are painted on sides and ends of the car, a flasher extinguishing and lighting the concealed globes at top and bottom. The car runs for two hours each night, in both business and residence districts. A feature of the signs is a picture on a revolving board about three feet long, of a man sweltering; the board is reversed by the flasher, the other side showing the same face wreathed in smiles, turned to an electric fan.



Street Car Converted Into Portable Billboard.



Illuminated Billboard for Advertising Appliance Sale.

Electric Motors Supplant Steam for Water Pumping at Wellesley.

The town of Wellesley (Mass.) obtains its water supply for domestic purposes from a group of driven wells, located on the northerly edge of the town near Newton Upper Falls. These wells, 60 in number, furnish the entire water supply of the town, amounting to 145,300,000 gallons for the calendar year 1914 or at the rate of approximately 400,000 gallons per day. The rate of consumption naturally varied during the year, reaching a maximum of 500,000 gallons per day in the month of June, or an average of 80 gallons per day per inhabitant.

The arrangement of the water system includes a pumping station located immediately adjacent to the wells, from which the water is pumped directly to two covered reservoirs having an aggregate storage capacity of 1,969,000 gallons, equivalent to 4 or 5 days reserve supply. These reservoirs, located at an elevation of approximately 250 feet above the pumping station, deliver the water to the distribution mains by gravity, at pressures suitable for all household purposes and, in many locations, at pressures ample for fire-fighting purposes.

For a period of 31 years the town has relied upon a single steam pump for the delivery of water to these reservoirs. This pump is rated at 700 gallons per minute at pressures not exceeding 120 pounds, and although still in good condition after its long service, its capacity is materially reduced and has become inadequate to meet the town's requirements.

During the year 1914 the installation of an electrically driven pump of large capacity was completed, and the new unit placed in commission recently. The new pumping equipment comprises a 12 by 14-inch Gould vertical triplex, double-acting pump, direct-connected to a 150-horsepower, 4,000-volt, three-phase, 60-cycle

Digitized by Google

induction motor, also a small air motor-driven pump used to remove the air impounded in the suction chambers of the main pump. When operated at 38 revolutions per minute, the main pump is rated at 1,500 gallons per minute at pressures not exceeding 135 pounds, equivalent to a static head of 310 feet, but as installed it is geared to run at 29 revolutions per minute, with a resulting capacity of 1,100 gallons per minute. In regular service, three pumps operate against a static head of 260 feet, this including a suction head of 11 feet under average conditions.

In deciding to use electric service of the Boston Edison Company for pumping purposes, the engineers of the town recognized the economies which could be effected through the use of this type of equipment.

Under present conditions the new pump is capable of pumping the entire daily requirements of the town in a period of approximately seven hours; whereas the steam unit previously required from 16 to 17 hours to perform similar service. It is, therefore, possible to confine all pumping operations to the hours of the day which do not coincide with the peak load of the lighting systems, thus securing to the town the lowest possible rate for this particular service.

It may be added that, in addition to the favorable effect produced on the rate paid for energy, the more economical operating conditions developed by the use of the electric pumping equipment will be reflected in a substantial saving in labor and materials ordinarily required for the maintenance and operation of a steam pumping plant.

At the present time, the substation controlling the electrical distribution system of the town is being remodeled to increase its capacity. These changes include the installation of a high-tension transforming equipment, to enable the town to receive its service from the 13,200-volt system, instead of from the 4,000-volt system heretofore employed in supplying the town's service from the Newton substation. With the completion of this work, the pumping station will be operated from a separate feeder from the substation entirely distinct from the other business of the town, thus eliminating any disturbance in the lighting service which might be caused by starting a motor of such large capacity as that employed in connection with the main pump.

New-Business Gains Made by Byllesby Properties.

All Byllesby electric properties for the week ending July 2 showed net connected load gains of 283 customers with 292 kilowatts lighting load and a temporary loss of 852 horsepower in motors. New business contracted for included 849 customers with 1,040 kilowatts lighting load and 3,635 horsepower in motors. Of the power business secured, 2,666 horsepower was at St. Paul where contract was entered into during the week by the Great Northern Railway with the Consumers Power Company, covering power for round house and shops. Output of the properties for the week was 7,645,066 kilowatt-hours, an increase of 10.9 per cent over corresponding week of last year.

The Minneapolis General Electric Company during the week secured contracts for 330 customers with 385 kilowatts lighting load and 87 horsepower in motors and took orders for wiring 28 already built houses. The Louisville Gas & Electric Company during the week secured contracts for 110 electric customers with 88 kilowatts lighting load and 53 horsepower in motors and took orders for wiring 44 already built houses. During the week of July 4, three power contracts were secured amounting to 61 horsepower, making a total of 118 contracts secured this year to date, amounting to 2,635 horsepower.

Improvement for Manchester Street Lighting.

A committee of the city government of Manchester, N. H., has been studying the street-lighting systems of Lowell, Lawrence, Haverhill and Salem, Mass., with a view to recommending changes in the public lighting of their city. It is proposed to substitute large incandescent units or magnetite arc lamps, like those installed in Lynn and Lowell, for the prevailing arches of small incandescent lamps which are used on the main business streets of Manchester.

Large Sign in Johnstown.

The Fort Stanwix Hotel of Johnstown, Pa., is now the bearer of one of the largest electric signs in that city. The new hostelry was completed recently and the contract for the sign was given to George J. Griffith & Company of Johnstown. The sign contains the name of "Fort Stanwix Hotel" and is 17 feet 6 inches from the top of the roof and 26 feet long. The letters are three feet high. The sign can be seen at all angles and for miles around the city.

The Jumbo Electric Iron as Feature of Parade.

A clever way of boosting central-station service, and advertising electric heating appliances, while aiding in success of a local celebration, has been demonstrated by the Wilmington & Philadelphia Traction Company, of Wilmington, Del.

The occasion was an "Old Home Week," among the special features of which was an industrial pageant. At about the same time the company was making a special campaign on Westinghouse electric irons. This gave A. W. Burke, superintendent of the Light, Power and Telephone Departments, the idea of building a float to represent a large electric iron. It was mounted on the chassis of a small electric runabout, ordinarily used by one of the company's trouble men.

The Wilmington & Philadelphia Traction Company had three floats in the parade, of which the monster electric iron attracted the most attention on account of its unusual appearance. This float was the subject of a great deal of favorable comment, and the company received a number of compliments from city officials as well as from the committee in charge of the parade, for the originality shown. The pageant was witnessed by a crowd of 30,000 and while no figures are available to show the number of sales resulting directly from this display, the company is confident that the expense was more than justified.

Operating Statistics, Pacific Power & Light Company.

The Pacific Power & Light Company, Portland, Ore., operating in various Oregon and southern Washington cities, has issued a comprehensive summary covering comparative statistics of electric operation at its different points of service during 1914. These statistics, setting forth important and individual features relating to distribution costs and earnings, are tabulated in the accompanying table, and are of particular interest with regard to operating and service cost to the individual consumer in that section of the country, with contingent revenue and profits, as will be noted:

Station	Population Per Customer	Gross Earnings Per Customer	Per Capita	Cost Distribution Mills Per Kilowatt-Hour Sold	Per Customer	Commercial Exp. Per Customer	New Business Per Customer, Gained	Operating Ratio, Per Cent
Walla Walla	7.4	$60.10	$ 7.72	0.83	$1.80	$4.02	$13.30	26
North Yakima	5.0	59.60	11.50	1.46	2.60	3.11	16.50	25
Pasco	4.6	95.03	19.85	0.65	3.65	6.92	25.62	33
Prosser	6.0	49.00	8.30	0.42	1.17	6.72	180.00	40
Pendleton	4.0	55.40	13.34	2.37	3.17	2.98	11.43	25
Sunnyside	4.2	40.80	9.01	3.47	2.87	3.97	12.77	31
Dayton	4.8	34.65	7.10	4.35	2.28	4.07	14.74	28
Toppenish	4.4	50.80	12.13	1.62	2.44	4.79	16.20	31
Pomeroy	4.9	43.90	8.75	5.30	3.31	5.37	16.91	43
The Dalles	5.2	62.00	11.60	1.43	2.97	5.04	19.86	27
White Salmon	6.0	31.90	5.20	4.82	2.11	6.50	28.60	62
Goldendale	5.4	32.70	5.91	4.76	2.17	3.85	8.22	42
Astoria	5.2	61.30	11.11	1.36	2.32	4.30	6.40	36
Average	5.3	$58.20	$10.50	1.29	$2.52	$4.30	$17.76	40

Digitized by Google

Electric Sign Diverts Trade.

An interesting instance of co-operative use by a group of retail merchants of electrical advertising is to be found in Louisville, Ky., where the Market Street Improvement Association is collectively spending about $12,000 a year in this manner. This is only a portion of the electrical advertising used by the retailers on that thoroughfare, who, individually, in the aggregate, probably equal the amount paid by the association as a whole. Market Street in Louisville is generally known as the popular-price retail section, compared with the Fourth Street section, although there are a number of retail establishments on Market that will compare with any on Fourth Street. But the Market Street retailers are organized and working as a unit to divert trade to their stores.

Recently mention was made in these columns that this association had invaded the Fourth Street retail district by buying space on the Federal Sign System, co-operative sign board on Fourth Street. A sign reading, "It Pays to Buy on Market Street," was installed as a trial. The results were satisfactory to the Market Street merchants and they have now contracted with the sign company for an elaborate flashing sign on the same board.

In both the upper corners of the sign, on colored ground, the insignia of the association will be displayed, the dollar with the dollar mark and slogan, "It Pays to Buy on Market Street." In the center of the sign is a large figure designed to give the impression of a rocket bursting, the lamps and the ground being outlined in various colors and the falling sparks to be indicated in the course of the descending lines of lamps.

The contract with the sign system is for one year's service and maintenance. The service will cost the Market Street Association $1,800 and the contract provides for the sign to burn an average of 200 hours each month, depending upon the time of year. The whole is 20 by 30 feet. There are approximately 350 eight-candlepower Mazda 10-watt lamps in the piece. The letters are each 24 inches high.

Electric Guide Post at Biddeford, Maine.

The Maine city of Biddeford, in order to insure travelers by automobile coming through the main business center, has erected a signboard 22 feet in height and containing 152 incandescent lamps forming the words "To Portland," at the corner of Elm and Main Streets, where travelers to Maine resorts pass in large numbers during the summer. The cost of $250 was borne by popular subscription.

SUCCESSFUL COMMERCIAL MANAGERS.

T. I. Jones.

While there has been and perhaps always will be considerable discussion on the question of the engineer versus the salesman for central-station commercial work, all are agreed that an engineer with real sales ability meets the requirements in an admirable manner.

Theodore Inslee Jones, general sales agent of the Edison Electric Illuminating Company of Brooklyn, is an electrical engineer, graduated from the Massachusetts Institute of Technology with the degree of Bachelor of Science in the Department of Electrical

T. I. Jones,
General Sales Agent, Brooklyn Edison Company.

Engineering. Soon after graduation he entered the telephone field in the New York office of the American Telephone & Telegraph Company, being identified with the inspection and executive departments of the company. From there, he took up local telephone work in the executive and traffic departments of the then New York & New Jersey Telephone Company, in its New Jersey division.

Leaving the telephone field the early part of 1907, Mr. Jones accepted position as illuminating engineer with the Nernst Lamp Company of the Westinghouse interests in New York, and while in this position was called upon to organize the sales department of the United Electric Light & Power Company of New York, becoming its first sales manager.

After two years' work with the United Company, he was invited to take charge of the sales activities of the Edison Electric Illuminating Company of Brooklyn, which position he accepted in September, 1909. He reorganized the sales department, including from that time the advertising and old-building wiring departments, which had until then been conducted separately from the selling organization.

During the past five years the annual gross earnings of the Brooklyn Edison Company have increased from $3,700,000 in 1909 to over $6,244,000 for the year 1914.

Since the reorganization of the sales department of the Brooklyn Edison Company in 1909, a showroom, called the Brooklyn Edison Shop, has been opened at the main offices in Pearl Street and three new branch offices established for the transaction of the company's business in the South Brooklyn, Bedford and Williamsburg sections, respectively. In each of these branch offices displays of electrical appliances are made.

In connection with the appliance policy, there was adopted during the latter part of the year 1913 a "monthly special" method of featuring some particular appliance and making a "special" of it for a given month. This has been most successful.

It is well known that in Brooklyn there is a large number of unwired residences. With a view to getting some of this business, the sales department of the Brooklyn Edison Company, under Mr. Jones' direction, devised, in connection with the contractors of the borough, a flat price per outlet partial-payment residence wiring plan, which was put in force the early part of last year, and is still in successful operation.

Mr. Jones has written a number of papers which have been presented before the National Electric Light Association and the Association of Edison Illuminating Companies. Among these may be mentioned: "Functions of a Sales Department," "Development of Revenue from Existing Customers," "Canvassing by Telephone," "Selling Electricity" and "Instrumental Methods of Measuring Maximum Demand."

He was elected chairman of the Commercial Section of the National Electric Light Association, and served in such capacity during the year 1913-14. He is Past Statesman of the Jovian Order, New York District, member of the American Institute of Electrical Engineers, Illuminating Engineering Society, New York Electrical Society, Kilowatt Club and the Manufacturers' Association of New York. Also member of the Technology Club of New York, Engineers' Club of New York, Crescent Athletic Club and others.

Digitized by Google

Electrical Construction

OFFICE SYSTEM AND FORMS FOR THE ELECTRICAL CONTRACTOR.[1]

By Clovis M. Converse.

In any business each department or division of the same requires a system of handling the work, and printed forms to facilitate this operation. These printed forms are also necessary as a permanent record of all transactions. In the electrical contractor's office, taking the case in which we are interested, there are three general divisions of the business, estimating and securing the contract or order, handling and completing the work after it has been secured, and credits and collections. It is with the second division, *i. e.*, the proper handling of a contract from the time it is secured until the final bill is sent to the customers, that this paper will deal. It is not the purpose of this paper to enter into keeping of unit labor costs, although the writer believes this is necessary and advisable.

In general there are three classes of contracts which the electrical contractor will be called upon to handle:

(1) Contracts large and small at a fixed predetermined sum.

(2) Contracts on a fixed basis, *i. e.*, cost plus a given percentage or cost plus a fixed sum.

(3) Open time-and-material orders.

The same system and forms will handle any of the above if properly designed and used.

In designing a system and forms for the electrical contractors we must first take into account the results to be secured. Briefly, these are as follows:

(*a*) The work must be started and carried to completion as speedily and accurately as possible.

(*b*) An accurate record must be kept of all labor and material required to complete the work.

(*c*) The customer must be informed of the amounts due the contractor from month to month or on completion of the job.

(*d*) A complete, clear and easily accessible record must be maintained in the office of all transactions, so that same may be reviewed at any time for the satisfaction of either customer or contractor.

Form EC 18 3M P

THE ELECTRIC CONSTRUCTION CO.

CONSTRUCTION ORDER

Date _____ 191— Issued by _____ No. _____

Charge to

Location of Work Permit No.

Description of Work

Additional Work

Work Done by Date Finished

Correct

Fig. 1.—Construction Order.

The order system in use by the Electric Construction Company, St. Paul, Minn., has proven very satisfactory, and seems to fulfill the foregoing requirements. A brief description of same will, therefore, be given.

When an order is secured (or comes in over the telephone) the first point considered is the credit of the customer. This having been approved, a construction order (Fig. 1) is made out, together with a labor sheet (Fig. 2). These construction orders are numbered consecutively and indexed. Each job has a separate number to which labor and materials are charged. The index mentioned above may be made as complete as seems desirable. In our office it shows the following: A list of the jobs in numerical order with the amount, an alphabetical list of customers showing the C. O. number, a list of the jobs obtained by each man during a given month. This list also shows the amount of the job, and eventually the profit on same. This work is all done by the stenographer.

The construction order is in duplicate, a white and a yellow copy, and shows the name of customer, the location of the work and has a space for a short description of the work.

For small jobs this description is written on the order; for larger work the order simply reads "as per plans and specifications" or something similar, these plans and specifications being sent to the foreman with the order.

Assuming the construction order and the labor sheet has been made out, and that complete instructions accompany them, let us follow them on their way to the general foreman. The labor sheets are filed in numerical order in a loose-leaf binder for future use, the construction order is separated, the white copy or original, going to the man who is to do the work, the yellow or duplicate copy being retained by the general foreman, who notes on same the man or men assigned to the work. (It is to be noted that the man who carries the construction order on a job is in charge of and responsible for same.)

Form 17

ELECTRIC CONSTRUCTION CO.

Closed By
Contract Price
Profit
Loss
Charge to
Address
Work to be done
C. O. No.
Date Ordered
Credit Approved
Order No.
Date Billed
Contract
Time & Mat'l
Labor for Month of 191—
Name
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 Total Hours Rate Total

Fig. 2.—Labor Sheet.

1 Paper presented at meeting of Minnesota Electrical Contractors' Association.

Digitized by Google

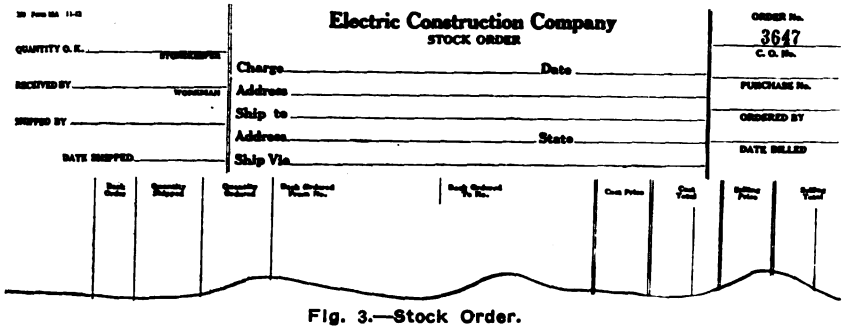


Fig. 3.—Stock Order.

The next item in the progress of the order is the getting out of material for the job. Two forms are used for this purpose; one for the recording of material taken from stock, and one for the ordering of material from others. Fig. 3 is the form for the stock order, and the form for ordering outside materials is very similar. These forms all bear consecutive numbers for purposes of identifications. These orders may be made out by any one, but are checked by the foreman and filled only by the stockman. All outside orders should be countersigned by the foreman. In general, on small orders, the material is ordered by the man who is to do the work; on larger orders the material is ordered by the foreman from the estimate sheet on file in the office. All special material requiring detailed information is ordered by the office, as is all material for out-of-town work.

In our system these two forms are identical, except that one is marked "stock order" and only one copy is made, while there are four copies of the outside order. These order forms, together with the credit sheet (Fig. 4) and the labor sheet before mentioned, form the backbone of our entire record system; in fact, they are our permanent files. Let us, therefore, look them over in detail.

Take the case of a small time-and-material job as typical. The man receives his construction order, orders his material, and it is written up on the stock order, the man being called on to furnish the name of the customer and the C. O. number. This order is then filled by the stockman from his stock, the exact amounts furnished being placed in the "Quantity Shipped" column. Any material which is not in stock is back-ordered and an outside order made out. (In our case all orders go to the Northwestern Electric Equipment Company, so that in some ways our system is special, but it could casily be modified slightly to suit other contractors.)

As before stated, there are four copies of this outside order. These are used as follows: The first copy or original, is retained and later filed in numerical order under the job number, as is also the stock order previously described. The second or tissue copy, and the third, or orange copy, go to the company from which material is purchased, as an order for material; the tissue copy comes back with the material ordered, the third or orange copy, being retained by the sellers for their records; the fourth, or yellow copy, is filed in numerical order, and is used as a file for invoices when they are received, and as a means of identifying them.

When the man has completed the job he brings in the unused material, obtains a credit slip from the stockman, and writes the customer's name and the C. O. number on the slip, placing same with material. The stockman then goes over this material, returns it to stock and enters the amounts on the credit slip.

Taking the procedure outlined as typical, let us see what happens to these material charges which are collecting on the stockkeeper's desk.

At the end of each day they go to the foreman who looks them over. To be sure that these slips are not lost after leaving his hands, the foreman notes on the yellow copy of the construction order the order number of each as he checks them. From the foreman these charge tickets, as they are now called, go to the bookkeeper.

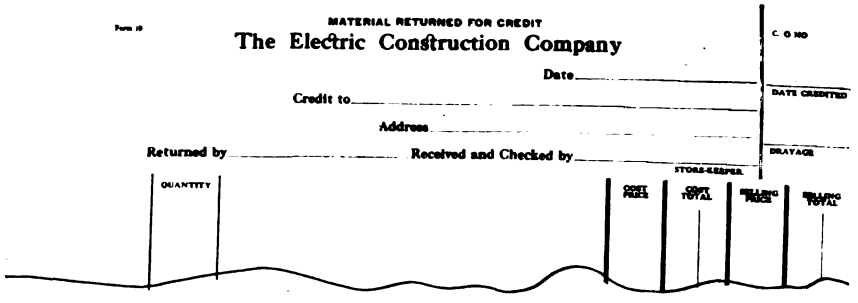


Fig. 4.—Credit Sheet.

Coming back for a moment to our man who has been doing the work; at the end of each day he makes out a time slip (Fig. 5) which he turns in. This time slip shows the time he has put in for the day and to what construction order number it is to be charged. These time slips go to the foreman, who approves them; the amount of time is then entered on the labor sheets and on the pay-roll book. These two entries are necessary to provide for charging the time to the customer and of recording same for the purpose of payment. If a job has been completed, the wireman notes this fact on the construction order and turns it in with his time slip. When the foreman receives this construction order he signs and sends the yellow or duplicate construction order through to the bookkeeper together with the labor sheet.

Once a day all material charges, credits, complete construction orders, labor sheets, and time slips are turned over to the bookkeeper, the time slips to be approved by the manager and filed, the material charges and credit tickets to be priced and filed in the

The Electric Construction Co.
ST. PAUL, MINNESOTA
TIME SLIP

Workman's No.
Name
Date

STARTED	QUIT	C. O. No.	No. Hours	Car Fare	CHARGE TO	DESCRIPTION OF WORK
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					
8 1/2	5					

Total Hours

Correct

Approved for Payment.

Foreman.

Fig. 5.—Time Slip.

Digitized by Google

current binder, and the construction orders to be put through for billing.

The latter consists of the following operation; when the completed C. O. is received by the bookkeeper, his first move is to withdraw all tickets of that number from the current binder, these tickets are then checked back against the numbers on the C. O. to show that none is missing. Next, all tickets not already priced are priced, extended and totalled, such prices (for stock material) being based on the market price, and for material purchased for that particular job on the invoice price. All material charges and credit sheets having been totalled and having deducted the credit for material returned, we have the net cost of material for the job.

The labor is computed from the labor sheet; the labor and material charges being added, we have the net cost of the job. These figures for convenience are summarized on the labor sheet.

In pricing a time-and-material job, both sets of prices are put on the charge ticket, *i. e.*, the cost and selling price. In this case the totals of these tickets would show the total cost and total selling price. On a contract job or on a percentage job the selling prices are of course not used. When this stage has been reached the job is ready for billing, except that all the extensions and additions are first checked by means of a comptometer.

For a contract job the form of bill or invoice used carries a simple statement of the kind of work done, the date and amount of the contract and the extras, if any. For time-and-material jobs the labor and material are itemized, except for the very small bills. A carbon copy is kept of all invoices and these are filed in a binder in numerical order and indexed under the customer's name.

The billing being completed, the invoices go to the bookkeeper to be entered and mailed to the customer. The charge tickets and labor sheet are filed in standard binders in numerical order under the C. O. number.

On large jobs where the customer is billed every month for the labor and material installed during the previous month, the tickets are handled in much the same way, except that the construction order is not turned in and a new labor sheet must be made out to replace the one turned in; also, credit is not given for material returned until the job is completed.

We believe our system as outlined obtains the desired results as given previously with the minimum of labor and maximum accuracy.

First, the construction order carries a complete description of the job giving the foreman the opportunity to handle it to the best advantage; second, the material charges and labor sheet previously described give us a simple, accurate record of all time and material entering into a job. The chance of error in these charges and also a lot of labor is eliminated by the fact that there is no transferring or copying of quantities of material, the original order or ticket forming the final permanent record. Third, our system of billing gives all the information necessary and automatically records same; fourth, by filing all tickets in numerical order in binders we can at any time refer to same and find a complete detailed record of the job showing just how, when, where and by whom the work was secured, completed and billed.

Important Committees of Electrical Clearing House.

The Louisville Electrical Clearing House, Louisville, Ky., has ordered appointment of two new committees. The first, which will be named by C. C. Childers, president of the association which is composed of the electrical contractors of the city, will take up with the Louisville Gas & Electric Company the proposition of special inspections of buildings when vacated by one tenant and before occupied by another. Such inspections, it is pointed out, would mean a lot of money to the contractors by reason of the fact that one tenant is often guilty of stringing wires on his own account, without regard to the building restrictions, and that any inspector would order them torn out. Deteriorating installations, also, could be detected and replaced. The contractors admittedly are prompted by primarily selfish motives, though they justify their attitude by the statement that improper wiring by amateurs is very likely to cause fires and loss of property.

The other committee is regarded as an extremely important one and will combine the duties of a grievance committee and an arbitration board. The intention is to select its five members from among the top-notchers in the trade in the city, including experts on motor installations, conduit work, house wiring, etc. It is the idea that such a committee could take up disputes between contractors who contend their work is up to specifications and the Code and inspectors of opposite persuasion, and determine from the facts in the case which party is in the right. Such deadlocks have proven expensive at times to contractors who felt that they were being imposed on by inspectors. Eventually, it is believed that the same committee may be able to take up and settle other issues, such as character of materials, manner of work, price, labor trouble, etc.

Contractors Promote Installation of Exhaust Fans.

Electrical contractors of Louisville, Ky., are paying a good deal of attention at this time to installations of exhaust-fan systems of ventilation in buildings which were constructed as theaters, etc., before this system came into more or less general use. There are numerous such buildings in old towns like Louisville—restaurants, factories, motion-picture theaters, etc. The argument is that in any large room or place where odor and moisture-producing processes are carried on and in which provision is not made for disposing of the dead air inside, the ordinary types of fans will not prove completely satisfactory. Unless exhaust fans are provided for removing the old air, it soon becomes saturated with moisture and the action of the electric fans within the room does not create the sensation of coolness. The result has been that the desk and ceiling-fan equipments of numerous small manufacturing establishments, restaurants, theaters and even some homes, have been supplemented by exhaust fans. In homes, however, the kitchens are, of course, getting most of this attention.

Pennsylvania Officers Elected.

At the meeting of the Electrical Contractors' Association of Pennsylvania, held in June, the following officers were elected:

President: John S. Musser, Harrisburg.

Vice-president: W. T. Brown, Philadelphia.

Secretary-treasurer: M. G. Sellers, Philadelphia.

Board of directors: George E. Shepherd, Wilkes-Barre; M. E. Arnold, Philadelphia.

National director: George E. Shepherd, Wilkes-Barre.

Building Operations in the United States.

The official building permits issued by leading American cities for the first six months of 1915, as compiled by the *American Contractor*, totaled $318,179,519, a decrease of $32,684,347, or only nine per cent, as compared with the same period in 1914. With the building projects in sight and the optimistic tendency that views enlarged activities in the near future, it is not improbable that the deficit in this half-yearly showing may be more than made up during the balance of this year.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

KANSAS.

Kansas Natural Gas Company. The Commission has issued an opinion justifying an increase in gas rates to consumers supplied by the Kansas Natural Gas Company from 25 cents to 28 cents per 1,000 cubic feet It is stated, however, that no increase will be ordered until the Missouri Commission provides for a similar increase in Missouri.

MASSACHUSETTS.

Newton and Watertown Gaslight Company. The Board of Gas and Electric Light Commissioners has reduced the rate of the Newton and Watertown Gaslight Company for gas service in Newton, Waltham, Watertown, Wellesley and Weston from 90 cents to 85 cents, effective August 1. The Board finds the new price will yield a fair return on the capital invested, and points out that since the last reduction was made the business of the company has increased about forty per cent and the price of gas oil has decreased.

New England Telephone Company. Under the provisions of an order issued July 14, by the Public Service Commission, the New England Telephone Company is required to install a meter for measured telephone service when the subscriber calls for it. The price to the subscriber is to be $1.50 a year, which is just half of what the company has been charging for it in the past.

MISSOURI.

Springfield Rate Case. The District Court of the United States, Southern Division of the Western District of Missouri, has granted a temporary injunction restraining the enforcement of the order of the Missouri Public Service Commission, which fixed the valuation of the Springfield Gas and Electric Company and established rates for electric service in Springfield, Mo.

The progress of this case will be followed with great interest, as its final disposition will afford the first ruling of a court in an electric rate proceeding upon appeal from an order of a public service commission, so far as known.

The decision of the Commission, rendered June 23, 1914, reduced the company's maximum rate from 15 cents to 8 cents per kilowatt-hour. (This decision was abstracted in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, July 11, 1914, page 83.) From this decision the company appealed to the Court. The company offered, in place of the old 15-cent rate for residence lighting, to install rates not in excess of 10 cents per kilowatt-hour, and the temporary injunction was granted upon that condition.

The injunction is granted because it is impracticable, in the opinion of the Court, to determine from the Commission's figures the reasonableness of the final valuation allowed.

The Court says: "The opinion and order of the Commission discloses that it took the lowest of the computations, made by three several engineers, of the cost of reproduction new of the property involved, less depreciation, made substantial reduction thereon, and therefrom deducted an actual cost of reproduction, less depreciation, of $200,126. The fixed valuation of $300,000 was arrived at by the addition thereto of $100,000, because of 'considering said plant as a going concern and taking into account the fact that said plant is in successful operation, and including engineering, supervision and interest during construction, organization and general expenses, legal expenses, contingencies, insurance, general contractor's profit, promotion and other development expenses, working capital, and including all other elements of value, tangible and intangible, as used in the public service in supplying electric energy at Springfield.' It is contended by complainant that this allowance for the various items thus recited is unreasonably low to the point of confiscation. The Commission has made an omnibus allowance without itemization in findings, opinion or order. Hence it is impossible to test the reasonableness of its findings without such a comprehensive examination of the entire case as is impracticable upon a preliminary hearing of this nature." * * *

Development Rates.—"Counsel for defendants sought to justify the order of the Commission in this case upon the ground that a like rate is in force at Joplin, Mo., a city of almost the same population. Complainant asserts that the nature of the industries and business conditions at Joplin operate to produce a materially greater net return at Joplin than at Springfield. To this the defendants reply that the establishment of an identical rate at Springfield would tend to build up a profitable patronage at the place to such an extent as to equalize industrial conditions in the two cities; but such a result must necessarily be theoretical and speculative. Commission action based upon such considerations invades the right to control and management incidental to ownership. In *Northern Pacific Railway Company and Minneapolis, St. Paul & Sault Ste. Marie Railway Company v. State of North Dakota, ex rel. T. F. McCue, Attorney General,* the Supreme Court of the United States has said that it is beyond the power of the State to compel the establishment and maintenance of rates not otherwise reasonable in order to build up a local enterprise."

Valuation Required by Commission Law.—"It is apparent that if the contentions of complainant be sustained, in any substantial degree, the return upon its investment would fall short of a fair and reasonable return at the rate fixed by the Commission itself. It further appears that such claims demand serious consideration. The Court has been embarrassed, in its review, by the form of the decision and findings which enumerate in general terms the items included, but fail to specify the amount allowed for each." * * *

The Court cites Subsection 2 of Section 78 of the Public Service Commission Act requiring the Commission to "make and file its findings of fact in writing upon all matters * * * bearing on the value of the property" of the corporations affected, and the Court says: "It may be doubted whether a decision and findings which state nothing but the total valuation fixed by the Commission, without showing the amount allowed for each item included, would be a compliance with the manifest purpose of the law to permit the parties interested to test in court the questions involved. Under such circumstances, what is the duty of the court upon temporary hearing? In *Newton v. Lewis,* 79 Fed. 715, the Court of Appeals announced the rule which prevails in this circuit.

Duty of the Court.—" 'When the questions to be ultimately decided are seri-

Digitized by Google

ous and doubtful, the legal discretion of the judge in granting the writ should be influenced largely by the consideration that the injury to the moving party will be certain, great and irreparable, if the motion is denied, while the inconvenience and loss to the opposing party will be inconsiderable, and may well be indemnified by a proper bond, if the injunction is granted. A preliminary injunction maintaining the *status quo* may properly issue whenever the questions of law or fact to be ultimately determined in a suit are grave and difficult, and injury to the moving party will be immediate, certain and great, if it is denied, while the loss or inconvenience to the opposing party will be comparatively small and insignificant if it is granted.'

"Counsel for defendants in their brief point out that, if its contention is sustained, complainant will seek to recover its losses by making charges against consumers in excess of the rates then in force. They say:

"'After a final hearing, and these rates declared illegal, the complainant will be admirably situated to make such collections. Having a monopoly of the business and power to discontinue the service at will, complainant has the whip hand and requires no aid from court to maintain its rights.'

"A sufficient answer to this argument is found in the fact that consumers of electricity are constantly changing, and that additional charges could scarcely be enforced against those who had not enjoyed the lower rate. Moreover, the powers of complainant are not so absolute as this suggestion of counsel would imply. It would, in most cases, be put to its recovery at law, and this would involve a multiplicity of suits.

Irreparable Injury to the Company.—"On the other hand, the injury to the moving party in this case will be certain, great and irreparable if its motion be denied and its contentions ultimately sustained, while the inconvenience and loss to each consumer will be inconsiderable and may well be indemnified by a proper bond. A course of business that will insure a prompt refund of charges ultimately adjudged to be excessive may easily be prescribed in a case like this." * * *

The order provided that a record be kept by the complainant, and "such evidence of consumption and payment issued to the consumer that any excess due the latter may be readily computed and judicially determined. A bond in sufficient amount and with appropriate conditions will be exacted to insure compliance with the order made, and jurisdiction will be reserved in this Court to adjudicate all claims which may be found to accrue from the granting of the temporary injunction."

NEW JERSEY.

The Farmingdale Lighting Company has been forbidden to favor officials and employees in rates for service. The Board found that upon the rates for service supplied by this company to its customers, widely different rates of discount were allowed. The officers and certain employees of the company were granted a discount of 25 per cent and the linemen received a discount of over 66 per cent, if their bills were paid within the required time. The company sought to justify this unusual discrimination in favor of its officers upon the ground that they received no salary or other compensation, but the Utility Board found that that was not a valid reason.

The opinion says: "It has been repeatedly held that a director, stockholder or employee of a utility company is entitled to no preference or advantage in the matter of the rate he is to pay for service. The only exceptions are those expressly made by statute. They should all be charged the regular rate. Matters of salaries and wages should be treated on a more business-like basis than discrimination in rates for service. The public utility act of this State provides that no public utility shall make any unjustly discriminatory or unduly preferential rate, charge or schedule for any service supplied or rendered by it; or make or give, directly or indirectly, any undue or unreasonable preference or advantage to any person or corporation. Under the prohibitions just referred to, the practice of allowing directors, officers or employees different rates of discount than are allowed to other purchasers of electric current is illegal."

The company is ordered to discontinue such discrimination.

NEW YORK.

Perpetual or Indeterminate Franchises. The Constitutional Convention Comittee on Legislative Powers has appointed a sub-committee to draft an amendment to the Constitution which will prevent the granting of perpetual franchises to public utilities in the future.

An amendment is before this committee prohibiting the Legislature or any municipal authority from granting a franchise in perpetuity and providing that indeterminate franchises may be granted without limit of time upon conditions that permit the granting power to resume control of the franchise upon terms to be embodied in the original grant.

NEW YORK—Second District.

Ulster & Delaware Railroad. The company's application for a rehearing of the recent order of the Commission, denying the Ulster & Delaware Railroad Company permission to raise its mileage rate above the two-cent maximum set by the Legislature (see last week's issue of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, page 121) has been formally denied by the Commission.

In the order denying the rehearing it is made clear that the Commission refused the proposed increase only on the ground that it did not have the power to grant it. The decision says:

"While the Commission is of the opinion that the rate complained of is insufficient to yield reasonable compensation for the service rendered, yet the Commission, as set forth in its order of July 6, 1915, is of the opinion that it has no jurisdiction to grant the increase."

The question of jurisdiction, involving an authoritative determination as to whether the Legislature of 1907 gave the Commission all power over rates irrespective of the acts of the Legislature in setting maximums, may now, therefore, be presented to the courts. It is not unlikely that in the meantime either the Constitutional Convention or the Legislature may define these powers of the Commission anew so as to remove all future doubt of their scope.

Empire Gas and Electric Company. The Commission has consented to the merger of the Weedsport Electric Light Company with the Empire Gas and Electric Company. Within thirty days of the merger the company is to report all the details to the Commission for approval.

The Western New York Electric Company has been authoritzed to begin business under the terms of its franchise in the town of Ellicott, Chatauqua County. The franchise is for parts of the town not supplied by the Jamestown Lighting and Power Company.

New York Telephone Company. The Commission has settled the complaint of Frank M. Bradley, individually and as representing the West Somerset Cold Storage Company, against the New York Telephone Company, as to its service and charges to the Barker exchange. The order provides for four-party service in place of the present multi-party service at a base-rate area charge of $21 for business and $15 for residence service, plus a mileage charge of $2 per square mile beyond the base-rate area. The mileage charge was opposed by the complainant, but the Commission finds that this charge is in state-wide use by the company, and that a change in this charge would involve an extended inquiry into the reasonableness of the charge throughout the state. The company is ordered to

Digitized by Google

put into effect the four-party line service at the above rate on August 1, and is authorized to collect the mileage charge pending the determination of the Commission as to its reasonableness.

PENNSYLVANIA.

The First Annual Report of the Public Service Commission has been issued in bound form. The cases handled by the Railroad Commission, subsequent to the last report issued by that Commission, are reported, and the work of the Public Service Commission, beginning July 26, 1913, to June 30, 1914.

Competition.—In discussing the work of the Commission upon the applications for certificates of convenience and necessity, the report says: "One case in which the certificate was refused, attracted more attention than all of the others, and it was almost at once followed by an effort upon the part of the officers of some of the smaller municipalities throughout the State to have this part of the act modified. The case was one where it was proposed to burden a minor municipality with two sets of poles and wires for furnishing light, heat and power. It is the evident intention of the act, as it exists, that excess of rates and imperfection of service shall be remedied, not by attempted competition, accompanied by duplication of expense, as formerly, but by the exercise by the Commission of the control and authority vested in it over the corporation supplying the service. This is a new method in Pennsylvania, though long in use elsewhere, to which her people have not yet grown entirely accustomed. It is altogether probable that when they learn by experience that there is a tribunal to which they may apply in their differences with the public service companies, and that the installation of competing companies with the duplication of unsafe and unsightly poles and wires affords only uncertain and temporary relief, they will be more satisfied with this provision of the act. Its repeal would, however, relieve the Commission from many burdens and, in the view of the Commission, it is a matter to be determined by the wisdom of the Legislature, having regard to the best interests of the people.

"The Commission has, by rule, required that previous to the consideration of these contracts, notice of the application shall be given by advertisement in the newspapers of the locality. This order has resulted in giving individual citizens the opportunity to be heard and to have their interests considered and respected, which otherwise would have been disregarded or only established after tedious and sometimes expensive litigation."

The report also says that, "The contracts which were examined exhibited a great lack of uniformity with respect to terms, rates and the services to be rendered in different municipalities, and oftentimes a want of proper and necessary provisions. The Commission is making a thorough study of all the classes of public service companies, with the purpose of securing as nearly as may be practicable such uniformity in connection with municipal contracts."

WEST VIRGINIA.

The Manufacturers' Light and Heat Company. The Comission has dismissed the petition of the city of Follansbee against the Manufacturers Light and Heat Company. The petition asked that the company be compelled to lay its mains in the alleys and be prohibited from tearing up the paved streets to lay its mains. The Commission holds that the company has the right to lay its mains in the streets.

Electrical Trade in South America.

First-hand information on business conditions and methods of trade in South America, based on a six-months' close study of conditions there, was presented to New England manufacturers by S. S. Brill, special agent of the United States Bureau of Foreign and Domestic Commerce, at the Boston Chamber of Commerce, July 13. Mr. Brill was for ten years engaged in selling American goods in Latin America. During his recent trip he visited 35 cities in Argentine, Chile, Brazil, Peru, Uruguay and Paraguay, interviewing merchants and dealers. He reported a growing demand for electrical goods, hardware and allied products, and dispelled the prevalent impression that the trade demanded goods of distinctive styles and patterns. He insisted that, except for the modifications demanded by the climatic conditions, American goods are welcome, in design and construction identical with those designed for home sale. There need be no marked departure from methods employed in domestic trade, either. Credits are not the *bete noir* that they are thought to be, the usual terms for goods of the character mentioned being 120 days from date of bill-of-lading. This means only about 60 days between date of receipt of goods and remittance, since about two months are consumed in forwarding goods and in receiving remittance by mail.

Contrary to prevalent ideas, South American merchants are generally reliable and scrupulous. Despite *moratoria* and crises in governmental finances, there have been few failures of good houses. Those in the Argentine were in large part due to the collapse of a bank which had been involved in the handling of boom lands at fictitious prices.

Some definite practical points were offered which will be of value to shippers of electrical goods. Salesmen in South America make it the rule to obtain *signed* orders. These are good at the bank, with shipping documents or drafts attached, for about 90 per cent of face value. Import duties are based on weight and not on cost and vary with the different component parts of the same apparatus. Hence it is often desirable to pack parts separately, as the rate on the highest-valued part would otherwise be levied on the whole. Each package should be strongly packed and correctly marked with its weight in the metric system. If goods are to be lightered at port of entry, they should be wrapped in waterproof paper. Shipping documents should go by the same steamer with the goods so as to be presented at the custom house promptly, a penalty of 10 to 50 per cent being imposed for failure to present documents within three to five days.

Mr. Brill said the people of Brazil, Argentine and other countries where American branch banks are being established are beginning to see that the United States merchants are in earnest. He held that now is the opportune time to lay foundations of trade.

Philippine Hydroelectric Project.

A hydroelectric project involving about $2,000,000, for the development of which a company composed of American and Spanish capitalists has been formed, contemplates the building of a large power plant in the mountains of Tayabas near the Pacific coast of Luzon in the Philippine Islands.

An application for the water rights on the Agos River immediately below the confluence of the Lanata and Canan Rivers has been filed with the Government. The Agos River flows from the Tayabas Mountains on the eastern slope into the Pacific Ocean near the Puerta Real de Lampan.

The proposed construction for the plant will consist of a reinforced concrete dam 328 feet in length, 13 feet in thickness at the summit, and 29.5 feet in thickness at the base. From this dam the water will be conducted in an open canal two miles to a point on the hillside, where a large reservoir will be excavated in the native rock with a capacity of 530,000 cubic feet.

From this reservoir the water will be dropped through pipes six feet in diameter upon a battery of double turbines which will be directly connected with four electric generators of modern design. The plant is designed to supply power for irrigation works, mining plants, and light and power for the district lying between Manila and the generating station.

Digitized by Google

ELECTRIC WELDING.—II.

By Gordon Fox.

Incandescent Welding.

Incandescent or resistance welding depends upon the basic principle that electric current, in passing through resistance, generates heat. The process comprises essentially the inclusion of the abutted metal parts to be welded in an electric circuit of low potential. Through this circuit sufficient electric current is forced so that the resistance loss (I^2R) in the pieces to be welded causes the metal adjacent to the joint to heat. The weld is completed by the application of pressure when the metal is at welding temperature.

Incandescent welding is done in special machines which have been developed in a variety of forms for different kinds of work, but which comprise primarily:

A transformer for reducing the potential of the available alternating current from circuit voltage, 110, 220 or 440 volts, as the case may be, down to 3 to 10 volts, as required.

Means for switching on and off the welding current and for controlling it by changing the secondary potential. Since the secondary currents are very heavy it is most feasible to vary the secondary voltage by changing the arrangement or number of turns of the primary coils, using some sort of switching device, or by the use of an induction regulator or choke coil in the primary circuit.

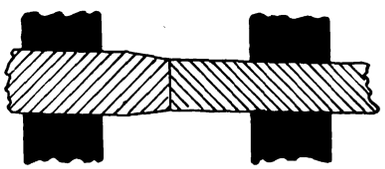


Fig. 5.

Clamping blocks for holding the pieces to be welded and for introducing the heavy currents into them.

Mechanical means for applying pressure to complete the weld. Hand levers, foot levers, motor and hydraulic power are used in different types of machines.

The simplest application of incandescent welding is found in the butt welding of iron bars of like section. Two bars to be welded are gripped between large copper clamps at points near the ends to be joined. These clamps are made heavy in order to carry thousands of amperes without overheating. The currents used for welding sometimes run as high as 50,000 amperes. The clamps must have good and ample contact with the weld bars in order to prevent undue heat by contact resistance at the clamping point. They are often water-cooled in order to dissipate the heat which is conveyed back into them from the hot bars which they grip. The distance between these clamps is short. In welding one-inch round iron the clamps would be about 1.5 inches apart. The heating is thus confined to a very short portion of the weld pieces. The heat is caused by resistance losses not primarily due to the contact resistance of the joint but mostly due to the internal resistance of the metal of the weld pieces themselves. Obviously, the longer the circuit between clamps the greater the resistance and the more the total heating effect of a given current. The chilling power of the clamp blocks cools the weld bars under these blocks and for a short distance out from them. The temperature is therefore a maximum at a point about midway between blocks, provided both weld bars and clamps are identical. If the distance between clamps is short, the joint at the center will be at welding heat while points but a short distance away are cool. The point of maximum temperature is thus very closely confined. Too short a distance between clamps causes too great dissipation of heat back through the clamps; too long a distance prevents confining the heat to the joint.

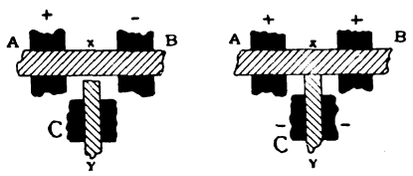


Fig. 6.

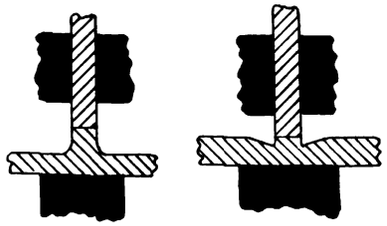


Fig. 7. Fig. 8.

The greater the distance from the clamp to the joint the more the heat in the part.

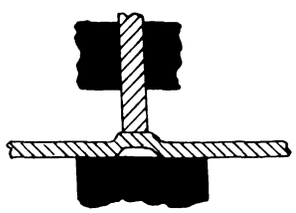


Fig. 9.

The smaller the section of the weld piece the greater the heat for a given current.

The greater the heat conductivity of the clamps the more their cooling effect. Copper clamps conduct heat away faster than iron clamps, for instance.

The faster the heating, meaning the higher the current-density, the more the heating is confined to the joint and adjacent metal, but the less chance the heat has to "soak" and become uniform. It is also more difficult with rapid heating to switch off the current and complete the weld at exactly the right instant.

Slow heating at low current-density leads to uniformity, but causes more heat to be lost through conduction into the clamps. Slow heating also leads to increased loss through radiation into the air.

Rectangular sections present more radiating surface than circular sections per unit of volume, hence require greater current inputs and involve greater losses.

Small sections present more radiating surface than large sections per unit of volume and therefore require more power per unit of volume.

Metals having high conductivity, such as copper or brass, require higher current densities and more rapid heating than metals of considerable resistance, such as iron.

These are some of the considerations affecting the methods of clamping, heating and applying the pressure. By suitably modifying the clamps, distances, form of sections or other details it is possible to weld together a great variety of unlike sections and different shapes.

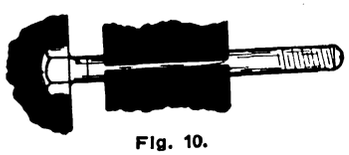


Fig. 10.

Bars of unequal section can be welded by clamping nearer to the joint upon the small bar than upon the larger bar. The chilling effect of the clamps then keeps the small bar cool enough while the longer distance in the large bar introduces resistance and heats up the larger section equally to that of the short small section. Fig. 5 shows the method of preparing the bars and clamping them.

A few of the more common commercial welds made by the electric process might be reviewed. Straight butt-welding is used for welding bars of all sorts, tubes and wires. Rings of all sizes, eyebolts, barrel hoops, bicycle and auto wheel rims and many similar parts are made by bending straight stock into circular form and butt-welding the joint. A specialized application of this type of weld occurs in the manufacture of chain. Here the open links are butt-welded in an automatic machine.

Right-angle welds are common, as in

Digitized by Google

the manufacture of printers' chases, dashboard frames, carriage rails, bag frames, oven racks and racks of all sorts, and many other parts. An interesting application of the cross weld is the manufacture of wire fencing, where the vertical and horizontal wires are welded at their intersecting points. This work is now done automatically in special machines. Garden rakes are made by welding wrought-iron teeth perpendicularly to a backbone part. This makes a product much superior to malleable iron and at a low cost.

Right-angle welds consisting of one piece of iron welded perpendicularly to the middle of another piece, are called T welds. In most T welds it is necessary to preheat the top bar of the T to a bright red, then bring the perpendicular piece into contact and complete the weld. Fig. 6 illustrates the method. The top bar is first gripped between the blocks A and B and sufficient current is introduced to heat the piece X. When this piece is incandescent the piece Y, gripped at C, is brought into contact and the flow of current changed by a switching operation so that the current travels from C to A and B. All parts now reach welding

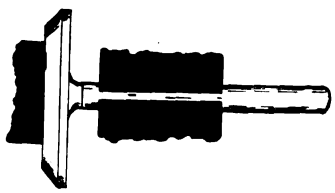


Fig. 11.

temperature and the weld is completed in the usual manner. Some experience is necessary to determine the proper clamping distances, the right amount of preheating of the T bar and other details, after which the work can be done easily and uniformly.

Bars may be welded perpendicularly to plates in several ways. It is not feasible to butt the bar directly against the plate, since the large section of the plate will not generate as much heat as is generated in the bar, but will tend to conduct it away. If a boss can be formed on the plate, the rod can be readily welded to the boss, as shown in Fig. 7. Another method is to make a recessed channel in the plate to gain the same end. Fig. 8 illustrates this method. A third method raises the metal of the plate by stamping as shown in Fig. 9. These methods are employed typically in welding heads to bolts (Fig. 10), valve stem to valve (Fig. 11), stirrup (Fig. 12), handle to sheet-metal cover (Fig. 15). A similar method is used for welding calks to horseshoes (Fig. 14). Tubes are welded to flanges in the same manner (Fig. 13).

Commercial examples of welding of special shapes occur in many forms. Automobile - engine crankshafts are made by welding several parts together. The central portions are drop forgings,

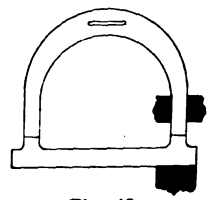


Fig. 12.

while the end portions are drawn steel shaped almost to size. The parts are welded together in the round sections, being guided and united with great accuracy. In the manufacture of table knives the blade, handle and hilt are made separately and welded together. Metal wheels for traction engines, farm machinery and wheelbarrows are made by welding the spokes both to hub and rim. Bicycle frames are assembled by welding tubing to the various

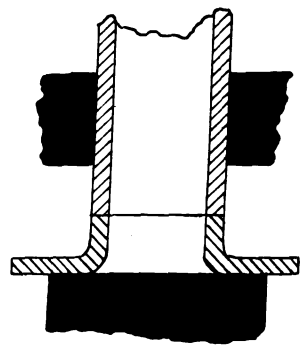


Fig. 13.

corner fittings, the electric process having replaced brazing for this purpose. Garden hoes are made by welding the round shank for the handle to the flat blade. These examples illustrate how the process had been adapted for different purposes. It is possible, by adjusting the various influencing factors, to obtain a great variety of characteristics and consequently to meet the re-

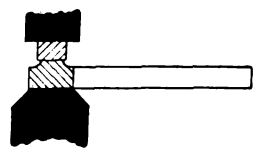


Fig. 14.

quirements of an increasing number of applications.

One development which has found considerable usage is the welding together of metals of different characteristics. For instance, in the manufacture of tools the cutting edge can be made of high-carbon steel, while the shank of the tool is made of low-carbon material. Axe blades are welded to the eye piece. Many machine tools are made advantageously in this manner. Nearly all twist drills now have forged-steel shanks welded to high-carbon-steel stems. Special clamping dies are required to secure perfect centering and alinement.

In welding high-carbon steel to low-carbon steel the joint is located so that the low-carbon stock extends farther from the clamps than the high-carbon stock. The high-carbon steel has the greater resistance and tends to heat faster, requiring some of the chilling effect from the clamps to retard it; moreover the high-carbon steel must not be overheated. It is generally necessary to anneal welds of high-carbon steel to remove the strains from uneven heating. It is difficult to weld steel having 0.75 per cent carbon or above.

Incandescent electric welding has many advantages over other welding methods, for these classes of work to which the electric method is adapted. Perhaps the greatest advantage lies in its possibilities for rapid production. The parts to be welded can be brought to welding temperature in a very few seconds and completed welds can sometimes be made at the rate of several hundreds per hour. The adaptability of the method to machine operation contributes largely to this advantage. The second valuable feature of incandescent welding is the exact heat control possible. The temperature can be raised or lowered at will and can be exactly duplicated indefinitely. The parts are in full view while heating, eliminating guess work. Machines may even be made so that they automatically turn off the power and complete the weld at the instant the metal softens. Overheating and burning thus become practical impossibilities. The heat for welding by the electric method is generated in the metal itself at the point of welding only. It is confined altogether to the small useful zone. Greater economy is therefore secured than in forge work or hot-flame welding, where the source of heat is without and but a small portion of the energy is taken up by the metal at the weld. The heat is generated by the electric method internally and homogeneously; there can be no outside burning while the interior remains cool. Due to the skin effect, which is quite marked in the presence of the very high currents used in this process, there is a tendency for the outer portions of the metal to carry more current than the inner portions. This effect just about counterbalances the cooling from radiation. Any ten-

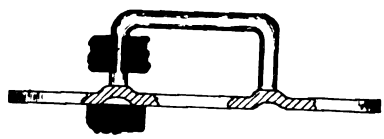


Fig. 15.

Digitized by Google

dency for one portion of the joint to overheat is automatically reduced since the hottest metal softens most, relieves the contact pressure, thus decreases the current flow at that point and reduces the heating. Even and uniform heat is thus encouraged.

Incandescent electric welding occasions no heat waste due to standby loss. The current is applied only during the heating interval and is disconnected at other times. The process is not attended with much smoke or dirt and there is little fire risk. Consequently the machines can be located anywhere in the plant, taking their proper sequence in production with the least trucking of materials. Electric welding is more flexible than forge welding. Many sections and shapes inaccessible and out of the question for blacksmith work may be handled easily by the electric process. Finished parts can be handled without distortion, injury or burning and without scar or scale except at the zone of the weld. The work can be held in accurate alinement and position while welding so that subsequent machining can be reduced or eliminated altogether. No scarfing is required with electric welding. Electric welding work can be made simple, mechanical work, in some cases quite automatic, so that unskilled labor can be employed. Due to the low voltage used there is practically no danger connected with the work.

The range of metals which can be welded by the incandescent electric method is large. Among the metals which can be welded to themselves are the following: steel of most grades, wrought iron, wrought and cast brass, cast iron, copper, zinc, aluminum, nickel, gun metal and bronze. Metals which have been successfully interwelded are as follows: wrought iron to cast iron, cast steel to mild steel, mild steel to tool steel, cast iron to steel, copper to wrought iron, copper to steel, copper to brass, brass to wrought iron, brass to steel, bronze to wrought iron and bronze to steel. This is not an exhaustive list, there being numerous other combinations in use.

Wrought metals lend themselves more readily to electric welding than do cast metals, since they are less brittle, soften more while heating and do not have a clearly defined melting point. Metals having a wide temperature range of plasticity are welded with comparative ease. Wrought iron and mild steel are thus favorable metals, while brass is difficult to weld since it passes quickly from the solid to the fluid stage, being plastic only within narrow limits of temperature. In welding brass or cast metals, it is usually necessary to confine the metal with a dam of fire clay or similar material or else by furnishing a retaining mold of some metal which will withstand the heat.

In welding together two pieces of metal, like or unlike, it is necessary that they both be in a plastic stage simultaneously. Different metals reach this stage at different temperatures. It is more difficult to weld together two metals having widely separated melting points than it is to weld metals which are plastic at about the same temperatures. The feat is accomplished with unlike metals by so clamping, proportioning and shaping the sections that the respective heating and chilling effects cause the piece demanding a higher temperature to actually reach the higher temperature while the other metal which might melt at such a heat, is retarded or cooled. The different electrical conductivities and heat conductivities of the metals enter here to play important parts. It will be seen that considerable study and ingenuity is required to effect just the right combination in each particular application.

The power cost is usually a considerable item in the cost of electric welding, largely because the labor cost is so much lower than with other methods. General data as to power costs for round iron and steel rods are given in Table I. Specific cases can be approximated from these data.

TABLE I.

Diameter of Rod, Inches	Area, Square Inches	Kilowatts	Seconds	Kilowatt-Hour, Per Weld
0.25	0.05	4	2	0.002
0.50	0.20	7	6	0.012
0.75	0.44	15	15	0.065
1.00	0.79	20	20	0.113
1.5	1.77	45	40	0.500
2.0	3.14	60	60	1.000

It is difficult, however, to state or to predetermine the exact amount of power required for any given section or volume of metal, since so many modifying variables enter. The shape of the section plays an important part. Round sections require the least power, since they have least surface to radiate heat to the clamps and to the air. On the contrary, thin flat sections require the most power. Identical welds may require different amounts of energy, depending upon the rate of heating. The amount of radiation depends largely upon the time taken to make the weld. If the rate of heating is made low, the heat will penetrate back from the weld further into the clamps, while, at the same time, more heat will be lost into the air. If the rate of heating be made high, the minimum energy will be required, but it then becomes more difficult to stop the welding at just the right point. Moreover, the heating is likely to be less uniform.

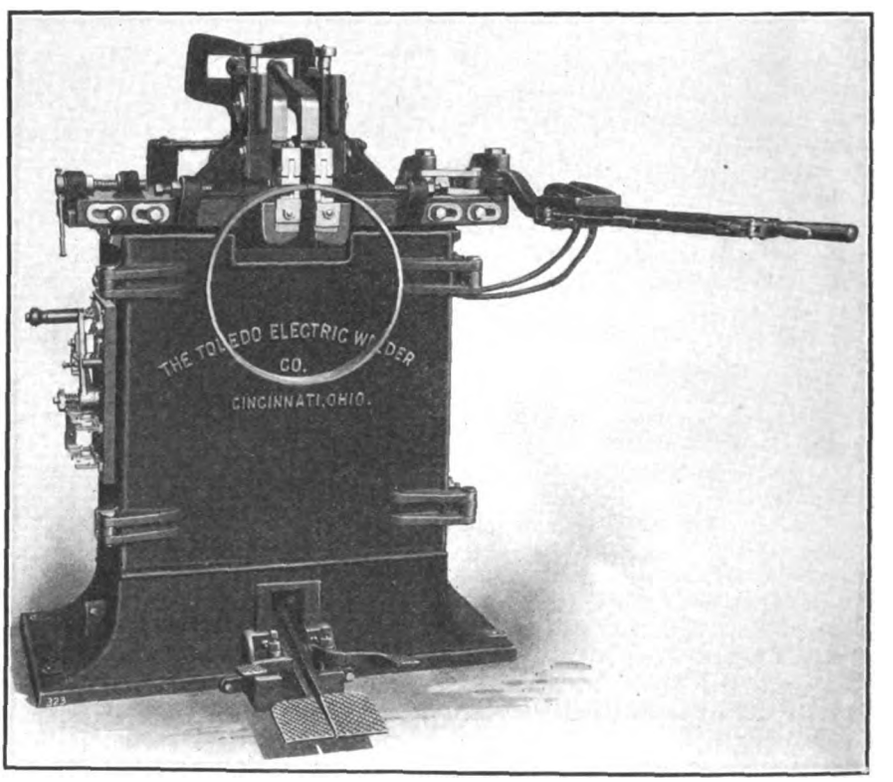


Fig. 16.—Hoop Welder.

A rough estimate of power requirements may be taken from the figures 300 to 450 kilowatt-seconds as the power required to raise one cubic inch of metal to welding temperature. These figures hold for iron, brass and copper. For metals which conduct heat away easily, such as copper, the time must be short and the rate of heating high to prevent excessive losses from radiation and conduction. The time required for most welds of iron lies within the limits of 15 seconds and one minute, the smaller sections requiring the shorter time. The rate of input

Digitized by Google

runs from 35 kilowatts per square inch for the small sections down to 15 kilowatts per square inch for large, round sections.

For electric welding by this method only alternating current can be conveniently used. Any frequency can be utilized. Electric welding causes an inductive load of about 70 per cent power-factor. This is largely due to the high induction from the heavy welding currents. A generator for welding service should be of ample size, so that the intermittent load will not cause too unstable voltage. It should have ample field turns and a liberal exciter, so that voltage can be maintained in spite of the low power-factor of the load. Where direct current only is available, a motor-generator set should be used for securing the alternating current. Inverted rotary converters are not generally satisfactory, since the low-power-factor load tends to demagnetize the fields, causing increased speed, irregular frequency and a tendency to race.

Electric welding is essentially a single-phase load, usually involves considerable peaks and is of intermittent nature. Consequently it is not most desirable from the point of view of the central station. Several arrangements of transformers have been suggested for distributing the single-phase load over two or three phases. This is an impossible proposition, since single-phase load represents pulsating flow of power, whereas multiphase load represents uniform continuous flow. It is impossible to transform one to the other without the intermediary of rotating apparatus.

The pressure required in welding of this nature varies with the character of the piece. The following figures may serve as a guide; iron requires about 1,200 pounds per square inch, copper about 600 pounds per square inch and steel about 1,800 pounds per square inch. As a result of these high pressures exerted upon the pieces at welding heat, there is usually a considerable extrusion of metal and slag at the weld joint, forming a burr. This is generally machined or ground off. Some machines are equipped with swaging blocks which are actuated in such a manner that they squeeze and form the hot metal at the weld immediately after it is forced together, smoothing away the burr and giving a finish to the piece, at the same time strengthening the weld by working it.

The average strength of electric welds made by the resistance method is very high. Average forge welds run 75 to 80 per cent of the strength of the bar. Electric welds average 85 to 90 per cent and many run as high as 100 per cent. Breakage does not always occur at the weld, the edge of the heated zone sometimes being the point of greatest weakness. Defective forge welds are usually due to underheat, overheat and burning or impurities in the weld introduced from the fire. Electric welds are likely to be more uniform since the heat is better controlled and inspected and impurities are eliminated. It is seldom necessary to use fluxes for electric welding, hence no weakness is introduced through incomplete extrusion of the flux from the weld.

A study of the characteristics of incandescent electric welding will show that it is primarily a method adapted to repetition work. The time required to set up the welding machine corresponds to the time required to set a die in a punch press. For a single weld the set-up time would be prohibitive except in the case of simple butt welds of regular shapes in so-called "universal" machines. After the welder is set up, welds can be made at rates anywhere from 50 to 500 per hour, depending upon the size and nature of the work. As a repairing process the value of incandescent welding is limited; as a manufacturing process it has a broad field, and is only beginning to receive the attention it deserves.

(To be continued.)

Chicago Telephone Company Gives Demonstration of Transcontinental Service.

Under the direction of officials of the Chicago Telephone Company a number of demonstrations of the transcontinental line between Chicago and San Francisco were given June 21, 22, 23, and 24.

On Monday, June 21, Mayor Thompson and men prominent in the business and civic affairs of Chicago were guests of Bernard E. Sunny, president of the Chicago Telephone Company, at a demonstration given in Mr. Sunny's office. Mayor Thompson exchanged greetings with Mayor Rolph of San Francisco. Mr. Sunny talked with George E. McFarland, president of the Pacific States Telephone Company. Messages were also sent by others present.

Preceding the conversations over the 2,400 mile line, Mr. Sunny addressed his guests as follows:

"It is a fact not generally understood that the great strides that have been made in developing the telephone service, and especially in building a long distance service between distant points, has not been in the telephone itself, but in the circuits and other appliances. Indeed it can be said that while the telephone itself was a remarkable invention, the aggregate of all that has been done in marshalling appliances to bring out the full possibilities of the telephone constitutes in itself an equally great invention.

"What has been done in the development of the telephone service, local and long distance, ranks with the best that has been achieved in all of the arts and sciences in a land where we have come to accept the best that men can produce as temporary facility, to be borne with as patiently as possible until a new best is created."

In the Red Room of the Hotel La Salle on June 22 a demonstration was given for women. Mrs. B. E. Sunny acted as hostess to about 500 guests.

On June 23 members of the Association of Commerce talked with San Francisco, the necessary equipment being provided at the weekly luncheon.

On June 24 a demonstration of the transcontinental line was given at a luncheon attended by 500 visiting delegates to the convention of the Associated Advertising Clubs of the World. Clifford Arrick, publicity manager for the Chicago Telephone Company, acted as master of ceremonies.

Accelerating Delayed Patents.

It has been the policy of Commissioner of Patents Thomas Ewing ever since he assumed office to facilitate the work of the United States Patent Office in every possible way. He has taken special measures from time to time to reduce the number of long-pending cases which have obstructed the consideration of new applications and tied up many inventions for long periods, over ten years in some instances. To further accelerate these delayed cases he has issued the following order:

After January 1, 1916, all applications which have been pending for more than three years or which have an effective filing date running more than three years shall be made special and any amendment or other action therein by or on behalf of the applicant which does not put the application in condition for allowance or final rejection, shall be submitted to a law examiner for his approval of its entry.

Electrical Devices for India.

The development of electricity has made considerable progress in British India, and American manufacturers of electric power equipment and the many devices which use such power will find a growing market there. For their benefit the New Handbook on India, just off the press, includes complete information about electricity in India —the electric plants, and the voltage, cycles, unit price, etc., of the current furnished. The book also includes chapters on the opening for the sale of electrical devices. This 640-page volume, with map, may be had for $1 from the Superintendent of Public Documents, Washington, D. C.

Digitized by Google

Massachusetts Hydroelectric Companies.

The hydroelectric companies in Massachusetts, with an aggregate capitalization of about $15,000,000, are described in the thirtieth annual report of the Gas and Electric Light Commission of that state. These companies came under the supervision of the Board August 1, 1914, under an act which codified the gas and electric laws of Massachusetts.

As shown by the accompanying map, long-distance transmission lines form an extensive network, covering the central and western portions of the state. The eight companies or groups operating the hydroelectric systems are as follows.

The Central Massachusetts Power Company was organized as a voluntary association in 1912 and acquired a plant on the Quaboag River in Palmer, later buying a steam plant. The present water generating station has a capacity of about 900 kilowatts and the steam station 2,250 kilowatts. It sells energy to the Central Massachusetts Electric Company and to the Springfield Street Railway Company, owning no transmission lines.

The Franklin County Power Company owns a developed water power on Millers River, with a 300-kilowatt plant. It owns no transmission lines, the electricity generated being sold to a mill and to the Athol Gas and Electric Company.

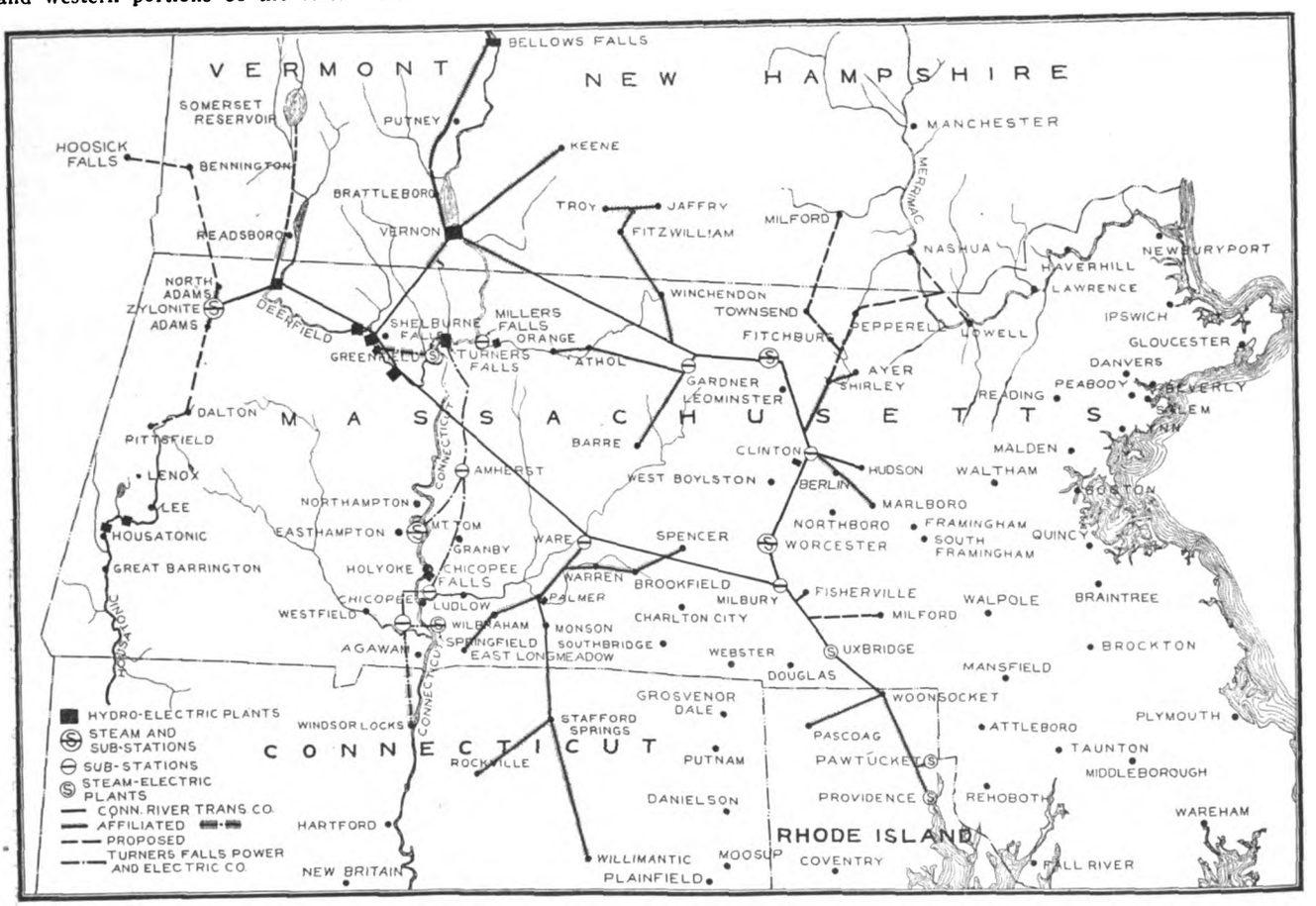
The Holyoke Water Power Company was chartered in 1859. It sells hydraulic power to Holyoke mills and has a generating station of 1,500 kilowatts in water, and 1,500 in steam, units. Electricity generated is sold to power customers in Holyoke and South Hadley, being transmitted over the company's lines.

The Millers River Power Company was organized to develop and operate water power and electric plants, and owns undeveloped water privileges on Millers River, but is not an operating company.

Monument Mills, at Great Barrington, is engaged primarily in textile manufacture, but owns two power plants on the Housatonic River, with electrical equipment consisting of water units of 1,000 kilowatts capacity and steam units of 500 kilowatts. The energy generated is used at the company's mills and sold to the Great Barrington Electric Light Company and Stockbridge Lighting Company, the transmission lines being owned by these companies.

The New England Power Group consists of the Connecticut River Power Company of New Hampshire, with a 20,000-kilowatt hydroelectric plant at Vernon, Vt., and transmission lines which deliver current to Brattleboro and Bellows Falls, Vt., and to the Connecticut River Transmission Company's lines at the Vermont-Massachusetts boundary; the New England Power Company, which owns four hydroelectric developments on the Deerfield River, with an installed capacity of 21,000 kilowatts; the Deerfield River Power Company, which owns a large storage reservoir at the Deerfield headwaters in Vermont; and the Connecticut River Transmission Company, which owns high-tension lines extending from the power plants of the New England Power Company to substations at Adams, Clinton, Fitchburg, Gardner, Millbury, Ware and Worcester, and to the Rhode Island and Connecticut lines, connection being made at Clinton with the station operated by the State of Massachusetts, utilizing the overflow of Wachusett Reservoir.

The Turners Falls Group comprises the Turners Falls Company, owning a large water-power development on the Connecticut River, from which it sells hydraulic power to mills, and in addition has a hydroelectric plant of 5,000 kilowatts capacity, selling energy to the Greenfield Electric Light Company and the Amherst Power Company. A new station, located at the end of an enlarged canal and forebay, soon to be put in operation, will develop 36,000 kilowatts. The Turners Falls Power and Electric Company owns the high-tension lines, fed by the Turners Falls Company, through towns along the Connecticut valley and sells electricity to the Amherst and Easthampton gas companies, the Greenfield Electric Light & Power Company and the Agawam Electric Company. Both above power companies are interested in the companies served.



Map of Territory Served by Massachusetts Hydroelectric Companies.

Digitized by Google

SIMULATING OLD ILLUMINANTS.

By M. Luckiesh.

The light user has been learning gradually that it is legitimate and also desirable to demand the quality of light that suits his utilitarian needs or satisfies his esthetic taste. He is beginning to recognize that an illuminant whose color value or spectral character is accidental (that is, determined by circumstances over which the manufacturer has little control) need not be accepted by him as satisfactory in all cases. For this reason there has been an urgent demand for artificial daylight where accurate color work is done and where colors should appear as they do in daylight. Likewise there has been an insistent, though less urgent, demand for converting the color of modern illuminants into the "warmer" tints of the older illuminants.

The recent increase in the luminous efficiency of incandescent lamps has made it possible to produce artificial daylight, namely north skylight, for accurate color work and noon sunlight for general lighting purposes, at efficiencies sufficiently high to be practicable. For the same reason it is possible to enjoy the "warmer" tints of the older illuminants if the esthetic sense insists. However, the alteration of the light from the incandescent lamp to that of the older illuminants is a problem far less difficult than the production of artificial daylight; nevertheless, the attempts to do this that have come under the writer's observation have not appeared satisfactory. It is desirable to understand, however, that the demand for stimulating the spectral character of older illuminants is purely a matter of personal taste, while the demand for artificial daylight is independent of taste, in most cases being a scientific and practical necessity.

There are many interesting, conflicting, and amusing statements to be found regarding the physiological and psychological influence of color. As a matter of fact, little is known accurately regarding this problem and it appears to the writer that while scientific information on this subject is highly desirable, the present lack of information should not worry the user of light. It is quite legitimate to demand an alteration of modern incandescent lamps to the color of the old kerosene flame but it is not proper to enforce upon others a condition that is at present only governed by taste. The failure to distinguish between matters of fact and matters of taste has left in our lighting literature, statements that are highly amusing when compared with each other. One writer makes the statement that tungsten light is so white that it gives him the blues. We have much to learn in lighting procedure but why complicate matters with the proclamation that a yellow light is so white that it makes one feel blue? If that be true, why does not that same person feel very blue under daylight? If light from the kerosene flame, the carbon and the tungsten incandescent lamps be compared at equal intensities with daylight it is seen that the first three illuminants are quite in the same class in regard to color. That is, while they are quite different from each other when compared in the absence of daylight, their differences in color are small compared to their difference from daylight.

On the physiological side of the problem we find some claiming (without any sound reason apparent to the writer) that yellow light is more glaring than light of any other color. Contrarily many claim it is "easier on the eyes" for reading purposes. These physiological problems while very difficult to study owing to the vagueness of the criterion, can be solved; however, the problems involving merely the esthetic taste are indeterminate. For several years the writer has experimented with artificial daylight versus yellow light for reading and has concluded that for him the former is less fatiguing. This is recorded merely as another bit of evidence to add its meager influence in future summaries.

This extended introduction has appeared necessary owing to the indefinite and inaccurate statements that have been made regarding the desirability of simulating the color of older illuminants. The writer has found such a change very pleasing in some instances in home lighting and inasmuch as many are of the same opinion, has given the matter of altering modern tungsten-lamp light considerable attention, which will be briefly discussed.

The transmissions of ideal screens for converting the light from vacuum tungsten lamps of various luminous efficiencies to the exact spectral character of the old carbon incandescent lamp (3.1 watts per mean horizontal candle) and of the kerosene flame have been computed and the resulting luminous efficiencies have also been determined. In Fig. 1 curve C_t represents the transmission of the ideal screens for converting the light from vacuum tungsten lamps operating at various efficiencies into light of the same spectral character as that of the carbon incandescent lamp. Curve K_t is a corresponding curve for the ideal screens which convert the light from vacuum tungsten lamps into light of the same spectral character as the kerosene flame.

On combining the transmission of the ideal screen in any case with the luminous efficiency of the unscreened illuminant, the luminous efficiency of the altered light is obtained. That is, curve C_E represents the final luminous efficiencies of the vacuum tungsten lamps after they have been screened

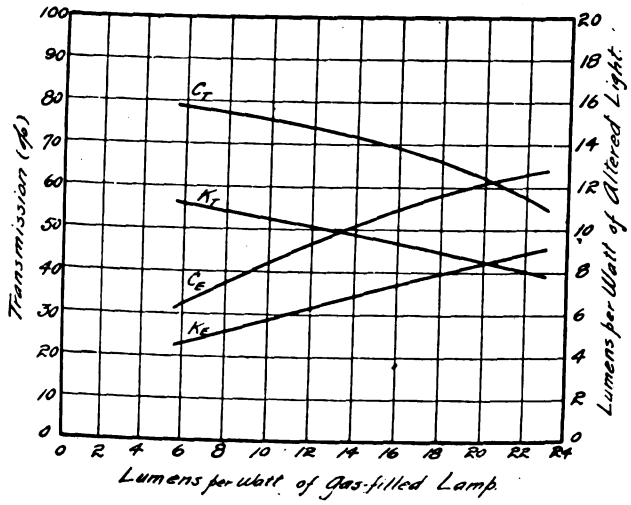


Fig. 1.—Transmission Screens for Vacuum Tungsten Lamp, and Efficiency of Combination.

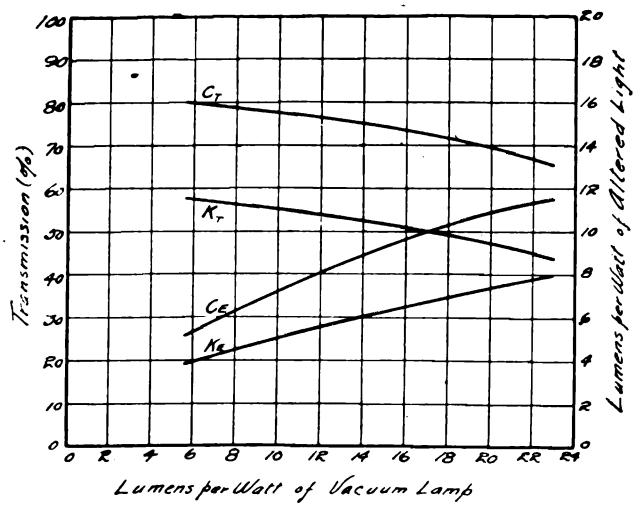


Fig. 2.—Transmission and Efficiency Curves for Screens for Gas-Filled Lamp.

Digitized by Google

to match a carbon lamp in color. K_e is a corresponding curve representing the resultant efficiencies of the vacuum tungsten lamp screened to match the kerosene flame.

In Fig. 2 the corresponding data are given for gas-filled tungsten lamps.

In Fig. 3 curve C represents the spectral transmission curve of the ideal colored screen for altering the light from a vacuum tungsten lamp (operating at 7.9 lumens per watt) to an exact spectral match with the light from the carbon incandescent lamp under consideration. Curve K represents the spectral transmission curve of an ideal screen for converting this tungsten light to a spectral match with the light from a kerosene flame. Curves C′ and K′ in Fig. 4 are similar curves of corresponding ideal screens for the gas-filled tungsten lamp operating at 22 lumens per watt. Similar computations have been made for tungsten lamps operating at various efficiencies, which data have been used in plotting the curves shown in Figs. 1 and 2.

In producing practical colored screens for the above purposes the obvious beginning is to use a yellow pigment. It is a noteworthy fact that there is no suitable yellow pigment that alone will suffice. This is not surprising to one familiar with coloring elements, but it has not been recognized by those attempting to simulate the color of the old illuminants, if observations are to be relied upon. Most so-called yellow pigments are greenish in appearance in the lesser densities and become a deep orange when quite dense, but at no densities do they match the unsaturated yellow of the old illuminants. Usually a pigment known as amber is considered the proper tint for the above purpose. Of a number of yellow pigments examined (and these represent perhaps all of the permanent yellow pigments) it has been found that no density will produce a screen for use with tungsten lamps that will alter the light to match that of old illuminants such as the kerosene flame. An example is shown of so-called amber glass of four different densities in Figs. 3 and 4. The numbers on these curves represent the relative amounts of coloring matter present per unit area of the amber glasses. In general it is seen that the glass transmits green rays too freely. In order to make this point clear, the transmission curves C and K in Fig. 3 have been plotted equal to unity for all wave-lengths in Figs. 5 and 6 respectively, and the transmission of the amber screens are made equal to unity at 0.70 micron., the practical limit of the visible spectrum. It is thus seen that no density of a so-called amber glass will suffice for the purpose under consideration.

These curves for an average yellow pigment have been presented to illustrate that it is not an extremely simple matter to simulate the color of the older illuminants by using colored screens with the tungsten lamps. However, inasmuch as the requirements do not demand more than a close approximation, one familiar with pigments and color mixture can readily produce a

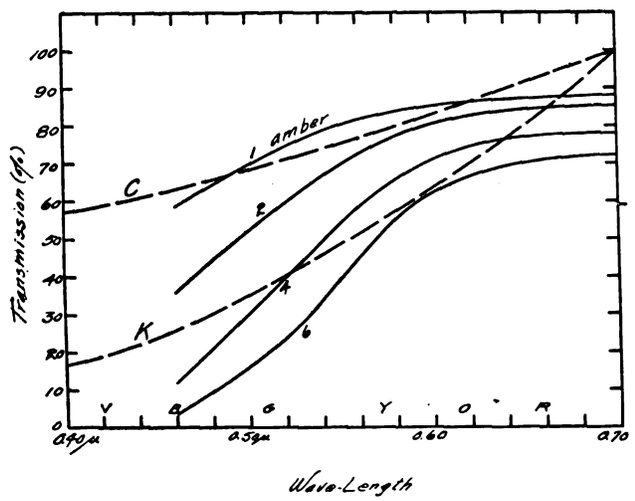


Fig. 3.—Ideal Screens for Vacuum Tungsten Lamp Compared with Amber.

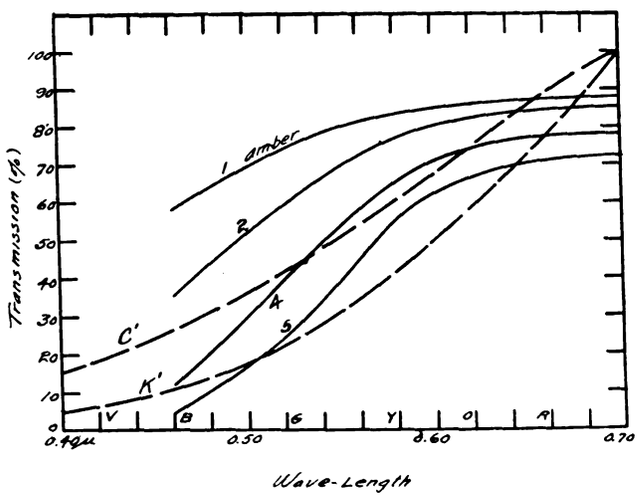


Fig. 4.—Ideal Screens for Gas-Filled Tungsten Lamp Compared with Amber.

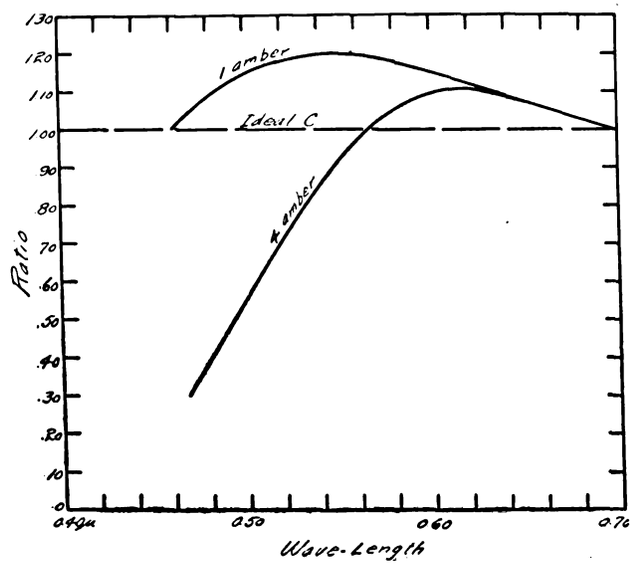


Fig. 5.—Ratio of Transmissions of Amber Glass and Ideal Screen for Simulating Carbon Lamp.

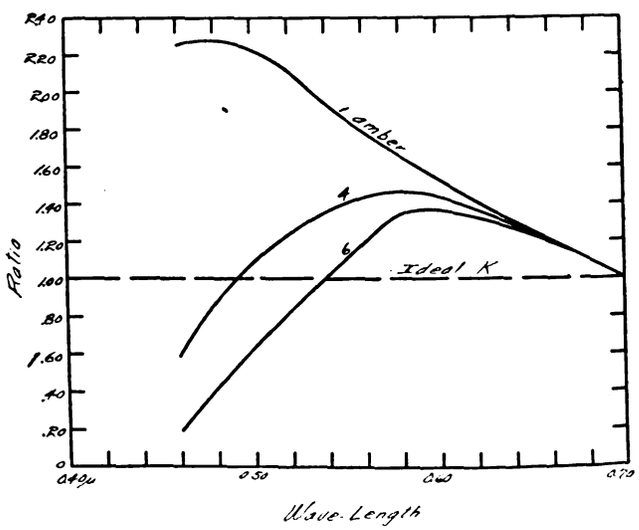


Fig. 6.—Ratio of Transmissions of Amber Glass and Ideal Screen for Simulating Kerosene Flame.

Digitized by Google

proper coloring. The writer has done this without difficulty. On viewing a tungsten lamp that has been colored so that its light is altered to match the old illuminants, the truth of the foregoing is strikingly evident. That is, the ordinary amber lamps appear very different from the unsaturated yellow of the properly colored lamps.

The writer acknowledges the assistance of Mr. H. McMullan in making the computations.

Flood Prevention, Water Power and Navigation.

The recurrence of floods in some parts of the country has again aroused consideration of systematic efforts at their prevention. In this connection it is of interest to note how the problem has been most advantageously solved in the Province of Silesia, Germany. The following is from a recent consular report in which this matter is referred to.

About 20 years ago an investigation was made to devise ways of preventing the destructive floods in the spring of each year. As a result of this investigation a system of dams and reservoirs was constructed to catch and hold the surplus water and then regulate its flow into the Oder River. This system soon revealed commercial possibilities which have since been realized. In addition to their primary object of protecting the valley from floods, these reservoirs have now been utilized for large power plants, from which electrical energy is transmitted to all parts of the province. It has also been found that by a conservation of this surplus water in the dams during the freshet seasons and its systematic release during the summer, when the Oder often runs very low, navigation on the river can be extended throughout the dry period, thus adding to the transportation facilities of the district. The Province of Silesia bore one-fifth of the cost of construction of these dams and the State of Prussia bore the rest. The province further assumed all the cost of maintenance and built the power plants at its own expense. The State is reimbursed for its investment out of the earnings of the project.

Plans for Electrical Prosperity Week.

A 20-page booklet has been issued by the Society for Electrical Development, Incorporated, outlining the plans for Electrical Prosperity Week to be held November 29 to December 4, 1915, under the auspices of the Society. The booklet first explains the idea back of this important coming event and the generous co-operative spirit among all electrical interests and even some that are non-electrical in actively furthering the movement. It is pointed out that while the various branches of the electrical industry are peculiarly interested in making Electrical Prosperity Week a grand success on account of the direct profit this will bring to them, the public and the country in general will benefit in no small degree, because the increasing use of electricity and of electrical appliances makes for general progress, comfort, economy and health. A distinct feature of value will be the stimulus that the dates for Electrical Prosperity Week with its extensive publicity will give to early Christmas shopping, a feature that is making special appeal to non-electrical merchants and securing their hearty support. Those who are actively cooperating for the success of the event are the central stations, electrical manufacturers, jobbers, contractors, dealers, local and national electrical organizations and electrical journals.

Official Design for Electrical Prosperity Week.

An outline of the scope of the publicity already being given and of the unprecedented variety and volume of advertising and other publicity planned for the months and especially the week preceding Electrical Prosperity Week takes up much of the present booklet. A unique feature of this publicity is the design that has been adopted for the Week. Its appropriateness is apparent from the reproduction of the design in the accompanying cut. This design will be used on poster stamps, in window displays, on billboards, in newspaper and magazine advertising.

Among features planned for the Week are special illuminations of business streets, central-station offices, power plants, stores and store windows, etc.; electrical parades; popular lectures on electricity; visits to power plants; displays of electrical appliances in operation and demonstrations of the utility and value thereof.

BOOK REVIEWS.

"Electric Railway Handbook." By Albert S. Richey, assisted by William C. Greenough. New York: McGraw-Hill Book Company, Incorporated. Flexible leatheroid, 832 pages (4x6¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $4.00.

This must be the season for handbooks, for they have been appearing with considerable regularity for some time. The book before us is not only one of the most recent of the crop, but it covers a field which has for a long time lain fallow. As the author points out in the preface, the field of the electric railway engineer is so broad that the information needed could be found only by an extended search through technical journals, proceedings of technical societies, and electrical, mechanical, or civil engineers' handbooks. The need of a book of concentrated information is thus quite evident.

The aim of the book is to make available with less trouble a vast amount of information on standard practice in the construction and operation of electric railways. This information has been collected and classified under eleven heads or chapters as follows: Roadbed and Track; Buildings; Train Movement; Railway Motors; Controlling Apparatus; Current-Collecting Devices; Trucks; Braking; Rolling Stock; Transmission and Distribution; Signals and Communications. Under these headings is given reliable information on some 2,000 separate items. The chapter headings do not always give an idea of the details in which the topics are covered. For example, under "Roadbed and Track" much space is given to a discussion of engineering costs of roadbeds, transmission lines, car-house construction, right of way and miscellaneous. Thus not only the best methods are outlined, but the relative costs of the different elements entering are given. In every case the information is specific and detailed. In many instances references are given to other sources of information. This is a valuable feature.

The multiplicity of the topics discussed (about 2,000 are given in the index) makes it impractical to mention many in a short review. Suffice it to say that the topics are well selected, well arranged, and treatment is clear and to the point. The many illustrations aid in giving a clear understanding of the operation and construction of electric railway equipment. The index is complete, which is a commendable feature. Nowhere after an item have I seen the words "see such and such a topic." It takes no more printers' ink to insert the page number than the indirect reference, and is considerably less trying on the patience of the reader.

This book should prove very useful to practicing engineers as well as to the teacher and student. Both the author and

Digitized by Google

the publishers are to be commended for making available such a storehouse of useful data and practical information. The book is bound in the well known style of the other handbooks published by the McGraw-Hill Book Company.

C. M. JANSKY.

"Practical Lessons in Electricity." By R. A. Millikan, F. B. Crocker and John Mills. Chicago: American Technical Society. Cloth, 334 pages (5½x8¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $1.50.

According to the title page of this book, it consists of "a simple presentation of fundamental electrical principles and their application to direct and alternating-current problems." In the introduction, it is stated that the volume should be "especially adapted for purposes of self-instruction as well as a manual of information for the experienced electrical worker." The book fulfills these claims with very different degrees of success in its different sections or parts, which appear to have been written by the different authors quite independently of each other, and without collaboration. The numbering of the pages is not continuous throughout the volume, but begins anew with each part, as if the volume consisted of four disconnected treatises bound up together.

Part I consists of 69 pages on "Elements of Electricity and Magnetism." A note explains that this part is a modification and abridgment of the treatment of magnetism and electricity found in Millikan and Gale's "First Course in Physics." This part fulfills admirably the claims made on the title page and in the introduction, and can be criticized only on some minor points. It does not appear to have been brought up to date very carefully, since on page 3, the discovery of the Heussler alloys is placed "within the last five years"; and on page 48, the definition of the ampere is given from the action of the Electrical Congress of 1893, with no mention of more recent international action. On pages 55 and 56, the term *induced current* is used throughout the discussion of electromagnetic induction, without making it sufficiently clear that it is electromotive force rather than current which is induced. On page 61 the word dynamo is used to refer to a generator as distinguished from a motor.

Part II consists of 63 pages, on "Direct-Current Dynamos." This part of the book also meets the claims of the title page very well, and requires criticism only on minor points. Several pages are devoted to the discussion of principles which are already fully discussed in Part I. On page 1, it is said that a dyne "is equal to 1/198 of a gram or 1/2800 of an ounce."

Part III consists of 91 pages, on "Elements of Alternating Currents." This is a purely theoretical discussion, and not at all in line with the other parts of the book. In fact this section seems to the reviewer to be wholly out of place in a book on elementary practical electricity, although no fault need be found with it as a presentation of the pure theory of alternating currents. It does not contain any description of an actual alternator; and there is no mention, either descriptive or theoretical, of the transformer, or of any type of alternating-current motor.

Part IV consists of 95 pages, on Storage Batteries. This is an excellent practical treatise. After describing different types of storage batteries and their management, brief sections are given on troubles and remedies, and on tests, and then 50 pages are devoted to commercial applications.

Considering the book as a whole, it suffers from the lack of connection between its different parts; and while each part treats satisfactorily the specific subject with which it deals, the combination does not furnish a well rounded treatment of practical electricity.

The typographical work is excellent, and the illustrations are numerous and good.

J. R. BENTON.

"American Handbook for Electrical Engineers." By Harold Pender and a staff of specialists. New York: John Wiley & Sons, Incorporated. Imitation leather, 2023 pages (4x7 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $5.00.

It seems to be hopeless to expect that any engineer's handbook will attain to the ideals of the user. One after another comes out, some defects are eliminated, others remain and perhaps new ones are introduced. The volume before us appears to be an improvement over the previous electrical handbooks, but cannot be considered to be the last word on the subject. The wants of different engineers will vary, of course, and it is impossible to please all. For if a handbook contains everything that might be demanded of it, it becomes too bulky for convenience, and is objectionable to some on that score. This criticism may fairly be made of the present volume, which is excluded from the class of pocketbooks. Its thickness is almost 2.5 inches, which at once restricts it to desk use. In the reviewer's opinion it is preferable to have a handbook smaller. This can be done, while retaining data and matter required for field use, by excluding much of the theory and other matter that is available in standard treatises, equally easy of reference in library or office. As an example of this might be mentioned the matter under "Principles of Mechanics," giving definitions and mathematical relations. It is not necessary that a handbook be an encyclopedia of engineering knowledge.

One of the conspicuous features of this book is its arrangement of topics in alphabetical order, instead of grouping by subject. This, however, is not carried out as fully as in a dictionary or encyclopedia, so that it is doubtful if it is of any advantage, as one will frequently look first under a wrong heading and might as well look in the index at the start. Thus the only reference to electric welding comes under "Bonds, Railway Track," and to electric cooking under "Heating." The heating of cars, on the other hand, comes under "Railways." One is in doubt, in cases such as Storage Batteries, whether to look under "storage" or "batteries," and so with electric vehicles and many other subjects. Reference to the index is consequently necessary, and fortunately one has been provided.

The book has many features to commend it. The treatment of all subjects is similar in method; descriptive matter, theory, design, testing, etc., being taken up in definite order. Bibliography and costs are given and the latter feature is a very desirable improvement over most handbooks. The typography is good and editing and proofreading seems to be thoroughly done. The book contains a wealth of information, but the reader who expects it to supply all his wants is doomed to disappointment. For example, the reviewer had occasion to look up the following items without finding the information sought; high-tension fuses, electric welding, freezing temperature of electrolyte, effect of temperature on magnetic properties, magnetic hysteresis in a rotary field. This, however, is a fault of every handbook, and the present volume will readily be accorded a place at the head of the electrical list.

"The Mechanics of Electricity." By F. J. B. Cordeiro. New York: Spon & Chamberlain. Cloth, 78 pages (5x7½ inches), seven illustrations. Supplied by the Electrical Review Publishing Company, Inc., for $1.25.

The author of this volume has endeavored to put forward in concise form the idea that electricity is a definite entity, which, in his view, is identical with ether. Known phenomena are stated in terms of this point of view, and enough mathematics introduced to demonstrate the quantitative relationships. The treatment is brief, but the essential ideas are presented in a very readable form. The subjects dealt with are the ether and its properties; longitudinal waves and their resulting attractions and repulsions; vortex filaments, comprising magnetic lines and electromagnetic waves; static electricity; electrochemistry; Maxwell's theory; and a discussion of various phenomena such as light, electrons and X-rays.

Studies are being continued for the development of water power on the Aconcagua, Maipo, Cachapoal, Laja, and Cautin Rivers, in Chile, which will form the basis for future industrial expansion.

Digitized by Google

New Electrical and Mechanical Appliances

Duplex Wall Receptacle.

The continually increasing demand for electrically operated devices causes many householders to regret that their rooms were not wired with more outlets. This demand can be conveniently met and the number of the outlets originally provided can be doubled by placing in each existing standard receptacle box one of the new Bryant Junior duplex receptacles—all without adding to or changing in any way, the original wiring or outlet-box installation. As will be noted from the illustration, this duplex receptacle is the practical combination of two receptacle units on a single plate.

It may also be used in floor outlet boxes as it has the smallest openings of any device of this character and is therefore claimed to be the nearest waterproof. The small porcelain bosses which receive the points of the plug are flush with the surface of the plate; therefore, when this device is used with a square-edged plate it is possible to provide a smooth and unbroken floor surface. This receptacle is particularly desirable also for attaching standard table lamps; the plug fitted with long prongs can be inserted in the receptacle through a rug with practically no damage, only two small holes being required for the points to penetrate. At this time of the year when fans are so much in demand, this device forms a convenient means for connecting such without interfering in any way with the present use of lamps and existing extensions using single outlet boxes.

Duplex Flush Receptacle.

These duplex receptacles are manufactured by the Bryant Electric Company, Bridgeport, Conn.

Fargo Busbar Tap.

In equipping power houses and substations it is highly important to keep in mind that dependability should be one of the strong points of central-station service. Consequently it should be possible to make replacements of damaged apparatus in the least possible time so as to maintain a high standard of continuity of service.

This was one of the features considered in the design of the busbar tap illustrated herewith. It can be very quickly applied at any point of a tubular busbar to permit adding an extra branch circuit, a new transformer, or other apparatus, all without cutting or disturbing the busbar.

Fig. 1.—Busbar Tap.

The construction of this busbar tap is shown in Fig. 1 and its use in Fig. 2. The tap is made of high-conductivity metal and is shown so that the cylindrical contacts exactly fit the busbar. When the wedging nut is screwed down the contact is so intimate as to practically constitute a cold weld. The contact has about three times the conductivity of the wire used in the tap. Consequently the ordinary losses due to contact resistance are eliminated. Other savings result from avoiding cutting the tubing and threading it for couplings. The labor and time involved in making a tap are insignificant.

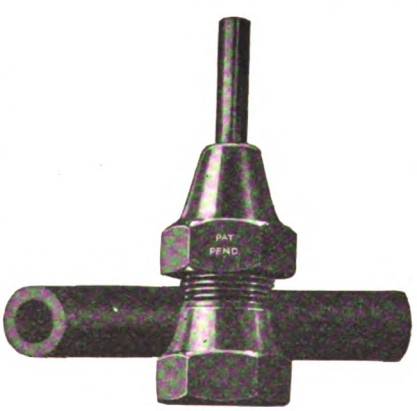


Fig. 2.—Tap in Use.

These busbar taps are made in several sizes. The ones shown are intended for three-quarter-inch tubing and will take a tap circuit from No. 6 to No. 0 B. & S. gauge wire. These taps are made by the Fargo Manufacturing Company, Incorporated, Poughkeepsie, N. Y.

Demonstration of Welding Apparatus.

A demonstration of the arc welding apparatus of the Lincoln Electric Company, Cleveland, O., was given on the afternoon of July 19, at the factory of Roth Brothers and Company, Chicago. Robert E. Kinkead, sales engineer of the company, first made an address to the forty or fifty guests who were present in regard to the different methods of welding and the essentials of the welding process. He then explained the characteristics of the Lincoln apparatus and had an assistant make demonstrations of welding by the use of same.

The apparatus exhibited has as one of the principal features a generator of the constant-current type which supplies current to the welding electrodes without the interposition of any dead resistance. It is on this account that the process of welding can be carried out so much more cheaply by the Lincoln apparatus than by any form in which it is necessary to control the current by the insertion of power-consuming resistance. The machine exhibited had a capacity of 100 amperes. It consisted of a motor-generator set driven by alternating current and with a separate exciter mounted on the same shaft. The field of the main generator contains regulating resistance which can be adjusted according to the strength of current needed in the welding circuit. When the elctrodes are short-circuited the voltage of the machine drops, but the current does not rise to an abnormal value. Greater stability of the welding arc is provided by the insertion in series with it of a reactance or stabilizer.

Demonstrations of welding with both

Digitized by Google

carbon and metal electrodes were given and the possibilities of applying this process to a variety of work were explained by Mr. Kinkead. Units of the type shown can be operated in parallel when larger currents are desired. Single machines with capacities up to 600 amperes are available.

Sangamo Meter Exhibit Receives Medal of Honor.

The International Jury of Awards of the Panama-Pacific International Exposition, San Francisco, Cal., has awarded the Medal of Honor, the highest award for an exhibit of watthour and ampere-hour meters to the Sangamo Electric Company, Springfield, Ill.

The Sangamo exhibit is a very interesting one. A view of the attractive exhibit-booth, which is located in the Palace of Machinery, is shown herewith. The exhibit consists exclusively of electric meters and their accessories; to make the display more striking and instructive, considerable equipment with which the meters are used is installed in the booth. In this line is part of an automobile with Delco electric self-starting and lighting equipment and a Sangamo ampere-hour meter to show at all times the condition of the storage battery. A small gas-engine-driven lighting plant is in operation, supplying part of the current for lighting the booth; with it is an ampere-hour meter for indicating the state of the battery charge and controlling the limits of charge and discharge. A U. S. L. axle-driven car-lighting set is shown with electric tachometer and battery indicating and controlling ampere-hour meter. The vestibule of a street car with controller and ampere-hour meter is also shown.

A large dial indicating through remote control the total alternating-current load of the Palace of Machinery is conspicuously hung. There are also several marble switchboard panels with a varied assortment of Sangamo meters arranged in circuits so that the visitor can readily operate them. Two racks for testing direct-current and alternating-current meters and instruments are also provided. There are also several showcases containing meter transformers, shunts and portable testing meters, parts of typical ampere-hour and watthour meters, and method of assembling meters.

Each part of the exhibit is laid out so that the visitor can easily study the action of the meters and instruments displayed. Demonstrations of the operation and testing of the meters are made at various times. Aside from the educational exhibit, the booth contains an attractive rest room, where visitors will be made welcome and will find comfortable facilities for resting, reading or writing.

Exhibit Booth of Sangamo Electric Company.

General Electric Makes Gain.

"There has been an eminently satisfactory, but not a sensational betterment in the volume of General Electric's business since January 1," says the Boston *News Bureau*. "During the first two months of this year, incoming orders were at the rate of but $73,000,000, a shrinkage of 20 per cent from the level of sales billed out during 1914. Back in the first quarter these figures were regarded as forecasting the smallest business the company had had since 1911.

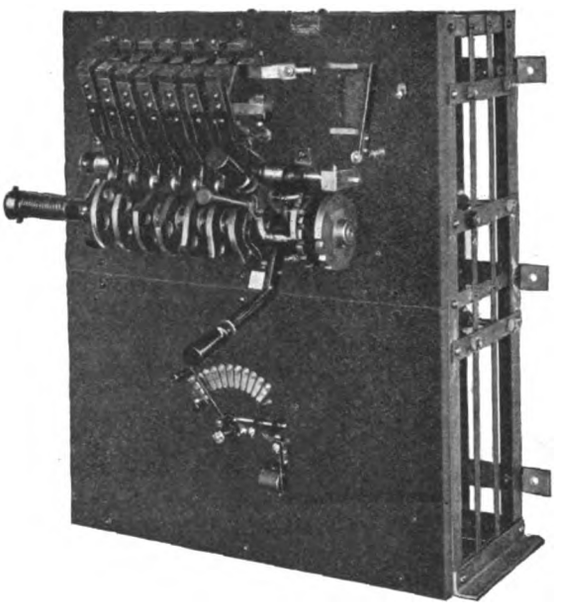
"But orders have picked up in one way and another since March 1, with the result that the first half year, the period concluded June 30, recorded incoming business at the rate of about $88,000,000 per annum, a gain of 20 per cent over the low figures for the first two months."

Large Starter and Speed Regulator.

The Industrial Controller Company, Milwaukee, Wis., has recently developed a combination starter and speed regulator of the multiple-switch type which has many novel features. A view of it is shown herewith.

The first three switches of this controller are used for starting duty only, the next four for speed reduction by means of inserting resistance in the armature circuit, and in addition to speed reduction, speed increase above normal speed is obtained by inserting resistance in the shunt field.

This controller is arranged with two levers for operating the switches. One of these levers must be held up by the operator with his left hand while the first three switches are put in place with the right-hand lever. Should the left-hand lever be released at any time before these three switches are set, they will all return to the off position, thereby preventing the use of the first three switches for anything but starting duty. When these switches have been set, the remaining four may be operated in or out at will by means of the right-hand lever.



Multiple-Switch Starter and Speed Regulator.

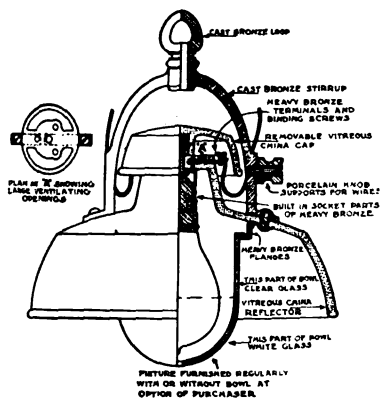
The shunt-field resistance is inserted when all of the multiple-switch levers are in place by means of a small lever on the lower panel. No-voltage-release protection is provided so that should the line voltage at any time fail or be interrupted, all of the field and armature levers will immediately return to the off position, thereby stopping the motor and protecting it against injury on return of the line voltage.

The American consul at Sao Paulo, Brazil, wants catalogs and price lists in order to answer trade inquiries.

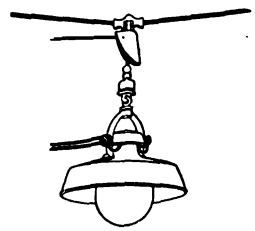
Digitized by Google

New Outdoor Incandescent Lighting Unit.

The outdoor lighting fixture illustrated herewith and known as the "dayway" has recently been produced by the Luminous Unit Company, St. Louis, Mo. It is produced in two forms, one for suspension from brackets, mast arms, cross spans, stems, etc., the other for mounting on ornamental or plain posts. Either of the types is supplied with a partially clear and partially diffusing glass bowl which incloses the lamp, affording optical protection, as well as mechanical protection to the lamp. This bowl is supplied as optional equipment, the distribution characteristics being approximately the same in either case. Exposed or concealed wiring may be used with either type of fixture, as duct space is provided in the supporting structure as well as arrangements for mounting insulators.

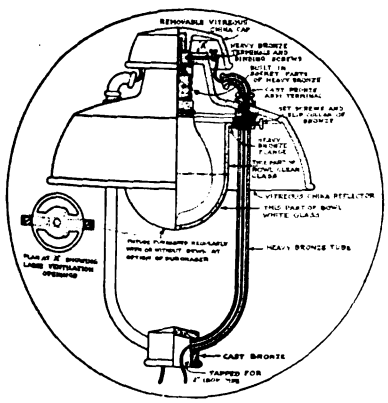

CAST BRONZE LUGS
CAST BRONZE STIRRUP
HEAVY BRONZE TERMINALS AND BINDING SCREWS
REMOVABLE VITREOUS CHINA CAP
PORCELAIN KNOB SUPPORTS FOR WIRES
BUILT IN SOCKET PARTS OF HEAVY BRONZE
HEAVY BRONZE FLANGES
TAILPART OF BOWL CLEAR GLASS
VITREOUS CHINA REFLECTOR
TAILPART OF BOWL WHITE GLASS
FIXTURE FURNISHED REGULARLY WITH OR WITHOUT BOWL AT OPTION OF PURCHASER

Construction of Suspended Dayway Unit.



Center-Span-Suspended Unit.

Constructional features of this new unit are of particular interest in view of the fact that a consistent effort has been made to produce a unit which will not only be highly efficient but which will be virtually indestructible under any service conditions.


REMOVABLE VITREOUS CHINA CAP
HEAVY BRONZE TERMINALS AND BINDING SCREWS
BUILT IN SOCKET PARTS OF HEAVY BRONZE
CAST BRONZE ARM TERMINAL
SET SCREWS AND SLIP YOKES OF BRONZE
HEAVY BRONZE FLANGE
TAILPART OF BOWL CLEAR GLASS
VITREOUS CHINA REFLECTOR
TAILPART OF BOWL WHITE GLASS
HEAVY BRONZE TUBE
CAST BRONZE
TAPPED FOR

Construction of Unit for Post Mounting.

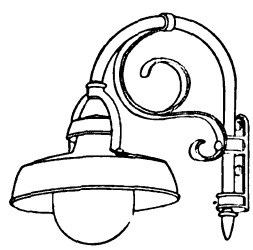
The reflector and cap are of vitreous china of sufficient weight to resist a heavy blow without breaking, thus insuring them against any accidental or intentional blows which might be inflicted. Vitreous china is absolutely impervious to all action of the elements, sulphurous smoke, fumes, etc., and is, therefore, substantially indestructible.

All metal parts used in the construction of the fixture are of pure copper or bronze of heavy-gauge sheet metal or cast, thus insuring extraordinarily long life and absolute freedom from corrosion.

The fixture is perfectly ventilated, two holes being provided in the top of the neck under the cap which permit of the passage of a current of air for cooling the lamp up alongside the lamp and receptacle and out under the cap, thus allowing the lamp to operate at normal temperature, which is productive of long life in the lamps.

All emitted light is directed to the working plane, hence the utilization factor is high. The adaptability of this unit to lamps of high candlepower makes it possible to reduce the number of units normally required to the block.

It is furnished for either multiple or series circuits. When used on series circuits, it is only necessary to remove the burned-out lamp to renew the film cutout; no part of the socket or receptacle need be removed as is normally the case with series units. This facilitates lamp renewals in case of burnouts. The only change necessary for adaptation from multiple to series circuits is to change the center contact and provide each unit with a series adapter which fits on the base of the lamp; therefore, existing multiple systems may be converted at any time to the series system at a very low cost, so far as the units are concerned.



Bracket-Supported Unit.

This unit will be found particularly desirable for all classes of outdoor service, such as street lighting, railroad yards, train sheds, warehouses, etc., where efficiency, low maintenance cost, and indestructibility are factors which enter largely into the determination of the proper units to be used.

New Outlet-Box Receptacle.

To the extensive line of receptacles made by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., there has recently been added a new outlet-box receptacle designated as No. 6103. This device provides a very simple and compact means of connecting extension cords to conduit outlets. The receptacle has the new Hubbell T-slot contacts, which make it interchangeable with 17 different types of caps. The device is readily attached by clamping the outlet-box cover between the upper and lower porcelain parts by means of a center screw which is threaded through both of them. A leather washer is included between the top porcelain and the outlet-box cover to take up any variation in either the porcelain or the cover. It also prevents the plug from rotating as the result of vibration. This method of attachment does away with the need for drilling and tapping holes in the bottom of the fitting.

These receptacles are so designed as to be used with a variety of standard outlet-boxes and conduits of various manufacturers.

Outlet-Box Receptacle.

Electric Trucks for Panama Railroad Terminal Piers.

In order to expedite the handling of cargo on the piers at Cristobal, Canal Zone, the Panama Railroad Company has placed an order for electric trucks, in the expectation of increasing the use of such equipment if the results from their operation and the developments of traffic warrant. The order placed was for four electric tractor trucks, each equipped with three trailers, to be furnished by the Buda Company of Chicago, Ill., and in addition eight trucks of different type are to be selected by the New York office of the company and sent to the Isthmus.

Each of the tractor trucks ordered is six feet long over all by 40 inches wide, has a wheel base of 42 inches, and wheel gauge of 32 inches, four wheels 16 inches in diameter, and a clearance of its working parts of 6 inches above the floor. Equipped with two sets of storage batteries, each weighs approximately 2,500 pounds. The steering radius is five feet and the

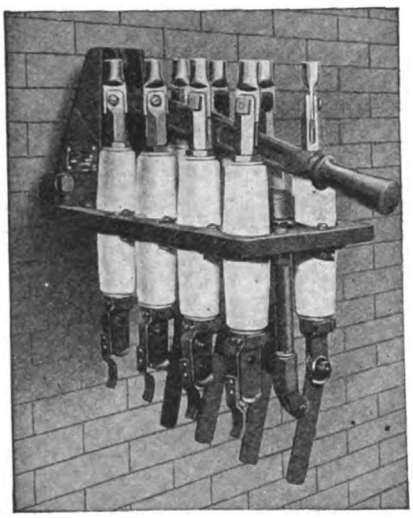
Digitized by Google

speed, with three speeds forward and three in reverse, is from one to seven miles per hour. Each tractor is rated to haul 20,000 pounds on trailers.

It is proposed in the selection of additional trucks to experiment with types equipped with small cranes, making a unit capable of lifting cargo in a sling, transporting it, and delivering it, with a minimum of dependence on human labor.

Westinghouse Oil Knife Switches.

An extensive line of oil switches, known as type D, for voltages up to 7,500 has recently been announced by the Westinghouse Electric & Manufacturing Company. These switches are non-automatic and are suited for a wide range of application, being made for indoor service in various styles for switchboard mounting, direct wall mounting, and remote-control wall or

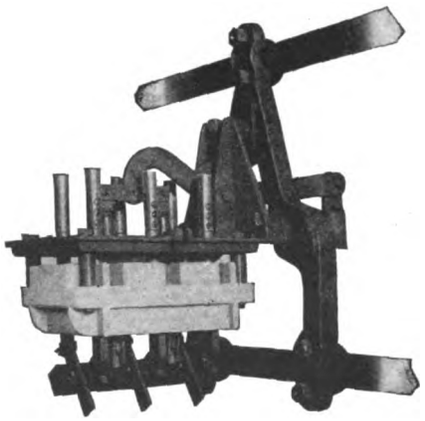


Wall-Mounted Indoor Switch, 300 Amperes, 7,500 Volts.

pipe mounting, and for outdoor service, either for pole or subway mounting.

The direct wall-mounting style is particularly adaptable to motor installations on account of the facility with which it may be mounted on any support convenient to the motor operator. The lever and handle extend outward over the oil tank so that the switch may readily be mounted against a wall, or any vertical support. The remote-control wall or pipe-mounting style allows the switch to be mounted at a convenient point away from the switchboard and operated from the switchboard or other point, as desired.

The outdoor oil switch of this type is particularly adapted for controlling lines where they enter buildings, branch feeders from the main lines, sectionalizing feeders, or any of the numerous purposes for which an outdoor type of switch may be utilized on distribution systems. The subway-type oil switch is for mounting in subways, manholes and other places where



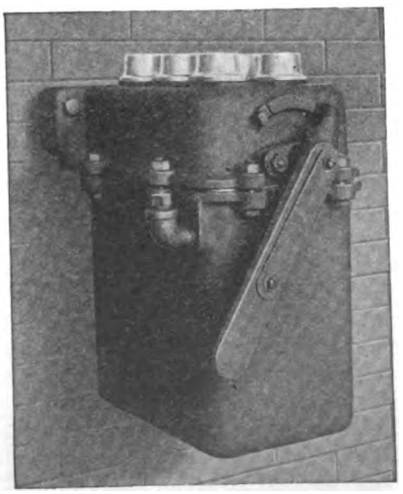
Pipe-Mounted Indoor Switch, Remote Control, 200 Amperes, 4,500 Volts.

a switch may be required to be operated submerged. The subway-type switch is made in two, three or four-pole forms for single or double throw and for voltages up to 4,500 and capacities up to 200 amperes.

Characteristic features of this type of switch are: knife-blade contacts submerged in oil; live parts carried on insulating supports, affording a high quality of permanent insulation between adjacent poles, and between the frame and live parts; small space required for mounting; accessibility of parts for purposes of inspection and repair; inclosure of all live metal parts; low first cost.

Knife-blade contacts are used as they insure the best contact for low temperature rise in a non-automatic switch. Each contact jaw has attached to it an arcing piece which takes the final break, thus preventing any burning of jaws. These arcing pieces are inexpensive and readily replaced when worn or burnt away.

With the exception of the 1,500-volt switches, the contacts are mounted on all-porcelain insulation. In switches for 7,500 volts and above, the insulation is of the pillar porcelain type, similar to that of the best accepted standard form of circuit-breaker construction. In the 4,500-volt type up to 200 amperes, the contacts are mounted on a sturdy horizontal porcelain base, with molded porcelain barriers between all live parts. In general, this form of construction gives these switches the same characteristics ordinarily looked for only in the highest grade oil circuit-breaker construction.

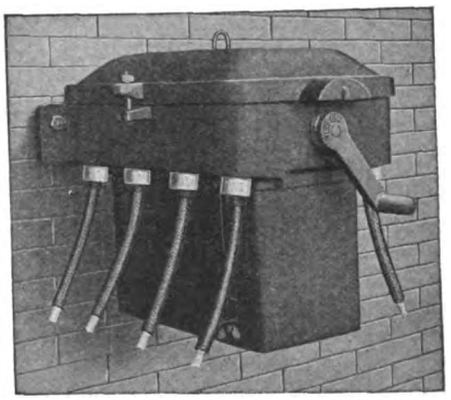


Three-Pole Subway Switch, 200 Amperes, 4,500 Volts.

The type D switches generally provide a line only paralleled by the non-automatic form of oil circuit-breakers, but by being designed particularly as switches not intended to be used automatically, they combine within their limits of capacity and voltage the highest grade of construction, insulation, etc., with a more moderate price than could apply to the non-automatic form of oil circuit-breaker.

Busch-Sulzer-Diesel Engine Day at Panama-Pacific Exposition.

An exhibit that has attracted an unusual amount of favorable attention at the San Francisco Exposition is that



Outdoor Oil Switch for Wall or Pole Mounting.

of the Busch-Sulzer Brothers-Diesel Engine Company, particularly from engineers and others interested in the economical production of power. An illustrated description of this exhibit was given in our issue of January 2, 1915. Recently there was celebrated Busch-Sulzer-Diesel Engine Day at the exposition, the ceremonies taking the form of a reception which was attended by over 500 invited guests. Lieut. G. W. Danforth, chief of the Department of Machinery, presided.

Charles V. Vogelsang, representing President Moore of the Panama-Pacific International Exposition, presented Manager W. S. Heger with a bronze medal of honor commemorating the splendid exhibit, its prompt preparation and efficient management. Lieut. Commander Woodward of the United States Navy explained the use of the Diesel engine in the navy, and Guy C. Bayley, chief electrical and mechanical engineer of the exposition, explained the theory of the engine.

Digitized by Google

An American flag was raised by a little girl as a signal, and the engine was started by three attractively attired young ladies, indicating the simplicity of its operation. Music was furnished by a band from Guatemala. The program was arranged by W. S. Heger, western manager for the Busch-Sulzer Brothers-Diesel Engine Company, who gave a brief historical sketch of the Diesel engine and its development. He said that there are at present in operation in the United States 70,000 horsepower in stationary Diesel engines. It may seem strange that the progress of the engine has been so apparently slow in this country as against its rapid strides made in Europe. The late Dr. Diesel answered this question in an address made before the American Society of Mechanical Engineers as follows:

First, coal and oil are much cheaper here than in Europe, and therefore are much more wastefully used.

Second, steam engines are much cheaper in this country, and therefore the carefully constructed Diesel is more expensive than the ordinary type of steam engine.

Third, general business profits have been so large in this country that it has not been necessary to investigate each and every expense, and it is only in the last few years that concerns have realized the importance of great economy.

The Diesel engine is manufactured in sizes from 120 to 4,000 horsepower, and can use most economically any kind of liquid fuel. It is remarkable to note that the total expense of operating this engine, 500 horsepower for one hour, is less than 68 cents for fuel and lubricating oil.

The development of the marine engine is being taken up and it will be but a short time before the company will be ready to place upon the market an economical and perfectly operating marine Diesel engine.

There has also been developed by Sulzer Brothers of Switzerland, together with the late Dr. Diesel, a Diesel engine-driven locomotive which is in operation upon one of the Prussian state railroad lines. This engine has been operating very satisfactorily and it is probably only a question of time when it will open up a field for Diesel engines of far-reaching magnitude.

The Busch-Sulzer-Diesel exhibit is located in Machinery Palace. The main engine is rated at 500 horsepower and is direct-connected to a 250-volt, 325-kilowatt, commutating-pole, direct-current generator built by the Westinghouse Electric & Manufacturing Company. Current is supplied from this set to other exhibitors using direct current.

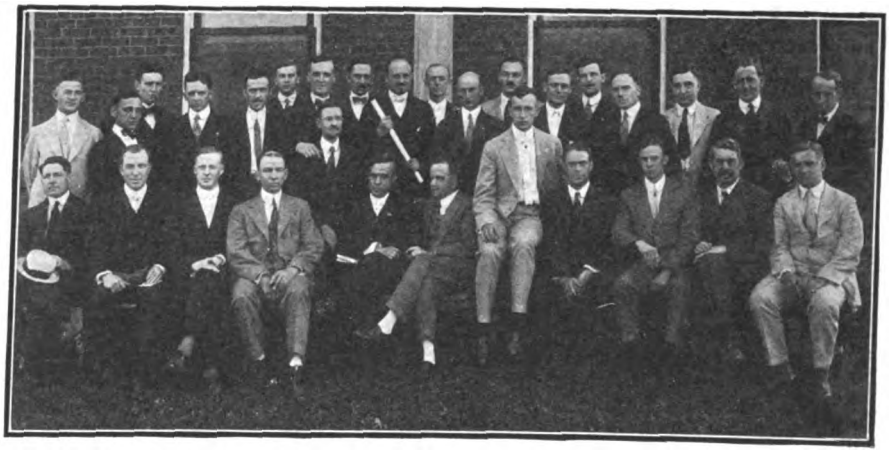
American Rotary Valve Company's Sales Convention.

The triple holiday on July 3, 4 and 5 was taken advantage of by the American Rotary Valve Company for the annual convention of its sales force. The conference took place at the company's factory at Anderson, Ind., and occupied practically the full three days. Each evening and Sunday morning was devoted to recreation.

Among the talks and papers presented were the following:

"The New Residence Vacuum Machine," by Professor W. Trinks, Carnegie Institute of Technology, Pittsburgh, Pa.; "The Road to Greater Sales," by George A. Arnold; "Jenney Motors from an Engineer's Standpoint," by William T. Hensley; "From the Shop Angle," by George T. Rosselle; "The Publicity Department," by L. L. Goding; "Productive Integrity," by William Ayer McKinney; "The Future of the American Rotary Valve Company," by R. O. Bright; "Credits and Collections," by W. H. Aurelius; "Building a Territory," by A. J. Loeb; "Co-operation Between District Offices," by Charles T. Reiss; "Wire Pulling for Business," by W. B. Haviland; "Press Drives," by Messrs. Hensley, Dudley and Immerfall; "Jenny Alternating-Current and Direct-Current Motors," by R. J. Immerfall; "Jenney Single-Phase Motors," by J. L. Hadley; "How to Win the Consulting Engineer and the Architect," by A. J. Loeb; "Rotary and Reciprocating-Type Vacuum Machines," and "Vacuum-Machine Sales Talk," by R. J. Immerfall; "The Pyschology of Salesmanship," by George A. Arnold.

There was also a general discussion of factory and branch-house motor stocks and customers' consignment stocks, led by R. O. Bright, and a general discussion of prices, discounts and terms of sale, led by George A. Arnold. One feature of the program was the one-act play in which R. J. Immerfall took the part of the salesman and L. L. Goding the part of the buyer.



Group at American Rotary Valve Company's Salesmen's Convention.

Electric Vacuum Cleaner Helps Students to Work Their Way.

An electric vacuum cleaner is in use at Purdue University to help students who wish to earn their own way through college. Some time ago Professor Alford of the university, who is interested in securing employment for students during their spare time, conceived the idea of purchasing a vacuum cleaner which could be loaned to the students, enabling them to do cleaning work for which the machine is adapted. The plan was approved by the university authorities, and the college Y. M. C. A. purchased one of the smaller-sized Western Electric vacuum cleaners.

A letter was sent to the families of the university faculty, announcing that the cleaner was available, with an operator, at 30 cents an hour. Twenty cents of this goes to the student for his services in running the machine, the remaining 10 cents going to the association for maintenance of the equipment.

By a slight change in the construction of the machine, the outfit at Purdue has been made portable in two parts. The demand for the use of the machine has been steadily growing, and if it continues at its present rate, will necessitate the purchase of a second machine in the near future. The present cleaner is busy practically all of the time and earns about $20 a month.

Before sending out the cleaner, Professor Alford requested the department of electrical engineering at the university to test it for current consumption. This was done, and it was found that, at the prevailing price of current at Lafayette, Ind., where Purdue University is located, the average cost per hour for running the machine is only about three-fourths of a cent.

The manufacture of arc-lamp carbons is increasing in Spain and a quantity of Spanish carbons was exported to the United States and other countries in 1914.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ASBESTOS MATERIAL. — The Phillip Carey Manufacturing Company, (Lockland) Cincinnati, O.

Carey asbestos board.

Listed June 16, 1915.

FIXTURES. — The Multi-Lux Illuminating Company, 6712 Union Avenue, Cleveland, O.

Fixtures shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed June 9, 1915.

FIXTURE CROWFOOT. — The Cleveland Electric Company, 2355 Lakeside Avenue, Cleveland, O.

Fixture crowfoot, made of fine-grained cast iron with set screw and two flat steel springs, for securing ⅛-inch-size pipe or chain fixture stem. P-U.

Listed June 24, 1915.

HEATERS, Electric.—Globe Stove & Range Company, Kokomo, Ind.

Globe electric heaters, up to 10 kilowatts, 110-220 volts. Porcelain-enamel ranges, hot plates and ovens.

Listed June 24, 1915.

HEATERS, Electric, Stand for Pressing Iron.—Hotpoint Electric Heating Company, Ontario, Cal.

Nickel-plated steel stand made of two pieces of formed steel riveted together. Hotpoint catalog No. C. S. 1.

Standard only for pressing irons consuming 660 watts or less.

Listed July 2, 1915.

INCLOSED SWITCH. — General Electric Company, Schenectady, N. Y.

Quick-make-and-break induction-motor starting switch, equipped with time-element plugs designed to afford protection to motor against overloads maintained for longer than predetermined periods. Inclosed in metal case and designed for manual operation without opening case.

Type CR-1038, 5 horsepower, 110-250 volts; 3 horsepower, 440-550 volts.

Listed June 25, 1915.

INCLOSED SWITCHES.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Three-pole, solid-neutral service-entrance switches with cutout bases for plug fuses, inclosed in metal cases and designed with fixed terminals and contacts, and a spring-operated porcelain base with special blades traveling on horizontal guides.

M. E. Co., 0-30 amperes, 125-250 volts, catalog No. 117, with meter-testing block, catalog No. 118.

Listed June 30, 1915.

LAMP ADJUSTER.—Indispensable Manufacturing Company, 201 Flatiron Building, San Francisco, Cal.

Adjuster forming a part of a chain fixture, consisting of a standard key socket, a length of portable cord, and a spring-controlled drum with pull-chain ratchet. The ends of the portable cord are attached and connected in circuit through insulated brushes and contact rings. A two-piece, formed brass shell supports and incloses the operating parts. The portable cord is guided through a large hole by composition roller.

Listed June 8, 1915.

LIGHTNING RODS.—Des Moines Lightning Rod Company, 772 Sixth Avenue, Des Moines, Iowa.

Listed July 2, 1915.

MOLDING.—Columbia Metal Hose Works. Incorporated, Cottage and Orient Streets, Bayonne, N. J.

C. A. C. metal molding.

Listed July 2, 1915.

MOLDING FITTINGS.—W. E. Bible & Company, Rawlins, Wyo.

Metal molding clip.

A clip for holding wire in channel of metal molding before capping is put on.

Listed June 24, 1915.

PANELBOARDS. — Electric Apparatus Company, 127 South Green Street, Chicago, Ill.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed June 16, 1915.

PNEUMATIC CLEANER. — Invincible Manufacturing Company, Farmers Bank Building, Pittsburgh, Pa.

Invincible electric renovator. A series-wound motor direct-connected to a suction fan with dust receptable and other attachments; mounted on a wheeled base. Motor designed for 100 or 220 volts, alternating-current or direct-current. For cleaning purposes in households, hotels and office buildings.

Suitable for use when installed in connection with specially wired supply circuits approved by the Inspection Department having jurisdiction.

This machine should not be used on ordinary lighting circuits.

Listed June 14, 1915.

PORTABLE AIR PUMP. — Mayo Manufacturing Company, 54 East Eighteenth Street, Chicago, Ill.

This device consists of a two-cylinder air compressor driven by a small motor with a chain transmission, and controlled by a snap switch all mounted on a portable truck.

110 or 220 volts direct or alternating current. 0.25 horsepower.

Listed June 18, 1915.

SOCKETS, Weatherproof. — C. P. Lovering Company, Corner North and Water Streets, East Cambridge, Mass.

Molded mica composition weatherproof sockets.

Mica composition, 660 watts, 600 volts, catalog No. 43310.

Mica composition provided with connecting ring for connections to ⅜-inch pipe, 250 watts, 250 volts, catalog No. 43312.

Black composition, 660 watts, 600 volts, catalog No. 60666.

Listed June 24, 1915.

SWITCHES, Automatic.—Owen T. Snyder & Company, Lynn and Ludlow Streets, Columbus, O.

Safety elevator door switch and threshold light.

An inclosed duplex series spring-opened switch automatically operated by elevator door. One side connected in series with car controller so that car cannot be started until door is properly closed. The other side is connected in series with threshold fitting for illuminating threshold of car when door is open.

Listed June 8, 1915.

SWITCHES, Inclosed. — Berry, Skinner & Company, 78 Upper Thames Street, London, England.

Three pole, double-break, spring-actuated, plunger-type switches and cutout bases for standard cartridge-inclosed fuses. Inclosed in metal cases and designed for manual operation without opening cases.

Adanac, 20 amperes, 250 volts.

Listed June 7, 1915.

SWITCHES, Knife. — Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

A three-pole switch, the blades consisting of cartridge-inclosed fuses mounted on a hinged cover plate with handle whereby all can be withdrawn simultaneously when device is used as a switch. 100 amperes, 125-250 volts, catalog No. 155.

Listed June 10, 1915.

SWITCHES, Push-Button, Flush.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 2701.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 2703.

Listed June 15, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

PITTSFIELD, MASS. — The committee on fuel and street lights has voted to extend the lighting system on North Street from the present terminus at White Terrace as far northward as Wahconah Street. This will require seven lamps, of the nitrogen type.

BINGHAMTON, N. Y.—The ordinance, passed over the mayor's veto by the council, authorizing the sale of municipal lighting bonds, has been repealed.

FEDERALSBURG, MD. — The Eastern Shore Gas and Electric Company, organized under the laws of Delaware, has made a settlement with the stockholders of the Federalsburg Electric Light Company, to assume control of this plant, together with those of Laurel, Salisbury, Cambridge and Georgetown. This new concern is controlled by Day & Zimmerman, Philadelphia engineers, and backed by the banking houses of Brown Brothers and Company and Frazier and Company of Philadelphia.

LEBANON, VA. — Arrangements have been completed for construction and equipment of an electric light and power plant by a group of Lebanon citizens. The town is not on a railroad, though in a rich agricultural section. Provision will be made in connection with the electric light plant for an ice factory.

COLUMBIA, S. C.—State Hospital for Insane has plans for power house. Address J. R. Rutherford, superintendent.

NORTH CENTRAL STATES.

DAYTON, O.—A transaction involving the consolidation of the electric light and power interests in several Kansas cities, including Emporia, Lawrence and Parsons, and the plants at Union City, Ind., and Sidney, O., as well, is in progress of completion here, Albert Emanuel, a local attorney, being in charge of the deal, on behalf of New York interests. Dayton capitalists will, it is understood, furnish about half of the $2,000,000 involved.

YOUNGSTOWN, O.—On account of the failure of the city to extend its recently completed ornamental street-lighting system on the request of some of the property owners in the business district, several of them are reported to be planning to install their own lighting plants, in connection with ambitious exterior lighting arrangements. The proprietor of the Albany Hotel, at South Champion and East Front Streets, has stated his intention of doing this, and it is understood that other property owner will follow his example.

BROOKVILLE, IND.—The Brookville Electric Light Company has petitioned the Public Service Commission for authority to issue bonds in the sum of $10,000. The proceeds from the sale of the bonds are to be used for improvements.

GOSHEN, IND.—The Hanks Electric Company has petitioned the Public Service Commission for authority to purchase the Home Electric Company, of Wakarusa.

LAGRANGE, IND.—The Council is planning ways and means to establish a municipal electric light plant. Address city clerk.

BELOIT, WIS.—Plans have been prepared for an ornamental lighting system for this city. There will be 94 ornamental standards mounted with tungsten lamps of 600 candlepower. Current will be furnished through underground wires. The estimated cost of the system is $8,000. F. W. Dupke, 439 East Grand Avenue, is chairman of the committee in charge of the work.

NEW RICHMOND, WIS. — This village has voted to establish a white way.

ELK RIVER, MINN.—Articles of incorporation have been filed by the Elk River Power and Light Company. Capitalization, $100,000. The incorporators are F. D. Waterman, Eva Waterman and M. E. Waterman.

MINNESOTA LAKE, MINN.—A power line is to be built to Mapleton from here. The contract for the supplies, amounting to $7,658, has been awarded to the Electrical Appliance Company of Chicago.

MONTEVIDEO, MINN.—The local electric light and power plant has gone into the hands of the Northwestern Light and Power Company.

VIRGINIA, MINN. — Electrical power is being used here for the first time to operate a rock crusher which is under contract to furnish 2,000 cubic yards of rock to the city. The machine is being operated by J. C. McCusick. It was found cheaper to operate it by current than by gasoline.

ALBANY, IOWA. — Franchise has been voted to the Clinton Gas and Electric Company.

MARSHALLTOWN, IOWA—The Board of Supervisors has granted permission to the Iowa Railway and Light Company to build a transmission line from LeGrande to Gilman.

ST. JOSEPH, MO.—The electric light committee recommended $75,000 for duplicating the present plant and extending it to furnish lights for all the streets, including the white way, and providing ample facilities for making boulevard lighting extensions as they might be needed.

KINGSTON, N. D.—Additional improvements will be made to the electric light plant. Address F. I. Sutton, mayor.

EVEREST, KANS.—The citizens of Everest have authorized a bond issue of $8,000 for municipal electric lights. A transmission line will probably be run from Hiawatha. M.

LARNED, KANS.—The Council is planning to install a white way. Address City Attorney Finney.

REPUBLIC, KANS.—The sum of $6,500 in bonds has been voted for electric lights. The electricity will be furnished by the Concordia plant, and connection will be made from Courtland. Address mayor.

SOUTH CENTRAL STATES.

FULLERTON, KY. — An electric light and ice plant is to be constructed by John Davis, who, it is stated, will convert the Fullerton Canning Company plant into a lighting plant.

HAZARD, KY.—Proposals for construction of a large central electric power plant to supply surrounding coal mines with current are being developed by E. C. Lilly, of Bluefield, W. Va., and D. Terpstra, of Norton Va.

JENKINS, KY.—A franchise for construction and operation of an electright light plant is a recent development. The mayor is in touch with the situation.

LEXINGTON, KY.—Plans for the white way system are rapidly being perfected by the Board of Commerce, and Harry S. Brower, president, announced that they would be submitted to an engineer experienced in these installations before work was actually begun. The system will be composed of 97 ornamental standards, each equipped with two type C Mazda lamps, the installation cost to be borne by property owners; the city to attend to the rest.

RUSH, ARK.—John Conness Shepherd is planning to put in an electric plant to supply his own properties with light; possibly to furnish light for the entire village. This is one of the largest mining camps in the field.

KENEFICK, OKLA. — The city council is considering the proposition of installing an electric light plant. Address mayor.

AUSTIN, TEX.—Part of the $125,000 which the Legislature appropriated recently for repairing the State Capitol will be used for constructing a new power plant and rewiring the entire building.

CORPUS CHRISTI, TEX.—The city council has called an election for August 10 to vote on the proposition of granting a franchise to J. H. Caswell and associates for the construction of an interurban electric railway over certain streets. D.

HARRISBURG, TEX.—The new cement mill which the Texas Portland Cement Company will build here will be electrically equipped. The plant will have an annual capacity of about 4000,000 barrels of cement. D.

Digitized by Google

WESTERN STATES.

GLASGOW, MONT.—In the immediate future this city will vote on the proposition of issuing bonds in the sum of $20,000 to be used in installting a 225-horsepower oil engine and a 160-kilowatt generator as an adjunct to the municipal water system. O.

ROUNDUP, MONT.—Reported the city council has passed a bill ordering the immediate installation of an ornamental lighting system in this city. The installation will consist of 100 lamp posts with cluster lights. Engineer C. A. Renshaw, who prepared the plans for the improvement, estimates the cost at $100 per post. Understood bids for the material and installation will be received by the city clerk at an early date. O.

ROSWELL, N. M.—The Pecos Valley Investment Company's power house at South Spring was destroyed by fire recently.

BONNERS FERRY, IDAHO.—The city council has decided to install an electrically operated pumping plant as an adjunct to the municipal water system. The installation will be made by the Bonner Light and Water Company. O.

RICHLAND, IDAHO.—According to Stanley G. Smith, representing a large power corporation which recently acquired the Oxbow plant on the Snake River, Eagle Valley and the small towns in this territory, are to be served with electrical energy at an early date. The company is petitioning for franchises at this time and it is understood, active construction of the transmission lines and various substations is but a matter of a few months. O.

WARDNER, IDAHO.—Councilmen Seaman, Struthers and Loer have been appointed by the mayor and city council to investigate the feasibility of this city installing and equipping a municipal lighting plant. O.

SEWARD, ALASKA. — A petition for a light and power franchise to serve this city with electric current for both light and power has been presented to the city council by J. C. Murray and J. P. Mantell. The petitioners state active construction will be ordered as soon as the franchise is granted. O.

CENTRALIA, WASH. — Application has been made to the Commissioners of Lewis County, by H. G. Fleischhauer, for a franchise to construct power lines over certain roads.

SEATTLE, WASH.—The Port of Seattle Commission, Central Building, C. E. Remsberg, chairman, will receive bids until August 4 for two electric freight elevators in the new fruit storage warehouse. O.

SPRAGUE, WASH.—The city council is negotiating with the Washington Water Power Company of Spokane relative to the installation of a new electric pumping plant as an addition to the local water system. Understood the plant will be installed this summer.

SUMNER, WASH.—The city council is working out details regarding the installation of an up-to-date street lighting system, to be placed this summer. Current will be purchased from either the Puget Sound Traction, Light and Power Company or the Tacoma municipal plant. O.

WALLA WALLA, WASH. — According to City Commissioner H. H. Crapton, cluster lights will be installed on Second Street, from Stahl Avenue to the Northern Pacific depot, some time this summer. The proposition of furnishing current has been taken up with Manager C. S. Walters, of the Pacific Power and Light Company.

WENATCHEE, WASH.—The local plant of the Wenatchee Valley Gas and Electric Company, here, recently sustained serious loss, totaling several thousand dollars, when a mud slide demolished a portion of the power plant and carried the generating machinery and other electrical equipment into the river. Immediate steps will be taken to repair the damage and rebuild the plant. O.

CROCKETT, CAL. — The recent municipal election for the formation of a public lighting district here carried.

LOS ANGELES, CAL. — "Greater Culver City," is shortly to have an electrolier lighting system that will harmonize with the present illuminating scheme of Culver City proper.

SACRAMENTO, CAL.—The Great Western Power Company has filed an application with the state corporation commission for an order preliminary to the issue of a certificate of convenience and necessity for the exercise of franchise rights to be granted by Plumas County and for authority to build an electric power line in that county. The franchise applied for is to be sold September 9, 1915.

SANTA ANA, CAL.—An election will be held on August 10 to submit to voters the proposition for the organization of the Buena Park lighting district.

SANTA BARBARA, CAL. — Plans are under consideration for the installation of an ornamental lighting system on West Boulevard, which it is estimated would cost about $4,000.

STOCKTON, CAL. — Residents of the town of Ripon, which is not incorporated, have filed a petition with the county supervisors applying for permission to organize a highway lighting district.

TULARE, CAL.—The Mt. Whitney Power and Electric Company, which recently purchased the Tulare County Power Company, is extending its lines ten blocks in West Tulare, and has surveyors at work determining which lines of the Tulare County company's system it will retain when it takes over the business on August 1.

PROPOSALS.

SUBMARINE CABLE.—Sealed proposals will be received at the office of lighthouse inspector, Buffalo, N. Y., on July 26 for furnishing approximately 6,900 feet of submarine electric cable. Address lighthouse inspector.

SIOUX FALLS, S. D.—Bids will be received until July 26, on the alternative installation of pumping machinery, either one 5,000,000-gallon vertical triple-expansion steam pumping engine, or two units, each consisting of an oil engine operating a 40-kilowatt generator and a 1,500-gallon per minute vertical triplex pump. Address W. C. Leyse, city auditor.

ELECTRIC DUMBWAITER. — Sealed proposals will be opened in the office of the Supervising Architect, August 16, 1915, for the installation of an electric push-button dumbwaiter in the extension, United States postoffice and courthouse, Detroit, Mich., in accordance with the drawing and specification, copies of which may be had at the office of the Supervising Architect, Washington, D. C.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

ELECTRIC TRAIN LIGHTING. NO. 17,470.—An American consular officer in a British possession writes that a demand is being made that the system for lighting passenger coaches on the state railways by gas be changed to electricity in the interest of the traveling public. The consular officer transmits the name and address of an official of the railroad who may be addressed relative to this opportunity.

ELECTRIC METERS. NO. 17,478.—An American consular officer in Canada reports that an electric power company in his district is in need of meter clocks which will automatically charge energy to the consumer at the regular lighting rate during the rush or peak period and at a reduced rate for cooking purposes at other times. Quotations should be made c. i. f. destination. The Canadian customs tariff on electric meter clocks is 35 per cent ad valorem.

TELEPHONE MATERIALS.—Mr. Kwan Po Pin, manager, Chinese Telegraph Supply Department, No. 27 Markham Road, Shanghai, China, has invited tenders for telephone material and printing machinery. Bids will be received until August 20, 1915. Specifications, requisition sheets, and other information may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

COPPER AND STEEL WIRE. NO. 17,553.—An American consular officer in England transmits a report relative to a market for copper and steel wire. A copy of his report may be had on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

CABLES, COPPER WIRE, ETC. NO. 17,554.—An American consular officer in Norway transmits a report relative to an opportunity for the sale of vulcanized cables, copper wire, electrical wire for bells and house telephone cables. A copy of this report may be had on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

ELECTRICAL SUPPLIES. No. 17,559.—The commercial agent of the Bureau of Foreign and Domestic Commerce in New York has been informed that an Italian firm desires to represent American manufacturers and exporters of electrical apparatus, electric light fixtures, and electrical appliances. Catalogs containing the articles desired may be seen at the New York office of the Bureau. The firm desires to receive samples, catalogs, and full information relative to prices, etc.

NEW PUBLICATIONS.

BUILDING CONSTRUCTION. — An attractive book showing 31 plates of office buildings, educational institutions, industrial plans, warehouses, power stations, etc., constructed by Stone & Webster Engineering Corporation, Boston, Mass., has been issued by the company. Some of these structures are illustrated with several views depicting the progress of the work.

Digitized by Google

Condensed data on most of the buildings are given.

COKING OF COAL.—Bulletin 79 of the University of Illinois Experiment Station has been issued under the title "The Coking of Coal at Low Temperatures with Special Reference to the Properties and Composition of the Products." This report by S. W. Parr and H. L. Olin gives valuable observations on the by-products of modern coke making.

LATIN AMERICAN MONETARY SYSTEMS AND EXCHANGE CONDITIONS.—A 31-page booklet with this title has been prepared by Joseph T. Cosby, of the National City Bank of New York, and is being distributed by the Foreign Department of this bank. It gives an explanation and data on the monetary system of 17 Latin American countries, and also gives the current state of exchange between the United States and these countries. Thus it forms a valuable compendium for those interested in developing export trade with the Latin countries south of us.

NEW INCORPORATIONS.

FRANKLIN PARK, ILL.—The Gite Electrical Company has been incorporated with a capital of $16,000, by A. B. Kircheff, James O'Malley and John Early.

JACKSON, ALA.—The Jackson Electric Company has been incorporated with a capital of $15,000, by R. V. West and others, to operate electric plant, ice plant, etc.

BROOKLYN, N. Y.—D. K. Electrical Contracting & Fixture Company, Incorporated. Capital, $5,000. Incorporators: Sam Kuslansky, Rachael Kuslansky and David Davidson.

NEW YORK, N. Y.—E. H. Tiffany & Company, Incorporated; electrical apparatus, etc. Capital, $25,000. Incorporators: E. H. Tiffany, J. W. Stone and Glenn M. Congdon.

NORFOLK, VA.—Virginia Electric Welding Company, Incorporated. Capital, $2,400 to $15,000. Officers of the company are: J. A. Ridgwell, president; F. Tonnemacher, vice-president; William Benseler, secretary and treasurer.

NEW YORK, N. Y.—The Great Eastern Electric Company has been incorporated to deal in machinery, engines, tools, appliances, etc. Capital, $8,000. Incorporators, A. Hallberg, G. Hallberg, R. Lundin.

VERNON, IND.—The Vernon Hydro-Electric Company has been organized to manufacture and sell electricity. Capital, $1,000. The incorporators are George C. Ale, F. T. Semon and Nicholas Eitel.

NEW YORK, N. Y.—The American Magnet Power Company, Incorporated; to develop electrical apparatus, etc. Capital, $200,000. Incorporators: Thomas J. Scherer, William T. Leverenz and Charles Wintrowd, all of Danville, Ill.

NEWARK, N. J.—The Essex Electric Company has been incorporated with a capital of $125,000, to manufacture electrical appliances. The incorporators are: Job H. Lippincott, Thomas S. Woodruff, William A. Smith, all of New York City.

HIGHLAND SPRINGS, VA.—The Fairfield Electric Light and Power Company has been incorporated with a capital of $5,000, as an electric light and power business. The incorporators are G. T. Collins, president; S. M. O'Bannon, secretary, both of Highland Springs.

SHELBYVILLE, TENN. — The People's Power Company has filed its charter with the county register. The authorized capital stock of the company is $25,000. Capt. J. E. Huffman, E. C. Huffman, A. B. McGill, Ernest Caldwell and Thomas N. Greer are the incorporators. The company will do a general electrical business in the state of Tennessee.

FINANCIAL NOTES.

United Gas and Electric Corporation has purchased and surrendered to the Fidelity Trust Company, trustee, $1,000,000 of its $5,500,000 three-year six-per-cent notes, for cancellation. By this, United Gas & Electric anticipates the retirement of $500,000 of the notes on July 1, 1916, and $500,000 on January 1, 1917, as provided in the indenture under which the notes were issued last April.

Edwin Hanson, A. Kingman, T. B. MacCauley, S. J. Moore and E. Mackay Edgar have been appointed a committee for the protection of the holders of the $10,000,000 first-mortgage 30-year five-per-cent bonds of the Mexican Northern Power Company, on which interest was defaulted some time ago. Depository for the bonds is the National Trust Company, Limited, of Montreal and Toronto, and all bonds must be deposited by October 1, 1915.

Shawinigan Water & Power Company will issue $1,237,500 of capital stock to stockholders, at par, in the ratio of one share of the new stock to ten shares of the old stock. Owing to financial conditions, the stockholders are given the right, good until June 30, 1916, of subscribing for the stock at 105, instead of par. Subscription rights at par expire August 30. At 114, the price at which the stock has been selling, immediate rights would have a value of $1.27 a share, and the deferred rights a value of 82 cents a share.

Dividends.

	Term	Rate	Payable	
Am. Rys. pf.	Q	1.75%	Aug.	14
Automatic Elec.	Q	1 %	Aug.	1
Bangor Ry. & Elec. com.	—	0.5 %	Aug.	2
Col. Ry., Pr. & Lt.	Q	1.25%	Aug.	2
Col. Ry., Pr. & Lt. pf. "B"	Q	1.25%	Aug.	2
Commonwealth Pr., Ry. & Lt.	Q	1 %	Aug.	2
Commonwealth Pr., Ry. & Lt., pf.	Q	1.5 %	Aug.	2
Elec. Bond & Share	Q	2 %	July	15
Elec. Bond & Share pf.	Q	1.5 %	Aug.	1
Ft. Worth Pr. & Lt. pf.	Q	1.75%	Aug.	1
Grand Rapids Ry. pf.	Q	1.25%	Aug.	2
Illum. & Pr. Sec. Corp. pf.	Q	1.75%	Aug.	16
Lewiston, Augusta & Waterville St. Ry. pf.	Q	1.5 %	Aug.	2
Montreal Rys.	Q	2.5 %	Aug.	2
Phila. Co. pf.	S	2.5 %	Sept.	1
West Penn. Rys. pf.	Q	1.25%	Aug.	2

Reports of Earnings.

WESTERN UNION.

The Western Union Telegraph Company has issued its statement for the six months ended June 30, 1915 (June estimated), as follows:

	1915	1914
Total revenue	$24,019,260	$22,466,578
Maintenance and depreciation	3,878,138	3,511,571
Other expenses	15,481,607	16,186,556
Balance	$4,659,515	$2,768,451
Bond interest	668,600	668,625
Surplus	$3,990,915	$2,099,826

WESTERN POWER COMPANY.

	1915	1914
June gross	$232,820	$213,354
Net after taxes	165,801	144,014
Surplus after charges	77,401	63,334

EDISON COMPANY OF BOSTON.

	1915	1914
June gross	$ 559,291	$ 518,341
12 months gross	7,429,124	7,008,288

Increase during June is equal to 7.9 per cent, the largest percentage of increase since last September, while twelve months gross made a new high record, and represented a gain of 6 per cent.

PERSONAL MENTION.

MR. E. BURT FENTON, until recently advertising manager of the Sandusky (O.) Gas and Electric Company, has been appointed manager of a new publicity department for the various properties operated by W. S. Barstow and Company, New York.

MR. W. S. BARSTOW has been elected president of the Rutland (Vt.) Railway, Light and Power Company. Mr. Barstow succeeds as president Mr. Herbert Nash, Jr., who retains his directorship. Vice-president B. T. Burt, who came to Rutland a few months ago, is to have the entire management of the concern, assuming the dutes which are to be relinquished by Mr. I. M. Frost, who severs his connection with the Rutland company August 1. Mr. Burt before coming to Vermont was connected with several big electric power enterprises in the South.

MR. H. A. STEVENSON, who resigned recently as assistant electrical engineer of the Underwriters' Laboratories, Incorporated, Chicago, has been appointed sales engineer of the Starrett Electric Company, 215 West Superior Street, Chicago. Mr. Stevenson is well known through his connection with the Laboratories, and for his earlier work in the educational field as head of the electrical department of the Columbus Trade School. He has taken an active part in the promotion of high standards for electrical fittings and construction. He is an active Jovian, and has taken a prominent part in many affairs of the Jovian Order.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 19	July 12
Amer. Tel. & Tel. (New York)	121	119¾
Commonwealth Edison (Chicago)	134½	135
Edison Electric Illuminating (Boston)	235	237
Electric Storage Battery common (Philadelphia)	53	52
Electric Storage Battery preferred (Philadelphia)	53	52
General Electric (New York)	166¾	161½
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	5⅛	5
Massachusetts Electric preferred (Boston)	33½	34½
National Carbon common (Chicago)	130½	
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	132	131
Philadelphia Electric (Philadelphia)	23¾	23¾
Postal Telegraph and Cables common (New York)	70	75¾
Postal Telegraph and Cables preferred (New York)	64	64
Western Union (New York)	69⅛	65¾
Westinghouse common (New York)	103½	97
Westinghouse preferred (New York)	120	122

Digitized by Google

OBITUARY.

MR. WILLIAM G. DEACON, managing editor of the *Public Service Magazine*, of Chicago, and widely known as a public utility expert, died on July 16, in Minneapolis. He was formerly a newspaper man in Chicago, St. Paul, and Minneapolis.

MR. WILLIAM H. GERRISH, state smoke inspector for the Massachusetts Gas and Electric Light Commission, died at Malden, Mass., July 15. He was 49 years old, a native of Lowell and a graduate of Massachusetts Institute of Technology. He was appointed to his position five years ago, and was the first holder of that office under the commission.

MR. LOUIS F. BECKERT, a salesman with the Westinghouse Electric and Manufacturing Company, died suddenly July 7 at his residence in Pittsburgh, Pa. Death was due to typhoid fever. Mr. Beckert was born in Pittsburgh in 1886. He received his early training in Bellevue Public Schools and graduated from the Allegheny High School with honors in 1903. In the fall of that year, Mr. Beckert entered Penn State College, graduating in 1907. While in college he made many friends and was a member of the Sigma Nu fraternity. Upon the completion of his college course, he entered the employ of the Westinghouse Electric and Manufacturing Company as an engineering apprentice. After completing his course he accepted a position in the railway equipment division of the railway and lighting department, in which department he remained until his death.

PROFESSOR FREDERICK PRIME, of Girard College, Philadelphia, died on Wednesday, July 14, at Chelsea, Atlantic City, N. J., in his seventieth year. He was born in Philadelphia, and after serving for a year in the civil war attended Columbia University, from which he was graduated in 1865. Professor Prime later received degrees from the Royal School of Mines at Freiberg and Lafayette College. From 1869 until 1870 he was an assistant in assaying at Columbia, and for the next nine years was professor of geology and metallurgy at Lafayette. He was also president of several iron and electrical companies in Alabama and Pennsylvania and from 1891 until 1893 was president of the Edison Electric Light Company of Philadelphia. In 1895 he became professor of natural history at Girard College. Professor Prime was a secretary of the American Philosophical Society from 1897 until 1900

DATES AHEAD.

American Association for the Advancement of Science. Summer meeting, San Francisco, Cal., August 2-7. Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention. Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Seattle, Wash.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23, 24 and 25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

With the Electrical Manufacturers

The King Electric & Manufacturing Company, Cleveland, O., announces that owing to increased business it is moving to larger quarters at 10514 Dupont Avenue.

The Fargo Manufacturing Company, Incorporated, Poughkeepsie, N. Y., is publishing new catalogs describing its connecting devices and electrical and mechanical appliances. Copies of these bulletins will be sent to those interested upon request.

The Usona Manufacturing Company, Incorported, 100 Hudson Street, New York City, has ready for distribution a condensed booklet on its pocket and tubular Kwick-lite electric flashlights. About 20 of these are illustrated, also dry-cell batteries and Mazda lamps.

The Lackawanna Mills and **The Scranton Button Company,** Scranton, Pa., are giving their eighteenth annual outing for their employees on July 24. The event this year is an excursion and all-day picnic at Lake Lodore. As usual a great variety of sports and athletic contests with abundant refreshments and amusements are conspicuous features of the program.

Queen-Gray Company, Philadelphia, Pa., successor to the old and well known instrument firm of Queen & Company, has issued Bulltein E6, devoted to portable testing sets and instruments for the maintenance of lines and cables. Among the instruments illustrated and described are the following: Several decade and dial-type portable testing sets, lamp-testing meter, inductive fault finder, several types of ohmmeters, portable galvanometers, galvanometer shunts, choride of silver testing batteries, etc. Each type of instrument is briefly described and its special line of utility pointed out.

W. C. Sterling & Son Company, Monroe, Mich., one of the largest dealers in cedar poles, posts, ties, etc., has purchased a large, valuable site at Bay City, Mich., and will move its headquarters and main distributing yard to this point as soon as the property is improved with new dockage, sidetracks, etc. The new yard fronts 260 feet and has two adjoining slips on the river, and runs back about 1,000 feet to the tracks of the Michigan Central Railway, thus having exceptionally good shipping facilities both by water and rail. When completed this will be probably the largest cedar-distributing yard in Michigan.

Westinghouse, Church, Kerr and Company, 30 Wall Street, New York City, engineers and contractors, have prepared an interesting group photograph, designated as the "W. C. K. City," showing a multitude of structures that the firm designed and constructed in their entirety. The total cost of the buildings, shops and works illustrated was over $50,000,000 and their aggregate area under roof totaled over 56,000,000 square feet. Among the buildings are power houses, railroad depots, shops and various industrial works, office and public buildings, etc. The structures shown do not represent all the work done by the firm, as in many large undertakings the W. C. K. organization has carried on only part of the work.

Digitized by Google

Mutual Electric & Machine Company, Wheeling, W. V., is establishing its principal offices and factory at the corner of Fort Street and Fourth Avenue, Detroit, Mich. The company's rapidly expanding "Bull Dog" switch and panelboard departments and the character of its business connections makes a more central and metropolitan location desirable. This is particularly the case with the rapidly growing automobile specialty departments of the company's business. The manufacturing facilities will be greatly increased, as the new factory is strictly modern in construction and appointments. It is four stories high and well located on a main thoroughfare and within a few blocks of the business district.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has issued a highly interesting and very attractively illustrated book of 72 pages entitled "Results of Electrification." It gives a condensed summary of the many steam-railroad electrifications carried out by the Westinghouse company. Among the installations briefly described are the Hoosac Tunnel, St. Clair Tunnel, Pennsylvania Railroad, New York City Terminal, New York, New Haven and Hartford Railroad, Pennsylvania Railroad Paolo Division at Philadelphia, Long Island Railroad, New York, Westchester & Boston Railway, Italian State Railways, Giovi Division, Norfolk & Western Railway Elkhorn Grade, Niagara Junction Railway, Spokane & Inland Empire Railroad, Oakland, Antioch & Eastern Railway, Piedmont & Northern Lines, Southern Pacific Railway, Erie Railroad Rochester Division, Lackawanna & Wyoming Valley Railroad, Rock Island & Southern Railway, Maryland Electric Railways, Visalia Electric Railroad. These different installations represent electrifications under the greatly varying conditions existing in tunnels, main terminals, main trunk lines, mountain grades, suburban terminals, classification yards and general switching service, freight-interchange service, single-track systems, branch lines and feeder systems, and fully demonstrate the practicability of electric operation for any railroad service. The book contains a multitude of fine illustrations of these systems, together with the salient data of each. A summarized table of the electrified steam railroads of the country is given; this shows that out of a total of 2,255 miles of electrified trackage the Westinghouse company has equipped 1,549 miles, and of a total of 280 electric locomotives used on these lines it has furnished 178. The Westinghouse Electric and Manufacturing Company has also issued the first of a periodical series of "Westinghouse Electrification Data." No. 1 of this series is devoted to electric-locomotive characteristics. This is a general and illustrated discussion of the subject, supplemented by data on the comparative cost of steam and electric-locomotive maintenance, and by data on the splendid performance of the electric locomotives in the Pennsylvania Railroad's New York City terminal service.

Record of Electrical Patents

Issued by the United States Patent Office, July 6, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,144,997. Semi-Automatic Exchange System. A. M. Bullard, assignor to Western Electric Co., Chicago, Ill. Telephone set of keys switched onto any one of a number of senders.

1,144,998. Magnetic Engine. R. Burnham, assignor to Gebhardt Meter Co., Chicago, Ill. Movement of float in sealed chamber of fluid meter transmitted to exterior indicator by magnetism.

1,145,005. Electric Signal for Automobiles. H. C. Dolan, Detroit, Mich. Mechanism for synchronously moving shutter and signal arm in direction indicator.

1,145,006. Detachable Trolley Harp. F. M. DuBois, Thompsonville, Conn. Harp detachably clamped to pole.

1,145,025. Gyroscopic Steering Device. F. M. Leavitt, assignor to E. W. Bliss Co., Brooklyn, N. Y. Steering of torpedo controlled by gyroscope driven by electric motor.

1,145,033. Attachment Plug. C. D. Platt, Bridgeport, Conn. Two-part, separable plug.

1,145,035. Hair-Dressing Apparatus. F. Savoureux, New York, N. Y. Has electric heater.

1,145,041. Switch for Electric-Lighting Systems. T. Spencer, assignor to Helios Mfg. Co., Philadelphia, Pa. Generator switch responsive to changes in speed of armature shaft.

1,145,046. Ore Concentrator. J. Weatherby, assignor to Electric Ore Separator Co., New Cumberland, Pa. Table on which stratification and separation are effected has riffle bars with magnetic terminal edges.

1,145,047 and 1,145,048. Vacuum Cleaning Apparatus. T. Wiedemann and J. H. Templin, assignors to Santo Mfg. Co., Philadelphia, Pa. Mounting and connections of motor.

1,145,054. Bacterial Incubator. J. Boekel and J. H. Scherer, assignors to Boekel. Refrigerator and thermostatically controlled electric heater maintain temperature of incubating chamber.

1,145,057. Electrical Fitting. R. W. Davenport, assignor to Detroit Stove Works, Detroit, Mich. Combined switch and fuse block for heater.

1,145,066. Transmitting Apparatus for Wireless Telegraphy. A. H. Johnson, assignor to National Electrical Supply Co., Washington, D. C. Controlled by key in field of alternator which supplies energy and has flywheel for storing energy.

1,145,081. Dynamo-Electric Machine. P. P. Polltowski, Chicago, Ill. Field-pole structure.

1,145,087. Illuminated Fender. E. D. Shaw, Syracuse, N. Y. Light on front of wheel guard.

1,145,105. Case for Incandescent Electric Lamp Sockets. A. Weber, Sr., assignor to Weber Electric Co., Schenectady, N. Y. Telescoping sections snap together and are released by compressing inner one.

1,145,109. Telephone System. J. L. Wright, assignor to F. C. Stevens, Attica, N. Y. Automatic, with provision for selecting another link if first one chosen is abnormal.

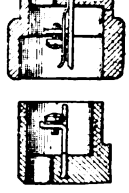
1,145,116. Alternating-Current Rectifier and Rectifying System. J. Chesler, assignor to New Jersey Patent Co., West Orange, N. J. Arrangement of direct and alternating-current magnets with pole-changer.

1,145,120. Telephone Exchange System. E. E. Clement, assignor to F. C. Stevens, Attica, N. Y. Semi-automatic; automatic branch exchanges connect with central exchange.

1,145,129. Street-Cleaning Machine. A. S. Emerson, assignor to Emerson Contracting Co., New York, N. Y. Suction cleaner with gas-electric propulsion and operation.

1,145,140. Apparatus for Treating Liquids with Ultra-Violet Rays. V. Henri, .. Helbronner and M. von Recklinghausen, assignors to R. U. V. Co., New York, N. Y. Structure of vessel for holding liquid.

1,145,152. Credit Marking System. J. J. Leidigh, assignor to National Cash Register Co., Dayton, O. Telephonic; devices at central credit office electromagnetically punch checks at substations.



No. 1,145,424.—Connector.

1,145,213. Device for Incandescent Lamps with Metal Filaments. C. G. H. Remane, assignor to General Electric Co., Schenectady, N. Y. Relates to the filament support.

1,145,218. Humidor. W. E. Schimmel, Watertown, Wis. Structure comprises electric heater for producing vapor.

1,145,224. Combined Automatic Burglar and Fire-Alarm System. O. Asmussen, Brooklyn, N. Y. Automatic switches at subscribers' stations operated by alarms to signal central station.

1,145,229. Telegraph System. W. M. Bruce, Jr., assignor to United Telegraph & Cable Co., Springfield, O. Alternating-current, tape-recording system.

1,145,232. Ignition System for Internal-Combustion Engines. W. W. Dean, Chicago, Ill. Timer specially adapted for advancing spark.

1,145,235. Circuit-Breaker. L. L. Elden, assignor to General Electric Co. Laminated brush and carbon break; trip releases gravity device which breaks holding toggle.

1,145,239. System for Direct Energization of Radiotelegraphic Antennae. E. Girardeau and J. Pethenod, Paris, France. Provides for uniform vigorous charging of the antennae by two phases.

1,145,245. Telephone-Exchange System. M. L. Johnson, assignor to Frank B. Cook Co., Chicago, Ill. Trunk lines between boards have automatic switches for selecting idle operators' receivers.

1,145,253. Electric Bell. C. F. Mead and L. E. Richmond, assignors to Mead Electric Signal Co., Cleveland, O. Electromagnetic striking mechanism for gong.

1,145,287. Telephonic-Telegraphic Communication System for Railroad Trains. F. Arena, assignor of one-fourth each to O. Scotto, G. Carpaneto and R. Maggio, New York, N. Y. Structure of contact shoe.

1,145,328. Electric Train-Lighting System. J. F. McElroy, assignor to Central Trust Co. of New York, N. Y. Battery and axle-driven dynamo equipment on each car connected by voltage-reducing train line.

1,145,331. Electric-Motor-Driven Coal Cutter. R. Martin, Irvington, N. Y. Tool connected with connecting rod by magnetism and air cushion.

1,145,338. Spring Jack. C. H. Vanderhoof, New York, N. Y. Structural details of jack for securing to post of telegraph instrument.

1,145,339. Electrical System of Distribution. E. VanWagenen, assignor to Gould Storage Battery Co., New York, N. Y. Regulation of system having storage battery floated on line.

1,145,346. Guard for Presses. J. J. Brophy and W. C. Roche, assignors to Turner Tanning Machinery Co., Peabody, Mass. Lock for starting device electromagnetically interlocked with the guard.

1,145,348. Synchronism Indicator. E. D. Carter, Montclair, N. J. Requires at least one of sources shall be polyphase.

1,145,359. Type-Setting Machine. H. Drewell, Charlottenburg, Germany. Keyboard is electromagnetically shifted from one to another of a number of line-casting machines.

1,145,361. Separable-Husk-Socket Fitting. E. H. Freeman, Trenton, N. J. Details of quickly detachable socket.

1,145,366. Conical Helix. C. D. Herrold, San Jose, Cal. Loose-coupled oscillating transformer having conical-shaped spirally wound primary and secondary.

1,145,374. Combined Electric-Lamp Socket, Holding Shell and Shade-Holder. H. W. Lawrence, Denver, Colo. Rectangular shade-holder base secured to shell by tongues sprung over rectangular bead.

1,145,382 and 1,145,383. Electric Lamp Fixtures. A. C. McWilliams, Chicago, Ill. First patent, shade and spring-supported socket independently vertically adjustable. Second patent, modified supporting means

Digitized by Google

for socket with shade connected by bayonet joint.

1,145,393. Cooler for Telephone Instruments. W. P. Stunz, assignor to Webb Talking Pictures Co., Lansdowne, Md. Has chamber for circulation of cooling agent in granular transmitter.

1,145,413. Welding Machine. A. S. Hatch, assignor to T. H. Ferguson, Oak Park, Ill. Details of frame and transformer structure in spot welder.

1,145,424. Separable Connector for Electrical Conductors. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Insures proper angular relation and prevents relative rotation of parts. (See cut.)

1,145,431. Power Transmission. G. G. Milne, assignor to Gould Coupler Co., New York, N. Y. Breakable connection between dynamo and driving car-axle when dynamo is stopped, to prevent breakage of other parts.

1,145,435. Starting Device for Internal-Combustion Engines. W. J. Perkins, Grand Rapids, Mich. Igniter circuit opened when spark is advanced and during cranking prevents "kicking" operator.

1,145,436. Safety Starting Device. W. J. Perkins. Modification of above.

1,145,453. Circuit-Controlling Device. P. H. Zimmer, assignor to Cutler-Hammer Mfg. Co. Automatic, electromagnetic resistance control for motor.

1,145,460. Printing-Telegraph System and Alphabet. C. G. Ashley, assignor to General Engineering & Construction Co., Toronto, Canada. Printing pens selected by impulses varying in intensity and polarity.

1,145,465. Means for Driving Dynamos From Car-Axles. W. F. Bouche, assignor to Gould Coupler Co., Depew, N. Y. Driving gearing.

1,145,468. Electric-Lighting System for Cars. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Axle-driven system wherein undirectional movement of generator is assured and speed regulated.

1,145,473. Railroad Appliance. N. L. Faufata, Paia, Hawaii. Air-brake valve electrically controlled by semaphore.

1,145,490. Printing-Telegraph Mechanism. O. L. Kleber, Pittsburgh, Pa. Type-wheel on continuously rotating shaft is clutched thereto for durations of impulses.

1,145,501. Single-Phase Motor. O. S. More and L. G. Long, assignors to Fairbanks-Morse Electrical Mfg. Co., Indianapolis, Ind. Commutator short-circuited by centrifugal device after starting.

1,145,507. Electrically Operated Vibrator. G. L. Patterson and I. F. Badeau, assignors to A. C. Patterson, New York, N. Y. Details of electric bell structure.

1,145,508. Hydroelectric Storing and Distributing System. F. C. Perkins, assignor of one-half to L. Stockton, Buffalo, N. Y. Hot water tank has water heated by circulation through transformer secondaries.

1,145,509. Electrochemical Controlling Apparatus. W. J. Pike and R. J. Sutton, Grand Rapids, Mich. Automatic control of supply of chemical and treating current at a certain point of conduit through which flows treated fluid.

1,145,542. Automatic Telephone-Switching Apparatus. J. G. Blessing, assignor to Automatic Electric Co., Chicago, Ill. Key-controlled impulse transmitter.

1,145,543 and 1,145,544. Impulse-Transmitting Device. J. G. Blessing, assignor to Automatic Electric Co. Modifications of above.

1,145,551. Transformer. J. Burke, assignor to Burke Electric Co., Erie, Pa. Details of core structure.

1,145,554. Sound Indicator. F. W. H. Clay, Pittsburgh, Pa. To increase sensibility and prevent noise, telephone receiver diaphragm is maintained in continuous vibration above limits of audibility by device independent of sound source.

1,145,563. Machine for Making Storage-Battery Plates. W. A. Crowdus, assignor to A. R. Porter, Chicago, Ill. Rolls for forming special form of plate.

1,145,565. Motor-Generator Set. C. W. Dake, assignor to Pyle-National Electric Headlight Co., Chicago, Ill. Details of housing, etc., in unit for headlight.

1,145,569. Electric Switch. W. E. Date, assignor to Automatic Refrigerating Co., Jersey City, N. J. Overload protective device having solenoid whose calibration is varied by adjusting plunger.

1,145,575. Dynamo-Electric Generator. F. Eichert, assignor to firm of Greif & Schlick, Coburg, Germany. Magneto armature has field-opposing coil which is automatically short-circuited at certain speed.

1,145,586. Electric Attachment for Ophthalmoscopes. H. G. Herold, assignor to General Optical Co., New York, N. Y. Mounting and structure of lamp and controller.

1,145,589. Portable Photographic Dark-Room Lantern Attachment. G. F. Holland, Revere, Mass. Structure adapted for mounting and housing electric lamp bulb.

1,145,593. Electrolytic Cell and Method of Maintaining the Efficiency Thereof. W. M. Jewell, assignor to Chloride Process Co., Chicago, Ill. Anode chamber liquor flows toward cathode chamber below level of cathode and then out of cell independent of outflow of cathode liquor.

1,145,594. Short-Circuiting Device for Electric Motors. C. L. Kennedy, assignor to Holtzer-Cabot Electric Co., Brookline, Mass. Centrifugally operated device connects commutator segments.

1,145,612. Dynamo-Electric Machine and Means for Cooling Same. E. H. Porter, Philadelphia, Pa. Cooling air flows through hollow interior conductors.

1,145,613. Apparatus for Holding and Cooling Bulbs of Electric Lamps. S. G. Rhodes, New York, N. Y. Globe-supporting shell directs air within globe and against lamp bulb.

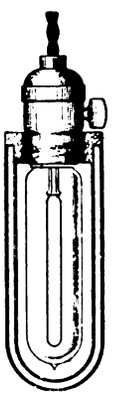
1,145,632. Means for Controlling Telephone Circuits. W. C. Ude, West Haven, Conn. "Central" can restore ringing circuit if subscriber does not "hang up" at close of talk.

1,145,642. Apparatus for Electric Welding. H. R. Woodrow, assignor to T. E. Murray, New York, N. Y. Butt-welding machine in which duration of welding current is automatically controlled.

1,145,652. Direction Pointer. L. S. Alter, Los Angeles, Cal. Advertising device having pointing arrow fixed on pintle of concealed magnetic needle and at an angle thereto.

1,145,655. Starting Device for Internal-Combustion Engines. H. E. Anderson, Lakewood, O. Structure of priming plug.

1,145,658. Wireless-Telegraph Detector. W. E. Ashton and A. M. Curtis, assignors to J. O. Fowler, New York, N. Y. Wave-responsive device consists of mass of red oxide of zinc.



No. 1,145,837.—Heat Shield.

1,145,659. Automatic Selecting Multi-party Telephone System. O. Asmussen, Brooklyn, N. Y. Has a pulsating selector at each station.

1,145,660. Machine for Mounting Incandescent Lamp Filaments. G. F. Atwood, assignor to Westinghouse Lamp Co., Pittsburgh, Pa. Details of machine.

1,145,680. System of Electric Motor Control. F. D. Hallock, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. "Foolproof" resistance starter.

1,145,692. Automobile Number Light. S. J. Lessing, Chicago, Ill. Arrangement of box, lamp, reflector, etc., to prevent tampering.

1,145,707. Mounting for Incandescent Lamp Filaments. C. F. Scott, assignor to Westinghouse Lamp Co. Manner of supporting the filament mounting.

1,145,709. Ratchet Mechanism. W. C. Starkey, Mansfield, O. Electromagnetic step-by-step signal device.

1,145,717. Electrical Receptacle. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. Frictionally grips lamp base to prevent accidental rotary displacement.

1,145,721. Dynamo-Electric Machine. M. Walker, assignor to Westinghouse Electric & Mfg. Co. Polyphase generator supplies excitation to its field from star-connected armature through a cummutator.

1,145,735. Electric Wave Detector. C. D. Ainsworth, Worcester, Mass. Comprises radio-active substance near cathode, anode and neutral electrode in rarefied atmosphere.

1,145,747. Process for the Manufacture of Aluminum Nitride. P. Bunet, assignor to Societe Generale des Nitrures, Paris, France. Passes continuously through electric furnace reactionary materials mixed with conducting materials which are magnetically separated after operation.

1,145,748. Electric Furnace. P. Bunet, assignor to Societe Generale des Nitrures. Structure of furnace for above.

1,145,751. Appliance for Telephones. J. L. Creveling, New York, N. Y. Provides means for attaching additional ear piece to ordinary receiver.

1,145,763. Fire Alarm. E. E. Fryberg, assignor of one-third each to L. Berglund and J. Carlson, Duluth, Minn. Sounding of alarm bell lifts telephone receiver from hook.

1,145,764. Electric Switch Lock. E. M. Fuller, Grand Rapids, Mich. Removable key controls locking of switch case to support and operation of switch in case.

1,145,787. Electrically Operated Mine Door. W. W. Murray and J. F. Dillon, Dearing, W. Va. Auxiliary car-operated door-opening means automatically thrown in if main means fails.

1,145,835. Maximum-Demand Meter. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Step-by-step maximum indicator driven electromagnetically by integrating mechanism during predetermined intervals.

1,145,837. Heat Shield for Incandescent Electric Lamps. E. R. Hoff, New York, N. Y. Bulb-shaped receptacle for lamp has vacuum between double walls. (See cut.)

1,145,839. Diaphragm Horn. M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co., Summit, N. J. Diaphragm vibrated by electric motor shaft normal thereto.

1,145,840. Paper-Feeding, Detecting and Rejecting Device for Printing Presses. M. M. Kandle, assignor to Kandle-Born Co., Springfield, Mass. Electrical detecting means for rejecting improperly positioned sheets.

1,145,843. Combined Lamp Bracket and Signal. C. G. Mollan, Chicago, Ill. Automobile direction signal and license-number illuminator.

1,145,848. Illuminated Note-Pad. T. Robins, New York, N. Y. Writing tablet has lamp and battery.

1,145,860. Steam Meter. R. Burnham, Chicago, Ill. Related to No. 1,144,998.

1,145,861. Telephony. W. W. Dean, assignor to Garford Mfg. Co., Elyria, O. Structural details of desk set.

1,145,862. Apparatus for Electrolytic Purification of Liquids. J. L. Goucher, assignor to New York Conveyancers Co., New York, N. Y. Liquid forms current conductor from one vessel-shaped electrode to another.

Reissue, 13,942. Sanitary Mouthpiece. Ed. M. Jenkins, Italy, Tex. For telephone transmitters; special disinfectant device.

Patents Expired.

The following United States electrical patents expired on July 19, 1915:

607,451. Electromagnetic Motor. A. B. McMilan, New York, N. Y.

607,476. Weighing Machine. F. H. Richards, Hartford, Conn.

607,540. Electrical Resistance. H. S. Chase, Boston, Mass.

607,551. Electric Regulator. J. A. Powers, Lansington, N. Y.

607,589. Electric Arc Lamp. J. H. J. Haines, New York, N. Y.

607,590. Galvanic Cell. A. Heil, Fränkish Crumbach, Germany.

607,593. Dynamo-Electric Machine. W. B. Sayers, Glasgow, Scotland.

607,608. Rheostat. M. J. Shiels, Westfield, N. J.

607,609. Field Magnet for Electric Machines. S. H. Short, Cleveland, O.

607,610 and 607,611. Electric-Railway System. S. H. Short.

607,617. Regulating Switch for Electric Circuits. H. P. Davis, Pittsburgh, and G. Wright, Wilkinsburg, Pa.

607,621. System of Electrical Distribution. B. G. Lamme, Pittsburgh, Pa.

607,638. Electric Line Switch. A. B. duPont, Detroit, Mich.

607,646. Electrolytic Bath. P. Marino, Paris, France.

607,672. Controller. T. von Zweigbergk, Cleveland, O.

607,697. Electric Railroad. C. A. Myers, Atlantic City, N. J.

607,714. Electric Stop-Motion for Looms. A. Stephens, Guadalajara, Mexico.

607,715. Voltmeter. J. F. Stevens, Philadelphia, Pa.

607,737. Dynamo-Electric Machine. A. G. Eigner, St. Petersburg, Russia.

607,745. Electric Buoy. E. W. G. C. Hoffmann, Charlottenburg, Germany.

607,746. Bond for Electric Conductors. S. W. Huff, Baltimore, Md.

607,760. Circuit Arrangement for Electrical Apparatus. J. Miesler, Vienna, Austria-Hungary.

607,801. Long-Distance Telephone. P. de Kilduchevcky, London, England.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 5. CHICAGO, SATURDAY, JULY 31, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER SOCIETY ELECTRICAL DEVELOPMENT DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
The Convention of the Ohio Electric Light Association..177
Overall Efficiency in Street Lighting.....178
Electrical Exports 178
Electric Service on the Farm.....178
DEPARTMENTS:
Commercial Practice 184
Electrical Construction 188
Public Service Commissions.....190
Questions and Answers.....193
New Electrical and Mechanical Appliances.....209
Latest Approved Fittings.....213
Current Electrical News.....214
Record of Electrical Patents.....217
LEADING ARTICLES:
Electricity in Lime Manufacture.—By Arthur C. Hewitt...181
Billing and Collecting Systems of Small Companies.....184
Business Hints for Contractor and Dealer.—By G. D. Crain, Jr. 188
Convention of Ohio Electric Light Association.....196
The Three Most Important Price-Fixing Cases Now Before the Public—The Ford, Victor and Kellogg Cases.—By Elton J. Buckley.....201
Annual Convention of Electrical Contractors.....202
Electric Welding.—III.—By Gordon Fox.....204
BOOK REVIEWS 208
MISCELLANEOUS:
Western Electric Employees Meet Disaster.....180
Electrical Exports for May.....180
Improving Railway Service.....180
Kilowatt Club Outing.....180
White Way Inaugurated at Malone.....180
Value of Advertising.....186
Electric Luncheon Held by Great Western Sales Force....187
A. K. Young.....187
Electrical Signal for Water Pump.—By E. W. Edwards....189
New Wiring Inspection Ordinance for Jersey City.....189
Among the Contractors.....189
Kentucky Mines to Operate Electrically.....200
Effective Resistance and Inductance of Iron and Bimetallic Wire 200
Demonstration of Electrical Appliances by Tasmanian Hydroelectric System 204
Vail Celebrates Seventieth Birthday—A Long-Distance Interview 207
Water Softener Effects Economy in Central-Station Plant..207
Wireless in Australasia.....208
Coking of Coal at Low Temperatures.....208

Copyright, 1915, by Electrical Review Publishing Company, Inc.

THE CONVENTION OF THE OHIO ELECTRIC LIGHT ASSOCIATION.

The twenty-first annual convention of the Ohio Electric Light Association, which was held at Cedar Point last week, added another to the long list of successful meetings which have been staged by this progressive state association. While the attendance was not quite up to the figure of last year, it was, nevertheless, sufficient to make a very successful meeting. As has been usual in recent years, there were no exhibits in connection with the convention. The program of the business sessions consisted largely of the reports of committees, and these with the discussion upon them brought out many points of interest. The Committee on Transmission and Distribution also arranged for a demonstration of line work which was very instructive and naturally leads to the suggestion that similar demonstrations might be arranged as a regular feature, as they are much more interesting and instructive than the ordinary type of exhibit which has been customary in the past.

One of the prominent topics at this convention was the attitude of the utility corporations towards the public and the means which should be utilized to secure good will, which is so necessary to the permanent success of any utility corporation. This matter was fully discussed in our last issue. The address by the Honorable Beecher W. Waltermier, chairman of the Public Utilities Commission of Ohio, was a feature of the convention, and indicated that the attitude of the present commission is one insuring a fair hearing to the utilities and an intention to do justice to them in all cases that may come up before the Commission.

The weather during the convention was delightful, in spite of a few showers which were experienced, and was in pronounced contrast to the sweltering days which have usually been experienced by those attending the convention at Cedar Point. The entertainment features were successfully carried out and added greatly to the enjoyment of the members and guests present.

It is to be noted, however, that the summer convention of the Ohio Electric Light Association no longer represents the principal part of its activities. The meetings which are arranged throughout the year by the various committees probably accomplish more than their reports made at the annual convention, as they permit attendance and participation in

Digitized by Google

the work by many who are not able to attend the summer convention. The work of other committees, such as those on accounting and appraisals, are of wide benefit to the members of the Association, and the benefit derived from these would alone make membership in the Association worth while. In addition, the monthly publication which has been successfully launched by the Association serves to keep the members in touch with the cases coming before the Utilities Commission, with legislative matters which are under consideration at the state capital, and other matters of general interest to the members. We are pleased to note that this publication is upon a self-sustaining basis and that the financial condition of the Association is the best that has been reported for some years.

OVERALL EFFICIENCY IN STREET LIGHTING.

The gas-filled tungsten lamp and the magnetite or luminous form of arc lamp are so nearly on a par with respect to both cost and general satisfaction that it is necessary to discriminate very carefully and examine very closely into all aspects of their use in order to determine which will prove best fitted to the needs of any particular case. In this connection it is well to bear in mind that efficiencies as usually stated are not a sufficient guide to determine the actual relation between the amount of power expended and the useful flux of light received from the lamp.

Not only is the shape of the distribution curve, showing the amounts of light emitted in different directions from the lamp, of the greatest importance, but the effect of the accessories used with the lamp are quite as important as the efficiency of the bare lamp itself. The modifications produced in the consumption of power for a given quantity of light flux as well as in the distribution of this light by the use of diffusing globes, reflectors, or other equipments are quite as important as the original efficiency of the bare lamp itself.

In making comparisons of the efficiency of different lamps, consequently, it should be done upon the basis of the overall efficiencies of lamps with their accessories in position: in other words, under the actual conditions of operation. Moreover, the effect of accumulation of dust, and the frequency of cleaning required, should be taken into consideration. Only a comparison on this basis will enable the engineer to make a proper determination of the desirability of any particular lamp, or advantages and relative economies of those being considered for any installation.

ELECTRICAL EXPORTS.

The volume of the electrical exports for May, reported elsewhere in this issue, shows a decrease with respect to the previous month, but has only been exceeded by the one month of April since the previous May. This, on the surface, seems to indicate that trade conditions in the electrical industry, so far as export business is concerned, are approaching normal. Such an inference may, however, be entirely misleading, as many readjustments have been made since the outbreak of the European war, and the materials exported are not traversing the same paths nor reaching the same territory as in normal times.

For instance, electrical exports to England are normally small, the latter country purchasing much more extensively from Germany in times of peace. In May, 1915, however, this country sent to Great Britain electrical goods valued at $898,000, or over three times as much as in May, 1914. Moreover, this represents nearly half the electrical exports for the month. It will be evident, then, that trade with other countries is far from normal, and the total figures are only kept up by emergency orders due to the war. These are concerned largely with wire and cables, while the figures for heavy machinery have experienced a decided slump. It is to be noted also that since the German supply has been cut off, the exports of metal-filament lamps from the United States show a steady increase.

It is obvious that any change in the present conditions will again modify the avenues of trade, and as the present conditions may be altered at any time, another readjustment must be anticipated before business settles down to a steady supply of normal proportions to meet a permanent demand.

ELECTRIC SERVICE ON THE FARM.

For many years there has been agitation of the desirability of using electricity on the farm. At first this was directed principally to the use of electric lighting; as the development of motor drive to farm machinery was perfected and the adaptability of various electrical devices was found to be serviceable on the farm, the use of electricity for all of these purposes has been advocated. There is but little argument presented against the use of electricity on the farm. It is realized that aside from possible economy it will materially aid in making farm life more comfortable and attractive, and therefore help to keep the young folks from augmenting the population in our already congested cities. Everything that can be done to promote the conveniences and pleasures of rural life should be encouraged; therefore, that which promotes the more general use of electricity on the farm should be given careful consideration.

Conceding that electric service is highly desirable on the farm, the question is how shall it be provided? Until some five or six years ago there was but one solution to this question, namely, the installation of an isolated generating plant, which necessarily involved considerable expense and troublesome attention. In the last few years, however, there has been a very marked advance in the design and manufacture of line equipment which is suitable for outdoor use on even very high voltages. This development has shown in numerous cases, where construction of farm lines has been actively carried out, that such lines not only can

Digitized by Google

be built, but can be operated very advantageously under many conditions. These developments have made it necessary to consider very carefully whether the provision of electric service on the farm shall be by means of an isolated plant or by means of a distribution system connected with some extensive electric supply network.

During the last few years also there have been marked developments in the design and manufacture of small engine-driven generating sets, mostly employing gasoline engines either directly or belt-connected to a generator, with which a storage-battery auxiliary is usually provided. In most cases these plants are designed to have fairly simple control, the switchboard containing but few instruments and a relatively small number of switches; in other cases it has been thought desirable to make the equipment as nearly automatic as possible, which involves a number of relays and automatic switches for insuring proper operation of the various parts of the equipment. The variety of these generating plants is very great and, although some of them have been designed and built in what appears to be a crude manner, nevertheless there seems to be a demand for equipments of even this type, since the investment is usually desired to be small. Some of the plants have been designed to give very satisfactory service as regards reliability and also as regards the cost of operation. That there is an important field for the various types of these isolated plants cannot be questioned, because there probably will remain for a great many years to come many farms so situated that to supply them from an electric transmission or distribution system would be practically out of the question. In these cases the installation of such a plant enables the farmer to secure the many advantages of electric service that would otherwise be denied him.

That many of these plants are being installed and will continue to be used on farms that can be served much more advantageously from a central-station system is also certain. There are a number of reasons for this, one being the conservatism of many central-station executives when it comes to the matter of extensions into rural districts. Another is that many of the plants in small towns are operated by the municipal authorities who are restricted to serve within the limits of their own community. Without mentioning other reasons, it may be well to point out that in the numerous districts where rural-line development has made considerable headway it has been found that under proper conditions the supply of electricity to the farmers from central-station lines is mutually advantageous to the farmers and to the electric companies. It should be remembered that electricity is used not merely for lighting, but that on the farm in particular it finds many applications for driving machinery and for relieving the drudgery of the farmer's wife, which insures that the load on the average farm will be much greater than that in the average residence. Most of the isolated plants that are going into farm use are designed primarily as electric lighting plants, their generating capacity being usually so limited as to prohibit the use of much power, heating, or other electric load. The investment in a generating plant of ample capacity to provide electric service on the largest possible scale would be so heavy as to be prohibitive. Most of the isolated generating plants are built for low voltage, 32 volts being particularly favored; if such a plant is to be discarded on account of difficulties in operation and central-station service with standard voltage is to be supplied later, rewiring will be necessary in many cases, making the conversion expensive.

Some central-station men are actively encouraging the installation of these isolated farm lighting plants in the belief that in the short time that they are giving fairly good service they will create such a demand for use of electricity that it will be easy to secure many farmers as central-station customers when they are ready to discard the plants as they become troublesome. This argument, while it seems to have a certain element of truth, is a fallacious one from the standpoint of economy. The investment by the farmer in a plant which is giving him inferior service will be practically a dead loss because the scrap value of the plant when it is discarded will probably be very low. Why should not the farmer be encouraged to co-operate with the central-station company to the extent, partially at least, that he would invest in his own isolated plant? By having the farmers pay part of the cost of the line construction, the chief bugaboo against serving them from a central-station system vanishes. The amount to be advanced by the farmer depends upon the situation. If the farms are small and closely adjoining, practically nothing need be advanced because the density of load per mile of line will then be fairly high. As density of load per mile diminishes, the amount to be advanced by the farmer must be increased. A number of central-station companies have made it a practice to accept such advances from farmers as absolute donations and others have arranged to reimburse the farmers as the density of load increases and makes the line more profitable. At any rate, even under quite adverse conditions, if the farmer is properly approached on the subject and it is explained to him how central-station supply eliminates his investment in an isolated plant, he will usually be ready to contribute freely to the cost of the line which makes it possible for him to get the advantages of electricity.

It should be apparent to any wide-awake central-station man that, unless he lays out a broad-gauge policy on the matter of rural lines, which will encourage the supply of electricity to practically every farmer in his district, he will find, as he ultimately does reach the point when he practically must make the investment in rural lines, that farmers will in many cases be provided with such well equipped and satisfactorily operating isolated generating plants that they will not be willing to become central-station customers. Every farm lighting plant now going in where the supply of central-station service is at all practical means so much less load on the line when it must be built.

Digitized by Google

Western Electric Employees Meet Disaster.

On the morning of Saturday, July 24, several hundred employees of the Hawthorne plant of the Western Electric Company, with many members of their families and a great number of friends, met death in an accident on the Chicago River. Five boats had been chartered in connection with the annual excursion of the employees of the big plant at Hawthorne. The destination was to have been Michigan City, Ind., a short sail across Lake Michigan. The first boat to be loaded, the lake steamer *Eastland,* was preparing to leave the dock at the foot of North Clark Street, with 2,700 passengers aboard, when it suddenly turned over and buried its side in the Chicago River. Despite the most heroic efforts of many willing rescuers immediately upon the scene of the accident, between eleven and twelve hundred men, women and children were drowned.

The city police and fire departments, aided by a corps of divers, worked unremittingly for several days until all bodies were removed from the hull of the vessel. The big commission houses along the river front turned their warehouses into emergency hospitals, and many business offices nearby were converted into relief stations. The big department stores sent van loads of blankets to the scene and gave over their motor trucks for the transportation of the dead to the Second Regiment Armory, which was used for a morgue pending identification. The Chicago Telephone Company performed a notable service in establishing centers of communication at the offices of the big daily newspapers, and in handling toll connections relating to information respecting the news of the disaster. The dailies prepared in noticeably short time authentic lists of recovered and lost, and so well was the work of identification carried forward that of 900 odd bodies recovered, only a few remained unclaimed on Monday morning. The Commonwealth Edison Company had a large crew at work on the hull of the vessel and a force of lungmotors in operation within a few minutes after the accident occurred. Strings of incandescents were installed, so as to facilitate night work and a battery of searchlights were trained from the roofs of nearby buildings.

H. B. Thayer, president, and H. A. Halligan, vice-president, of the Western Electric Company, left New York immediately upon receipt of news of the accident and arrived in Chicago early Sunday morning. The entire engineering and office staffs of the company were placed at the disposal of the authorities for co-operation in the relief of distress. Mr. Thayer authorized the donation of $100,000 to the emergency relief fund, which have been added to by business organizations and private citizens of the city of Chicago, so that a fund of at least $350,000 was available by Tuesday evening. It is expected that not less than $500,000 will be contributed during the week. No assistance from outside the city has been accepted.

So far as can be learned, no members of the office or engineering forces were involved.

Both city and federal authorities are conducting investigations to establish the causes of the accident and to place the responsibility therefor.

Electrical Exports for May.

The following data on the electrical exports of the United States for May are obtained from the official government report on the foreign commerce of that month issued by the Bureau of Foreign and Domestic Commerce.

Although the May electrical total is nearly 12.5 per cent below that of the preceding month, it is higher than any other month since May, 1914, which exceeded it by over 11 per cent. For the four classes for which the number of articles shipped is reported, there were sent during last May the following: electric fans, 2,013; arc lamps, 46; carbon-filament lamps, 60,496; metal-filament lamps, 257,104.

The following table gives the detailed figures for the various electrical classes reported, together with the comparative figures for the corresponding month of last year.

Articles.	May, 1915	May, 1914
Batteries	$ 79,618	$ 57,311
Dynamos or generators.	84,153	277,265
Fans	28,838	28,306
Insulated wires and cables	302,029	91,528
Interior wiring supplies, etc. (including fixtures)	131,600	54,983
Lamps—		
Arc	1,290	2,754
Carbon-filament	7,593	6,012
Metal-filament	42,232	12,032
Meters and other measuring instruments	67,813	.....
Motors	209,014	413,214
Static transformers	23,217	49,464
Telegraph instruments (including wireless apparatus)	2,968	5,069
Telephones	57,090	202,979
All other	764,844	839,803
Total	$1,802,209	$2,040,720

Improving Railway Service.

Recommendations looking to increased safety of the Boston Elevated Railway Company's service are contained in a report made to the Public Service Commission of Massachusetts by William L. Puffer, electrical engineer. They include a new signal system for the East Boston tunnel, all-steel cars for subway use, more telephones in subways, with blue-light indicators, the covering of the third rail of the rapid-transit lines, the inclosure of high-tension cables in ducts, remote control of third-rail feeders, and of ventilating motors, with a separate source of electrical supply. Some of the suggestions contained in the report have been acted upon by the Elevated Company and others are under consideration.

Kilowatt Club Outing.

Brooklyn's representative electrical organization, the Kilowatt Club, held its third annual outing on July 17 at Donnelly's Grove, College Point. More than 300 members gathered at Jewell's Wharf and boarded the steamboat *Thomas Millard,* which landed them at the Point at 12:30 p. m. Here the electrical men formed behind the Governor's Band and marched in regimental style through the streets to the large dining hall at Donnelly's Grove, where a substantial breakfast was served.

Following breakfast a series of bowling contests were held. Then came the athletic activities. The fat man's race was won by J. Crowley; 100-yard dash by G. Teevan; shoe race by H. Lausbach; potato race by H. Mayer; two-legged race by J. Forker and W. Forker; sack race by H. Klein.

The judges of the contests were W. Hernandez, J. Crowley, M. Powers, G. Knight, M. Seelman, W. Hernandez, Jr.

There was a ball game between the married and single men, the married men winning by a score of 12 to 9.

After the game a "short circuit" was made to the dining hall, where dinner was served at 6 o'clock. The outing committee was composed of W. T. Fairbairn, chairman; B. F. Rush, H. W. Bishop and Robert Rodrigues.

White Way Inaugurated at Malone.

A new White Way was put in operation in Malone, N. Y., on the evening of July 17. A number of state officials were present and a parade through the village streets was staged in honor of the occasion. There was an informal dinner at the Hotel Flanagan and speeches were made from the balcony of the hotel after the parade. The system consists of 400-candlepower gas-filled incandescent lamps mounted upon ornamental posts, 42 in number. The posts were made by the Union Metal Manufacturing Company, Canton, O., and are 15 feet in height. Diffusing globes of Monax glassware were supplied by the Macbeth-Evans Glass Company. The posts are spaced 75 feet apart on both sides of the street and are staggered. There is a cutout in the base of each post, so that in case of trouble on one post the remaining lamps will not be interfered with, as a series system is used. Alternating current is supplied by the Malone Light & Power Company at a cost of $52 per lamp per year. The lamps burn all night.

Digitized by Google

Electricity in Lime Manufacture.

By Arthur C. Hewitt.

This article is written by the engineer of an important lime plant, and treats the subject from the standpoint of the operator, pointing out the conditions to be met and the inherent advantages of electric motor drive. Data and specifications covering motor and control requirements are also given.

Electric power is the ideal power for use in the manufacture of lime and stone products. Among its advantages over other power sources are economy or efficiency, reliability, flexibility, and ease of cost distribution. It has the disadvantage of high first cost, danger from shock and danger from fire. However, these last two items are almost negligible quantities under present-day construction.

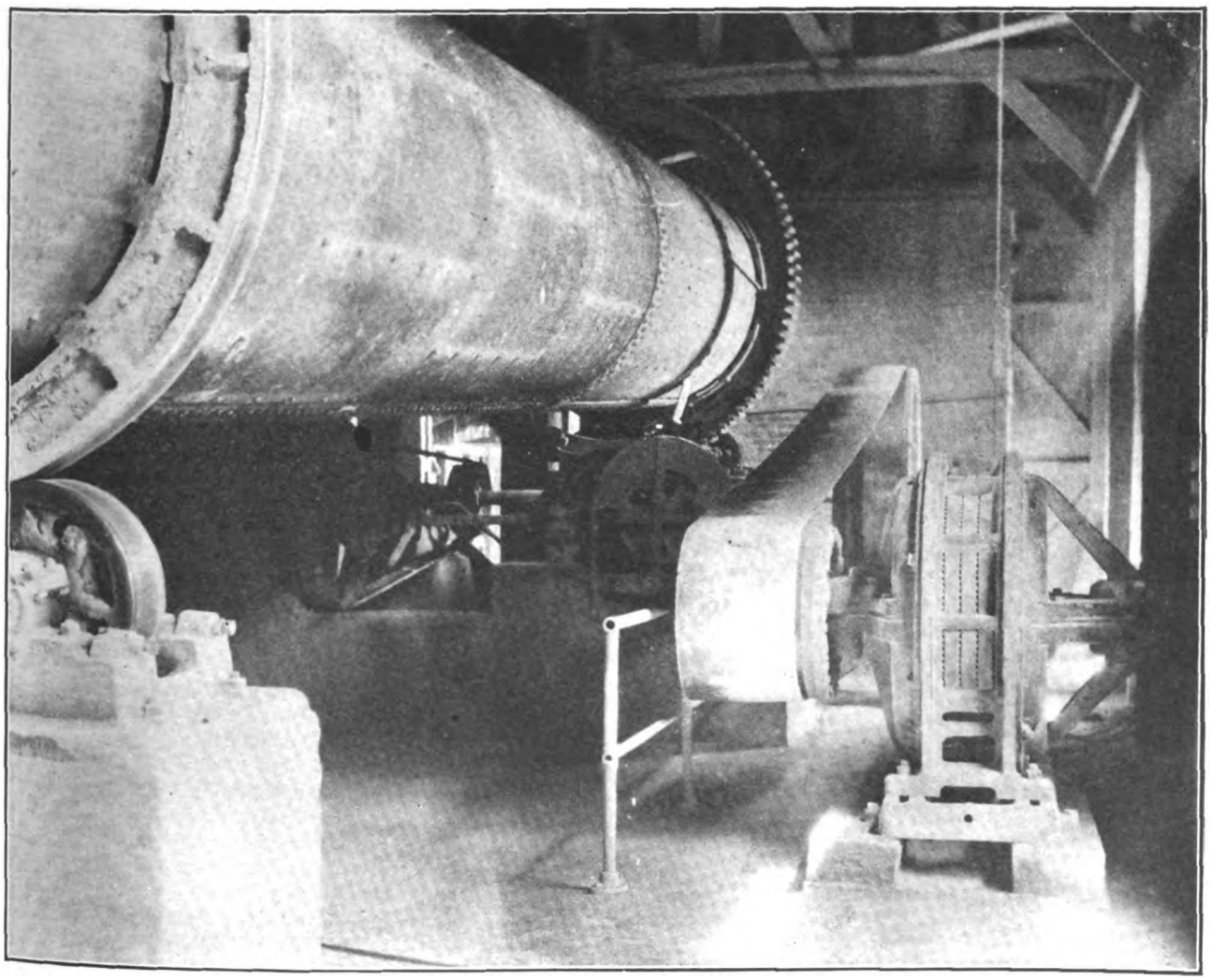
There may be special cases where steam or gas engines may have some little advantage over electric power on account of cheap fuel, etc., but where the lime plant extends over a considerable area, as most plants do, the electric drive is far superior to all other kinds of drive.

In the first place, electric power can be transmitted about the plant much more cheaply than other power. Losses in long steam or compressed-air lines or shaft drives are usually much higher than the losses in electric transmission lines.

Electric motors weigh less for equal power outputs and require less attention than any other type. The modern alternating-current mill-type electric motors can be started in the morning and run all day with no more attention than to see that there is oil in the bearings. Electric motors will stand up under very adverse dust conditions better than will any other power unit. Who would think of allowing a steam engine to be half buried in lime or stone dust and still expect it to give satisfactory service? And yet this very thing is done every day in many lime and cement plants. Of course electric motors can not work as satisfactorily under these conditions as where enough forethought is given to place them in dustproof protecting rooms such as would be used to protect a steam, gas or oil engine.

Most lime plants are located some distance from cities so that as a rule they do not have access to first-class repair shops, and on account of the plant location and operating conditions, it is often difficult to get and keep first-class mechanics. This is certainly an argument against the use of gas, gasoline or steam engines, whereas modern electric motors require practically no attention.

Electric motors can be expected to give the most reliable service. In a certain large lime plant where 35 motors were used, their reliability was shown to be 99.94 per cent perfect, figured on a readiness-to-serve basis. This figure represents the average for one entire year's



150-Horsepower Motor Driving a Large Hammer Mill Crusher, an Elevator and a Belt Conveyor.

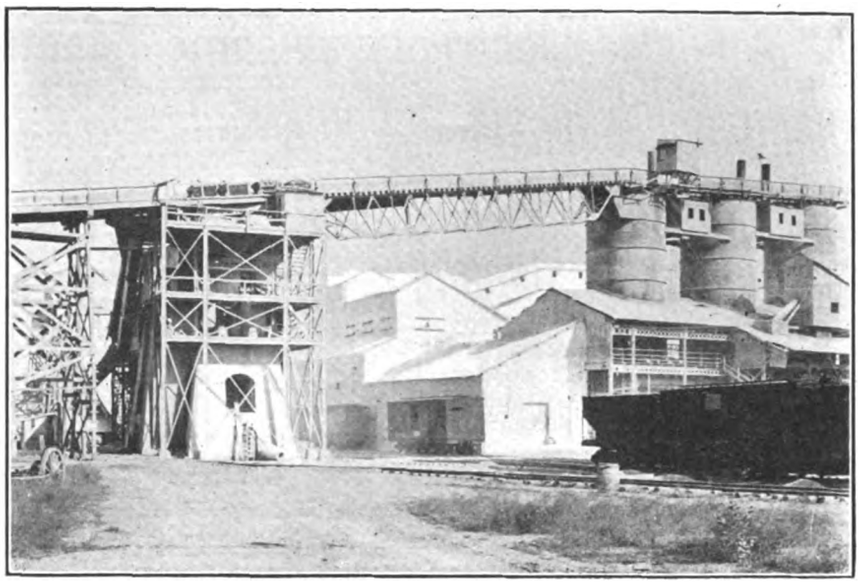
Digitized by Google

operation. The actual number of stops due to failures of the motors, distribution-system fuses, etc., around the plant was only 36, or an average of one failure per motor per year. These figures can be said to be a fairly representative example of the reliability of electric drives.

Electric drive can be made very flexible, and with flexibility there is no great loss of efficiency. For instance, motors can be selected to drive certain pieces of machinery and if after a trial it is found that a transfer of a large to a smaller unit is more desirable, the change can be accomplished very easily.

No other system of power supply is so admirably adapted to the distribution of power costs as is the electric drive. It is a very simple matter to so arrange the electric wiring that a meter can be placed on every department or on each individual machine and thus make it possible to keep accurate account of where all power is used. A very convenient way of arranging the meters is to have a central distributing switchboard with an indicating, as well as an integrating, meter for each department. The usual scheme is to use an integrating wattmeter for measuring the daily or monthly power consumption and an indicating ammeter to show the instantaneous rate of consumption. By watching the indicating meter any unusual condition such as a choked up elevator, conveyor or mill can be detected immediately and steps taken to remedy the trouble.

The disadvantages connected with the use of electricity about a lime plant can be disposed of very easily. The first cost may be a point which will be a deciding factor in the erection of a new plant. However, if the owner is far sighted enough to see the future benefits of electric drive, he will not let the item of first cost alone be the deciding factor.



View of Modern Plant for Manufacturing Lime and Stone Products. Crushed-Stone Plant at Left, Lime Plant at Right.

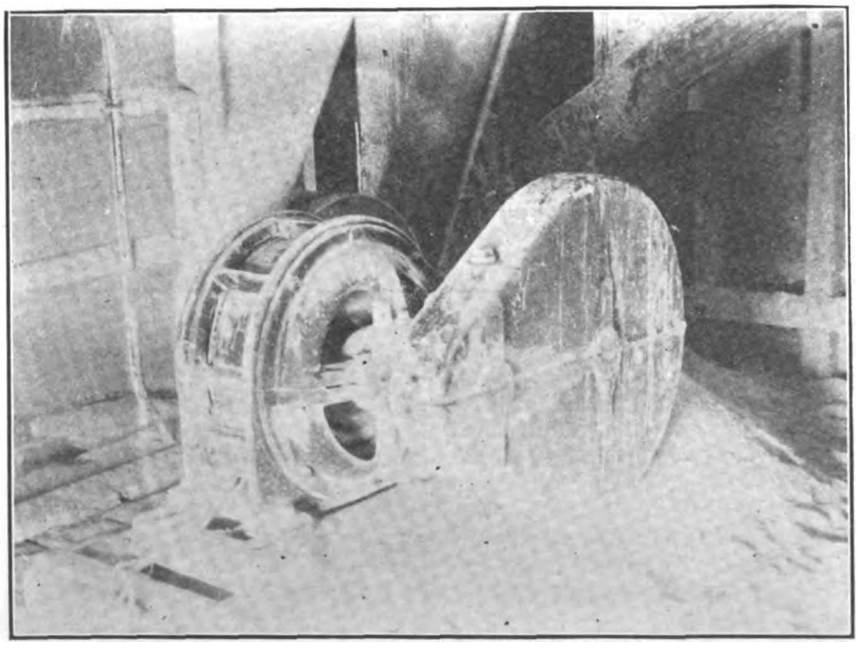
In some cases the first cost of the installation of electric motors will actually be cheaper than if some other kind of power was used. If a proposed lime plant were to be situated near an electric service supply line so that power could be purchased cheaply, then the first cost of electric drives in the lime plant would in some cases be considerably cheaper than the first cost of other drives.

In laying out a new plant it is very important that the engineer who determines what machinery will be purchased is fully aware of all the conditions to be met when the plant is in full operation. Many engineers undertake such work with little regard for the future operation and the result is that some other source of power than electricity would be a welcome relief to the troubles caused by a poor arrangement and type of equipment purchased. It must be understood that the average conditions in lime plants under which motors have to work are of the severest character imaginable.

The mechanical equipment will not be discussed in this article. However, the various crushers, conveyors, elevators, mills, etc., should be so arranged as to give the greatest flexibility in operation. For instance, if when a certain crusher is running it is necessary to operate an elevator and a conveyor, the logical thing to do is to use one motor to drive the group. But if it is necessary or desirable to operate the elevator or conveyor when the crusher is not running, then it will be better to use individual motors for them.

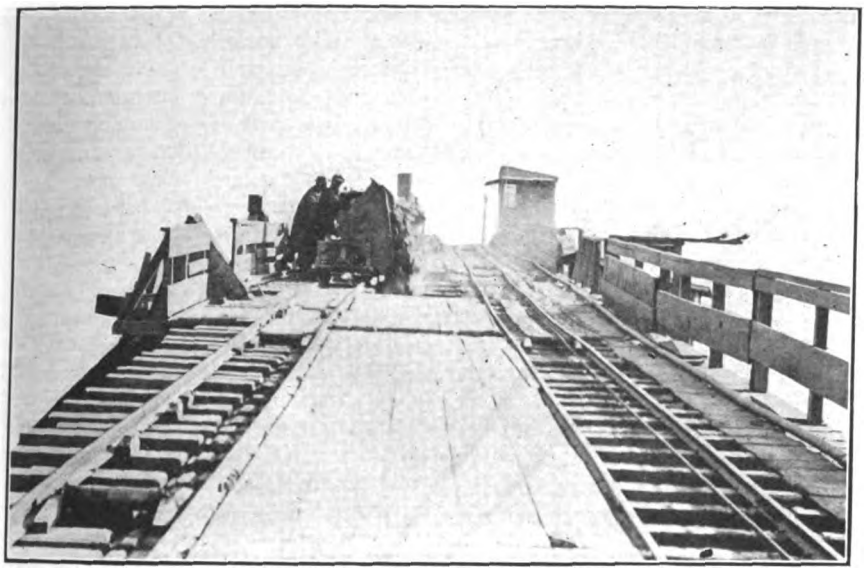
Where high-speed belts are encountered in lime plants, they are usually a source of trouble both from slippage and breakage. A large high-speed belt has considerable potential energy and when it breaks it may cause considerable damage. For these reasons gear, chain, or direct-connected drives should be considered. Silent-chain drives have in many instances proved that they can withstand as much rough usage as gears or ordinary link chains and at the same time be much more efficient. Silent-chain drives offer the advantage of short drives between shaft centers and still give some of the elasticity of belt drives and can be used at high speed. A flexible or a semi-rigid coupling is desirable for many drives because they will be efficient and give less bearing trouble and cause less vibration.

It is very desirable where several motors, especially large ones, are to be used in or about a plant that all of the motors be of one make and operated at the same speed and that speed just as low as possible. To the designing engineer this may not be apparent, but to the operating man it is a fact that is very



Ten-Horsepower Back-Geared Motor Driving Two Elevators and a Screw Conveyor.

Digitized by Google



Dumping Stone Into a No. 9 Gyratory Crusher.

likely many times to be driven home.

If all of the motors used in a single lime plant are of the same type and built by the same manufacturer, it will mean that a smaller stock of repair parts will be required, for all manufacturers try to make as many parts interchangeable as possible. If all motors are the same speed and one breaks down, another can be used temporarily and no change need be made in pulley sizes. By using a slow-speed motor a more reliable one is obtained, one that will take care of momentary overloads, tight belts, etc. Tight belts are the cause of more motor troubles in lime and crushing plants than nearly all other troubles combined. This is due to excessive dust which causes belt slippage and when the belts begin to slip there are two remedies available to the mill man. One is to use belt-dope (which is generally used too frequently for the good of the belt) and the other is to tighten the belt. Of course it is no little job to cut a belt and take out a piece, and says the mill man, "I'll take out enough while I'm taking." Then look out for hot bearings!

The following specifications are not intended to be complete specifications for the various pieces of apparatus, but they are merely some notes that show what kind of equipment will give the best results in service such as is required in modern lime plants.

Motors which may be admirably suited for use in machine shops, textile mills and other factories may fail utterly to meet the severe requirements of cement or lime-plant operation. For this reason the suggestions herewith are given which may serve as a guide when purchasing new electrical equipment.

All motors in any one plant or system of plants should be of the same general design and preferably made by a single manufacturer. Distance from lime plant to nearest shipping point of motor manufacturer will affect the length of time required to get repairs and should be considered.

All motors should have absolutely dustproof bearings with ample bearing surfaces. Motors above 50 horsepower should be equipped with an outboard bearing on the pulley side.

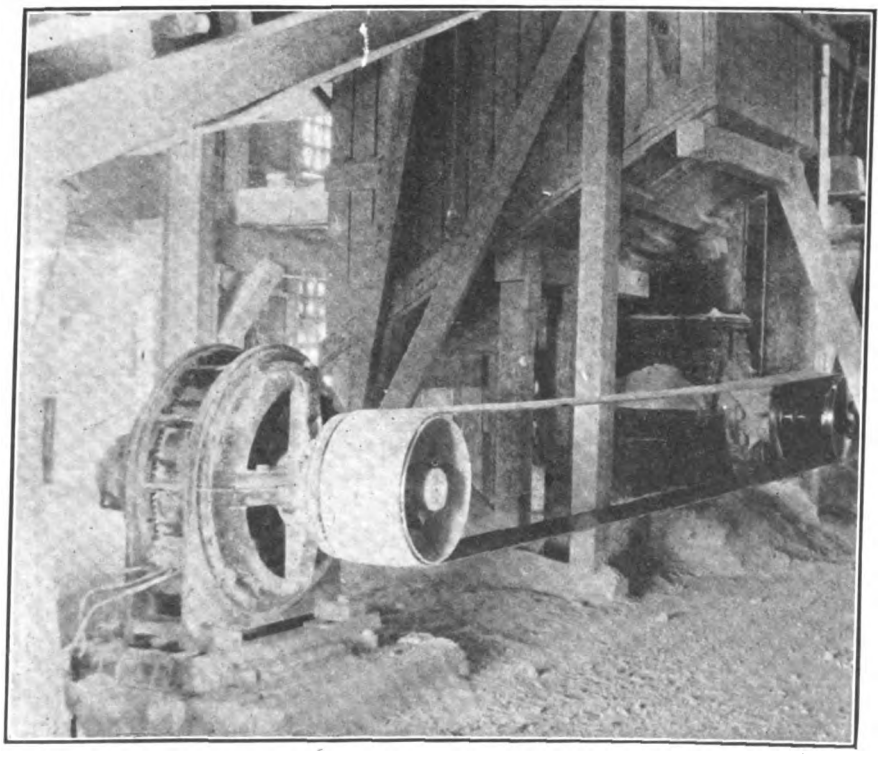
Every motor should be furnished with a sliding base or rails. This is necessary in order to keep the motor belt at the proper tension. In so far as it is possible all motors shall operate at the same speed. This will help greatly when a motor burns out and another is moved into its place temporarily. The speed of the motors should in no case be more than 900 revolutions per minute. Where it is necessary to use motors of different speeds the above table shows what maximum speeds are found to be good practice for lime-plant service with belted motors.

Motor Horsepower	Maximum speed for good results R.P.M.
1 or less	1800
1-5	1200
5-10	900
10-25	700
25-60	600
60-125	500
above 125	400

Motors should be furnished with cast-iron pulleys of the type known as the pneumatic pulley. This is a pulley similar to the ordinary pulley except that it has rows of slotted holes milled in the face. After trying wood, paper, composition, steel, and the pneumatic pulley this type has proved to be best suited for use in dusty places. Neither dust nor belt dressing will collect on the surface or clog up the slots which allow the dirt to work away from the belt surface. This type of pulley will cause much less belt trouble than any of the other types mentioned.

All motors in one plant should be equipped with screwed or bolted cable connectors. One size of terminal of a capacity large enough for the largest motor in the plant should be used on all motors. This will make for speed when changing motors. Terminals or connectors for this purpose should be soldered to the motor leads and also to the line wires or cables and should have a screwed or bolted joint which can be disconnected without unsoldering the connector.

Semi-inclosed or totally inclosed motors will give better service than open types as they will be more nearly dustproof. The rotor or armature in every motor is balanced before leaving the fac-



60-Horsepower Motor Driving a 36-by-24-Inch Jeffrey Hammer Mill.

Digitized by Google

tory but if they have to run where there is much dust, they soon get out of balance. Frequently this gets so bad without the dust being noticeable to the eye that a motor will vibrate very badly even when on a good, solid foundation. It is often necessary in such cases to use a long sharp-pointed screw driver to remove the dust from the rotating parts of the motor.

If alternating-current motors are used, they should be designed for about 5 to 7 per cent slip when carrying rated load. Where constant-speed motors are required, they should be of the squirrel-cage type for all sizes up to about 100 horsepower. Motors above 100 horsepower should have wound rotors with external resistance. Squirrel-cage rotors should have either welded or cast-on end rings. Rotors with bolted, screwed, soldered and riveted joints between rotor bars and end rings have proven very unsatisfactory where severe service conditions and rough handling are to be met with. The welded or cast end-ring construction is as near perfection as will probably ever be obtained.

Where large motors have to be started and stopped frequently, where heavy starting torque is required or where variable speed is required the wound rotor with external resistance must be used. Hoists and large crushers should have this type of motor. Alternating-current motors are not very satisfactory for variable-speed work at the present time on account of the elaborate control equipment they require. They are used, however, very extensively in cement mills for driving rotary kilns. The time is not far distant when alternating-current motors will be manufactured that are on par with direct-current motors where variable speeds are required.

The rules set down by the National Board of Fire Underwriters should be adhered to strictly in wiring lime plants. Exterior wiring should be of the open type, but heavier than ordinarily used in line construction. If the mill buildings are of wood then a similar type of line construction should be used. However, if first-class steel or concrete buildings are put up, then the electrical equipment should correspond; the outside wiring should be put on steel or concrete poles, fitted with steel cross-arms and steel pins. Porcelain strain insulators should be used where insulated guys are needed. The interior wiring should be placed in galvanized iron conduit throughout. All junction boxes and conduit should be extra large for future extensions or additions. It is well to use nothing smaller than 0.75-inch conduit for motor wiring even though 0.5 inch would answer. It will pay in the long run. All pipe joints should be screwed; no clamp couplings should be used.

No switch smaller than 100-ampere capacity should be used on account of mechanical strength. Switches should be mounted on separate slate bases from the fuses. This will allow of unit replacements as the parts get worn out or damaged. Separate fuse blocks for each fuse will be found advantageous especially in alternating-current wiring. Alternating-current motors should be so connected that heavy fuses can carry the current for starting and fuses of proper rating can protect the apparatus when running.

Fuses are to be recommended as being cheaper in first cost, a little more reliable and need less attention than overload circuit-breakers, etc. However, there are places where an automatic circuit-breaker may be used to advantage.

Commercial Practice Management, Rates, New Business

BILLING AND COLLECTING SYSTEMS OF SMALL COMPANIES.

Practices in Towns Under 50,000 Population Show Wide Variance.

In response to numerous inquiries as to the practices of the small central stations in reading meters, sending out monthly bills and collecting accounts, a canvass was made among numerous companies serving communities of less than 50,000 population, the returns indicating widely varying methods in vogue.

Opinion seems to be equally divided as to the advisability of mailing or delivering the monthly bills, although, save in a few instances, no local conditions seem to enter into the question. Of the companies reporting, which mail bills, opinion is also equally divided as to using one-cent postage, or postal cards and two-cent postage. Those companies sending bills out under two-cent postage are unanimous in their belief that the extra expense involved is justified because of the opportunity to include advertising matter with bills when sent under two-cent postage and also because of the publicity attached to unsealed bills.

A majority of the companies included in the canvass either use space on the bill heads for advertising or inclose advertising literature in the same envelope. All feel that this expense is well worth while, although in no case are figures available as to results, or have efforts been made through coupons or otherwise to check returns. Where appliances are not sold by central stations the available space is frequently used for various announcements relative to some phase of the company's service.

In connection with meter reading there seems to be a continually growing tendency to adopt the continuous-reading system whereby a community is divided into districts, each with its separate discount period, and reading of meters is continuous throughout the month. In some cases where this plan is followed meters are read in the forenoon and bills delivered by the same employee in the afternoon, a day intervening between the reading of meters and delivery of bills in each district. Occasionally, also, companies have found it convenient to have bills collected by the carrier at the time of delivery.

The detailed practices of a number of companies operating in communities of less than 50,000 population will be found in the subjoined paragraphs.

Eastern Wisconsin Railway & Light Company, Fond du Lac, Wis.

The city is divided into districts, each of which has its separate 10-day discount period. Only one meter reader is employed who devotes his entire time to this work, and reads both gas and electric meters. There are a total of 6,120 meters in the city. The reader works 25 days per month, nine hours per day and has read a maximum of 300 meters per day in populous districts. The bills are delivered by a collector who collects the money on the spot, or who leaves bill if the customer is out. The collector also does missionary work, adjusting minor complaints, suggesting new uses of energy, etc. The districts were arranged so that the meters in the business district are read the last of the month so that they can be paid on the first. In only two cases outside of this district were requests made to have bills rendered on the first of the month and both of these customers were so located that their requests could be granted without inconvenience.

Digitized by Google

Rockford Electric Company, Rockford, Ill.

We deliver the major portion of the bills in sealed outlook envelopes. The portion mailed are sent under two-cent postage. Meter readers perform the work of delivering bills that are not mailed. We use the space on the back of the bills for advertising purposes and find that results are very satisfactory, in fact much better than newspaper advertising. We bill approximately 6,000 consumers.

We have had under consideration a number of times the question of reducing our mailing expenses by sending our bills on a postcard. However, we have so far hesitated to take this step on account of the publicity attached to it, and also that we consider that the advertising which is on our bills is of sufficient value to make up for the excess cost.

It is but small additional work for the meter readers to deliver bills on account of their being familiar with the routes and knowing just where to go because they have read the meter at each place. This avoids much confusion which would necessarily result if the work was done by the clerical force.

I believe that our customers are much better satisfied in receiving their monthly bills in a sealed envelope than they would be if they were delivered without inclosure, or on a postcard through the mail.

Our cost of delivering is less than what it would be at two-cent postage, and is a little more than what we could do it for through one-cent postcards.

June, 1915 N. B.—Cheap Light With Inferior Lamps is impossible.

TO THE SANDUSKY GAS & ELECTRIC COMPANY, DR.

PRESENT THIS BILL AT THE OFFICE

OFFICE HOURS: 7:30 A. M. TO 6:30 P. M. SATURDAY 6:00 P. M.

JUNE 15 to SEPT. 15 Close 12 M. on SATURDAY. On 10th of Every Month we Close at 8:30 P. M.

AMOUNT DELINQUENT

DATE READ

STATE OF METER _____ K. W. H.

PREVIOUS STATE _____ K W H.

CONSUMED _____ K W H

If all bills are paid at the office of the company on or before the 10th of the month the current will not be turned off. When current is turned off a charge of $1.00 will be made and collected before current is turned on again.

☞ Bring this Card so your account will receive proper credit.

N. B.—WE SELL BEST MAZDA LAMPS
If Your Service is Bad, Tell Us. We Can Help You.

ELECTRIC
June, 1915
Folio.....
Line.....

Postal-Card Bill Form of Sandusky Gas & Electric Company.

Wisconsin Public Service Company, Green Bay, Wis.

Practically all of our bills are delivered to customers by special men who also do the meter reading. There are a few mailed by special request. We have one or two outlying towns in which the bills are mailed under one-cent postage. These bills are inclosed in envelopes, but as there is no free delivery the postage is one cent. The delivering of bills is ordinarily performed by our regular meter readers who devote their entire time to meter reading and delivering of bills. The cost of meter reading averages about 1.5 cents per customer, the cost of billing about 1.6 cents and the cost of delivering averages 1.1 cents. Space on bills is used for advertising, but we can not ascribe any results we may obtain specifically to this class of advertising. We are doing advertising daily in newspapers, billboards, personal solicitation, motion-picture shows and some other forms and it is difficult to tell just where the new business derived is obtained. It is quite possible that the bulk of it is derived we feel from the constant reiteration of our story. We bill something over 6,000 customers.

Southern Illinois Light & Power Company, Hillsboro, Ill.

All of our bills are mailed to our customers. In towns where there is free delivery, two-cent stamps are used, and one-cent stamps in smaller towns. We have no advertising on our bills, but generally put advertising matter in the envelope. We have gotten some results from this method by following it up each month. We have something over 6,000 customers. We believe that we can more easily reach all our customers through postal service than by being delivered by carrier.

Minnesota Gas & Electric Company, Albert Lea, Minn.

We operate a combined gas and electric service. The gas and electric meters are read by the same man at the same time, and the same holds good on our bills. The following figures, which are totals for both departments, cover about 2,500 bills monthly, divided as follows: 1,500 electric and 1,000 gas, 75 per cent of the latter being readings and collections from prepayment gas meters. These 2,500 bills are delivered to about 1,600 different addresses. About 200 of these 1,600 bills are mailed under two-cent postage, the balance are delivered by one of the office men. The cost of billing, including reading meters, making out the bills, entering the same in customers' ledger, is approximately two cents per bill, or a trifle over three cents per customer. We do not use space on the bills for advertising, but do use occasionally inclosures with the bills, advertising different appliances. We have no direct

Don't Swelter this Summer

The easiest, cheapest and best way to keep cool is the

ELECTRIC WAY

USE

ELECTRIC LIGHT
ELECTRIC IRONS
ELECTRIC TOASTERS
ELECTRIC FANS
ELECTRIC WASHING MACHINES
ELECTRIC PERCOLATORS

If your house is not wired, call 19 today and have it done in time to make this your coolest Summer yet.

To THE MIDDLETOWN GAS AND ELECTRIC CO., Dr.

Office Hours { 8 A. M. to 5 P. M. / Saturday noon 9 P. M. } 333 South Main St., Middletown, Ohio

Gas and Electricity for Month of June 1915

For Natural Gas Consumed to Date of Reading — Present Reading of Meter ..... 000 — Previous Reading of Meter ..... 000 — Cubic Feet of Gas Consumed ..... 000 @ 40c per M

If Paid at Our Office on or before July 10th, 1915, Less Discount of 10c per M

For Electric Current Consumed to Date of Reading — Present Reading of Meter ..... — Previous Reading of Meter ..... — K. W. Hours Consumed ..... @ ... Cts.

If Paid at Our Office on or before July 10th, 1915 Less Discount of 10 %

Flat Rate .....

Extras billed during month ending the 20th. inst. .....

Extras shown on previous statements, now delinquent .....

TOTAL

Checks mailed in payment of Gas and Electric Bills must bear Post Mark of not later than July 10, 1915, to entitle customer to discount.

If not paid by the 20th the supply will be shut off without further notice.

ALWAYS PRESENT THIS CARD WITH PAYMENT

C

June 1915

NET TOTAL
GAS
ELECTRICITY
FLAT RATE
EXTRAS
DELINQUENCY
TOTAL

Combination Bill of Middletown Gas and Electric Company.

Digitized by Google

The Sandusky Gas & Electric Company, Sandusky, Ohio.

We use postal cards for our billing entirely. Using same in connection with Matthews receipting machine, we find this a very satisfactory method of billing. Prior to our using postals, we had a regular bill and delivered it by messenger. We found that many people complained of not receiving their bills, and in this way this question is now up to the Post Office department. The regular one-cent regulation postal card is used. We bill about 6,000 customers a month. We have abandoned the card ledger for a permanent bound ledger, when this system was adopted, and find it more satisfactory. Our clerks, in addition to the general office routine, handle approximately 2,000 accounts each.

Eastern Michigan Edison Company, Ann Arbor, Mich.

We deliver our bills by messenger, using part of our office force in doing so. We have also a select mailing list for a limited number of our customers who prefer to receive their bills through the mail. We use our office men in order to give them a chance to get out of doors one or two days a month which they enjoy. Our cost of billing customers runs from one-half cent to three-fourths cent, depending somewhat on the season of the year. We use the back of our bills for advertising appliances, but are unable to state definitely, the results. We are billing, at the present time, approximately, 10,000 customers. We have about 300 bills on our mailing list which are covered by two-cent postage.

Sheboygan Railway & Electric Company, Sheboygan, Wis.

We mail our regular lighting bills to customers on a postal card with one-cent postage. If material bills accompany the bill for lighting or power, the whole consignment is put into an outlook envelope and mailed under two-cent postage.

The printed postal card permits a very small space for advertising purposes, but at the present time, we are not able to state just what the results have been from this method of advertising, since it has not been very extensive. The number of customers we bill is something over 3,000 each month. In connection with advertising, we have, on several occasions, had special notices to bring before our customers, and this has been done by handling the notice in the same manner that we handle the material bills; namely, inclosing all in an outlook envelope and mailing at the two-cent rate. This gives an additional cost for postage of $30, plus the cost of the envelopes, and we believe it is a wholly effective method of placing special notices before customers, since the customers are very careful to secure their light bills, and naturally examine whatever else may be in the envelope.

Wisconsin-Minnesota Light & Power Company, La Crosse, Wis.

We are at the present time reading our meters on the continuous meter-reading basis. We have divided up the city of La Crosse into 23 routes. We have two readers who read each forenoon between them, one route. In the afternoon they deliver bills for previous readings; that is on the afternoon of the third day they deliver the first day's readings. The only bills that we mail are the pick ups and notes. It is costing us at the present time to read and deliver our bills $0.0118. It is costing us to bill to customer $0.0142, which makes a total cost per customer of $0.026 to read, bill and deliver. Of course this does not include the overhead expense, other than the cost. We have discontinued using the space on back of bills for advertising purposes, and are at the present time putting on the backs of our bills a copy of Rules and Regulations governing gas and electric services. The returns from this class of advertising are so small in comparison with the cost, that of having the bills printed in 25,000 lots instead of in 5,000 lots. We are billing approximately 5,500 customers, which covers about 9,000 meters, gas and electric.

Kentucky Traction & Terminal Company, Lexington, Ky.

Up to the first of July we mailed our bills to customers, two cents postage involved, including advertising matter. Since the first of the month we have been delivering these by a clerk who also collects current and delinquent bills at time of delivery. We have practically 1,800 customers and the bill cost amounted to about $40 per month, excluding clerk's time. We are now distrbuting bill by a $40 clerk, or at the same cost and with very satisfactory result.

Citizens Light, Heat & Power Company, Canby, Minn.

The company bills approximately 662 customers each month, the bills being mailed under one-cent postage. The cost is analyzed as follows: Printing $2.40; bookkeeper's time, $15.90; reading meters, $8.75; stamps, $5.30; envelopes, $1.75; miscellaneous expenses in connection with reading meters, $2.75; a total of $36.85, or an average cost per customer of $0.055. The discrepancy in the number of customers and number of bills mailed is accounted for by the fact that in several instances more than one bill is sent to a single address.

Louisville Earnings Increase.

Since March the Louisville Gas & Electric Company, Louisville, Ky., has been showing good gains in gross earnings and greater gains in net, thus reflecting the results of vigorous sales efforts and efficient operating methods. For the first six months of the year the gross earnings increased $83,060, or 8 per cent, as compared with the first half of 1914, while the net earnings advanced $88,914, or 17 per cent.

Value of Advertising.

Surprising results followed the insertion in the daily newspapers of an advertisement bearing substantially the following text, by H. E. Young, sales manager of the Minneapolis General Electric Company: "To Our Customers Good for Tomorrow Only. If you have a friend or acquaintance who is not using electric light just give us his name—and if the house has been built at least a year—and is on our lines—and we have not already received the name—we will present you with an Electric Toaster, as shown, absolutely FREE."

More than 300 people telephoned and brought lists of names of wiring prospects, totaling approximately 1,000 on Wednesday, July 7, the day designated, and many additional prospects were turned in the following day by people who wanted to make sure of getting a toaster. Although the Minneapolis General Electric Company has seven trunk telephone lines but two of them are connected with the Sales Department, and these were kept busy continuously during the entire day by people who wished to take advantage of the offer. Many, finding the telephones unavailable, due to this unusual pressure, came down town and handed their lists in personally, some as many as 20 names of friends and acquaintances. Ninety per cent of those responding were women, the majority being obviously members of families with comfortable incomes. During the remainder of the week about 200 additional inquiries were made by people desiring to know if there was not some way in which they could take advantage of the proposition. These applications were refused, and the inquirers referred to the Company's regular summer premium offer, which gives various electrical household appliances free to customers who get wiring prospects.

The idea of making the free-toaster offer in return for live prospects suggested itself to Mr. Young owing to the fact that the company was carrying an unusually large stock of low-priced toasters left over from the winter holidays' campaign. His plan cleaned up every toaster which the company had on hand, has given the company a house-wiring prospect list of not less than 1,000 new names, and has put the Sales Department in touch with 300 or more people who have shown a willingness to co-operate with the company in a very friendly way.

Digitized by Google

Electric Luncheon Held by Great Western Sales Force.

An electric luncheon was held recently by the sales force of the Great Western Power Company, at the Hotel Washington, San Francisco, Cal. There were 65 present, including Mortimer Fleishhacker and the heads of various departments. The entire menu was prepared on two electric ranges, the current consumption amounting to 14 kilowatt-hours. At three cents per kilowatt-hour for energy the cost of preparing the luncheon, per person, was less than 6.5 mills.

An interesting feature of the luncheon was the menu, prepared on the company's regular order blanks in the form of a purchase order. Following the luncheon remarks were made by F. C. Czarnecki, secretary to the president, S. E. Gamble, Petaluma, F. H. Woodward, Oakland, C. E. Maynard, A. Mabico, and E. A. Wilcox, of San Francisco. W. Briggs acted as toastmaster.

One feature proposed by Mr. Briggs and unanimously adopted was that a banner be awarded to the district making the best showing during the next three months in the development of the electric cooking business.

Portland, Me., has "Electricity Week."

The week of July 12-17 was observed as "Electricity Week" at Portland, Me. The local newspapers specialized in a campaign for electrical advertisements, among the large space takers being the Cumberland County Power and Light Company; Cressey & Allen, advertising the electric Victrola; Charles M. Hay Paint Company's electrical department; Lowell & Sears, contractors; C. Coughlin and L. W. Cleveland, dealers in domestic appliances, and the agents for the Eveready lighting devices.

The *Portland Argus* offered two prizes for the best and second best essays of not over 250 words on the convenience and usefulness of electrical domestic appliances advertised in that paper. The prizes were an electric fan and a Hotpoint flatiron.

Porch Lights in Campaign at Springfield, Mass.

The United Electric Light Company, of Springfield, Mass., is advertising the pleasure to be derived from electric porch lights during the long summer evenings, when the house is too "stuffy" for comfort. It points out that the lamps are readily installed and will make the porch as well lighted as any room in the house, enabling the family to read, sew, play games, etc.

Such porch lights may be plain and simple or attractively ornamental.

SUCCESSFUL COMMERCIAL MANAGERS.

A. K. Young.

There is perhaps no other central-station company comparable in size that can boast of the sales record enjoyed by the Toledo Railways & Light Company. Especially during the past two years has the business made remarkable advances, during this time several campaigns being held which have established new precedents in sales activities. The records are particularly interesting when it is learned that in all these campaigns list prices wer absolutely maintained. It is a theory of A. K. Young, new-business manager of the Toledo company, that real sales ability is the only requisite necessary to sell electrical appliances, providing, of course, the article is meritorious and the campaign timely. He has so convinced his men of this theory that when an appliance, sign or other device is being featured the salesmen go into the field and get the business. As a tribute to Mr. Young's executive ability and personality it may be stated that during the course of these campaigns, although the regular salesmen do the work, the other business of the company is not allowed to languish.

A. K. Young.

Mr. Young started with the Doherty Company 10 years ago in Cincinnati with the Union Gas & Electric Company, and was later transferred from there to the Montgomery Light & Water Power Company, Montgomery, Ala. From there he was sent to Bristol, Va., to the Bristol Gas & Electric Company; from there to the Brush Electric Company, Galveston, Tex., and from the last named property to the Toledo Railways & Light Company.

It is significant to note that statistics show Montgomery, Bristol, Galveston and Toledo are among the best lighted cities in the world, for their size. This is a hobby with Mr. Young.

The results in Toledo during the past year have really been remarkable. The new-business department, under the direction of Mr. Young, sold 517 electric signs during 1914 on a flat-rate contract, burning from dusk to midnight each night in the year. January of this year, in order to prove that the saturation point had not been reached, Mr. Young inaugurated a "sign a day" campaign, and sold during the month 32 signs.

The company endeavors in all instances to sell electrical displays that are individual and distinctive, restriction being made to one sign of its kind throughout, with no duplicating in any instance.

In the last few months the company has had several small appliance campaigns. For instance, last July 2,508 appliances were sold in 10 days. In December an additional 10-day campaign was inaugurated with the result that 1,704 appliances were sold. Not satisfied with this record Mr. Young planned a 14-day campaign later and 1,100 additional appliances were disposed of.

One of the most successful and noteworthy special campaigns carried out by the sales department of the Toledo company under the leadership of Mr. Young was that featuring a standard $50 vacuum cleaner. During March of this year 300 of these appliances were sold, although newspaper advertising on a small scale and street-car posters were the only methods of advertising adopted. It is interesting to note that there had already been 1,000 vacuum cleaners sold in Toledo as a result of two previous campaigns during the past two years.

Also, during the same month of the vacuum-cleaner sale, an effort was made to increase the use of porch lights with the result that orders were taken for 63 installations of this character.

The central-station industry is familiar with the contract recently closed by the Toledo company covering an installation of industrial electric heating aggregating 6,200 horsepower, representing an annual revenue to the company of $150,000. This was the first move of the company in an effort to build up an industrial heating load and Mr. Young states that he estimates 100,000 horsepower of this business for 1915.

During the past two months attention has been given the extension of electric cooking. Already 12 ranges have been sold with bright prospects for the future in this field.

To aid navigation a lightship has been established in the harbor of Buffalo, N. Y.; it has a flashing white electric incandescent light. At the Schuylkill River Range, Pa., the navigation light has been changed from acetylene to electric incandescent.

Digitized by Google

Electrical Construction

BUSINESS HINTS FOR CONTRACTOR AND DEALER.

By G. D. Crain, Jr.

Emphasizing the Mistakes.

"See those items in red ink?" inquired a contractor, indicating an estimate sheet on a big wiring job which he had recently completed. "Those are items which our estimator failed to include in the original figures on the job, and the cost of which, accordingly, comes out of our profits on that job.

"Putting them down in red ink calls attention in a very emphatic way to these errors of omission, which are just as serious as those of commission. And, believe me, after every job is checked over, and the missing items noted, the estimator knows whether or not he has been hitting the bull's eye.

"This, in my opinion, is the most important thing about the contracting business: finding out the mistakes made on every job. Our system of issuing material, requiring itemized labor reports, etc., shows us exactly the cost of every job. To this we add 20 per cent for overhead. Then the cost is compared with the contract price, and the percentage of profit or loss figured. In this way I can go back over the work for the week, month or year, and see to the last cent how much I have been making; how the estimates have been running, and whether the material bill has been kept within the limits originally set.

"Furthermore, any contractor in this town who wants to see how we figure a job is welcome to come into this office and look over these cost sheets. We are glad to compare notes as to methods of handling the proposition, believing that it is for the good of everybody to find out the best way of doing things."

Making Telephone Appointments.

The day of the "bell-ringer" and the "canvasser" who went from door to door is about over. The man who has to ask for "the lady of the house," and take a chance on having the door slammed in his face, is handicapped right to begin with. In some cases this may be necessary; but in others, where the system is still being used, it could easily be replaced with a better one.

For instance, an electrical concern decided to make a special play on a vacuum cleaner which was popularly priced. It was light, well made and had a number of good talking points, while the price was low enough to put it in the reach of most well-to-do families. The company might have put its solicitor out in the better-class residence districts, given him general instructions, and let him go to it; but the plan actually used had that beaten in a good many ways.

This store believes in the use of the telephone for sales work, and uses it whenever possible. In this case the phone was used for making appointments. An intelligent young woman in the office was put at the telephone, and called up the people living in a certain district which was to be worked. This was easy, reference being made first to the city directory, and then to the telephone directory. The mistress of the house was called for by name, and the girl told her story about like this:

"Mrs. Smith, this is the Blank Electrical Company. We are showing some of our customers a very attractive vacuum cleaner which we have recently taken hold of, and would like very much to send one of our demonstrators out to your house tomorrow. Will that be all right? Ten o'clock in the morning? Very well; and thank you!"

After that, the appointments were arranged according to time and location, and the salesman stepped up to the door of every home assured of an entree and a hearing for his proposition. Incidentally, this plan sold a lot of vacuum cleaners.

Display's the Thing.

The dealer who wants to get from the storekeeper into the merchant class must know how to display his goods. That is fundamental. The same stock in one store will look unattractive and featureless, and in another will stick out like the proverbial sore thumb. It's all a matter of display.

Nothing succeeds like success; people like to patronize the successful establishment. And the thing which gives the appearance of success, like a well groomed appearance with an individual, is to have plenty of the stock in evidence. The people who see it are bound to realize that the dealer has the courage of his convictions, and believes in his proposition to the extent of putting his own money into it. And, besides, the store with the stock is also the store with the service.

One of the less prominent electrical concerns in a certain Middle Western city has attracted a lot of attention to itself this season in connection with fan business, simply by making the best possible use of its stock, and by displaying it so as to give the impression of having a large selection. It has built up display shelves of old packing boxes, covered with dark cheese-cloth, and the fans rest on these shelves, one tier above another. There are several sections of this kind in the store, arranged according to the kind of fans—direct current, alternating current and second-hand—and anyone coming into or passing by the store gets the impression right away that this must be "fan headquarters."

Of course, this dealer doesn't stop merely with display. He goes ahead and advertises for business, and keeps circulars in the mails, besides making direct solicitations whenever he can. But the basis of the whole thing is that he shows, by the way he displays the goods, that he has plenty of fans, of all kinds, and is in a position to meet any requirement that may be made of him.

The Value of Checking Up.

Those contractors who imagine that it is a waste of time to have every job checked up, and material and labor figures carefully tabulated, may be interested in an incident which happened recently with a big concern in the Ohio Valley.

It had handled a wiring job for a residence some distance from the community where it is located. It was on an electric line eight or ten miles from the city. In going over the figures for the job, after the work had been completed, it was found that through a mistake a good deal more wire than necessary had been requisitioned, but that none of the material had come back.

Attention was called to this by the office, and some inquiries made. All of this took some time, and it was several

Digitized by Google

weeks after the work had been finished when the wire was located. It was at the freight station of the interurban railway, and would probably never have been turned in, in the absence of shipping instructions, if the contractor himself had not been on the job and made inquiry.

The wire was valued at $20, and having this little checking system added that much to the net profits of the business, a fact which seems to demonstrate the value of the idea.

Direct Solicitation of Business.

The concern which advertises, has a good location for its store, and in other ways puts itself in the retail trade channel of its community, is sure to get a good deal of business, and to makes sales over the counter in comfortable volume.

But the electrical concern should not consider itself like the dry goods store, the hardware store or the clothing establishment, all of which deal in staples, and as a general rule wait for customers to come to them. It can afford, on the other hand, to go out and seek business, and because of the educational work which often must be done, it really can't afford not to.

And there is a lot of business which is what might be called potential. That is, the necessity which makes logical the purchase of the goods exists, but the buying impulse must be furnished by actual solicitation. Take, for instance, the electric-fan business. Motion-picture theaters, hotels and other places where the public comes in numbers need fans, and of course a great many have them. But the dealer who wanted to move a lot of fans could profitably put a man on the street, calling on hotel and theater proprietors, analyzing their fan requirements, and closing up the business. This will develop a lot of trade that otherwise would remain latent.

A Standing Advertisement.

The work that a contractor does is a permanent advertisement of his concern. If it is good work, it is a good advertisement; but, to just the same extent, it is a bad one if the work is not all that it should be.

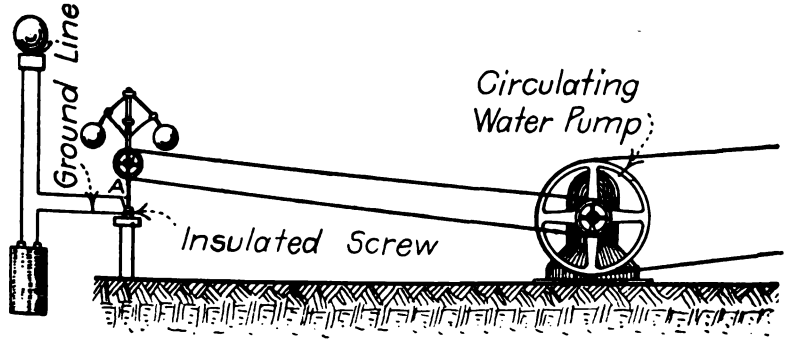
A little point like the location of electric light switches may influence future business. A lot of contractors who put the switches, in the absence of specific instructions from the architect or owner, wherever it is easiest for them, and without regard to their convenience, fail to remember this.

The writer was recently in a residence where the switches were placed at the most inconvenient points possible. They were behind doors, or on the opposite wall from the entrance, etc., so that turning on the light, instead of being the simplest thing in the world, became a matter of some difficulty under certain circumstances.

It is not always easy to put the switch just where it ought to be, but in the interest of a good standing advertisement for the contractor who is doing the work, why not try to place it there?

Electrical Signal for Water Pump.

In a gas engine and vacuum pump which runs day and night the circulating water is a very vital part. Instead, however, of keeping an engineer on duty all night an arrangement was fitted up so that an alarm would be given in case anything went wrong and the water pump stopped operation.



Electric Alarm Connected to Pump.

The accompanying illustration shows the connection. A ball governor, making 150 revolutions per minute, was connected by belt to the circulating pump. The electric circuit from the battery and bell had one wire grounded to the governor base and the other wire connected to an insulated contact, A, so that when the governor was operating the circuit was open, but if the governor dropped down the circuit would be closed and the bell would be rung.

E. W. Edwards.

New Wiring Inspection Ordinance for Jersey City.

The Board of City Commissioners, Jersey City, N. J., has adopted a new ordinance governing the inspection of electric wiring in buildings, providing for the establishment of a new bureau of electrical inspections, to be under the supervision of Building Inspector John Saul; a chief inspector will be appointed by the Board. The bureau will be self-sustaining, being supported by the fees charged for electric inspection and making the city the beneficiary. Under the former plan, the Board of Fire Underwriters has been handling the inspection work, no inspections being made by the municipality.

Among the Contractors.

Fred G. Dustin, of the Standard Electric Company, Minneapolis, Minn., reports two new jobs just started: the N. W. Knitting Company, power work, $1,650, and residence for A. L. Searle, $1,500. The N. W. Knitting Company work consists of wiring for 18 five-horsepower 220-volt, three-phase motors, with 300,000-circular-mil cable from the switchboard to a new panel on the third floor. Open galvanized conduit is used, mounted on the concrete ceiling, and Detroit motor starters are employed. The A. L. Searle work will be a strictly high-grade conduit job in a fireproof building, and will include wiring for lights, public and private telephones, vacuum cleaners, etc., service being brought in underground.

A. P. Mehren, of Downer's Grove, Ill., has secured the contract for wiring the new library building in that town, a conduit job. He also has the contract for rewiring the courthouse and jail at Wheaton, Ill.

The contract for wiring and placing of electrical fixtures in the new $25,000 school at Stoneboro, Pa., was recently granted to the G. A. Webster Company, of Youngstown, O.

Kohler Brothers, contracting electrical engineers, have moved their Chicago office to 111 and 113 North Jefferson Street, where their shops have been located for the past year. This location is near the heart of the electrical center of Chicago, which has shown a gradual trend to the West Side. The Chicago office will continue under the managmeent of Charles R. Kreider.

P. W. Lowry, Racine, Wis., has filed a voluntary petition in bankruptcy. Milton Knoblock, referee in bankruptcy; set July 27, 10:00 a. m., as the time for a hearing. No report of the proceedings is available at time of going to press.

Robert Hughett, who has been connected with the Citizens Lighting Company, La Salle, Ill., is preparing to open an electrical shop for repairing electrical work and dealing in electrical merchandise.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Tulare County Power Company was authorized to sell its electrical distribution system and plant in Tulare County to the Mt. Whitney Power and Electric Company for the sum of $550,000.

MASSACHUSETTS.

Adams Gas Light Company appealed to the Board from an order of the selectmen of the town of Adams, which granted the Connecticut River Transmission Company authority to erect and maintain wires for the transmission of electricity across a certain public way in the town of Adams. The Transmission Company furnishes service at present only to the street railway company and two manufacturing concerns. The sole purpose of its lines is the supply of electricity "in bulk." The purpose of the appeal is to have established the limitations under which the Transmission Company shall engage in the distribution of electricity in the territory which was already supplied by the Adams Company. This appeal is brought under section 157 of Chapter 121 of the Revised Laws of 1914. Under the Massachusetts laws there is no "certificate of convenience and necessity" provision, which is in a number of the public service commission laws of other states. In a city or town in which a company is engaged in the manufacture or sale of electricity, no other person, firm or corporation is allowed to erect and maintain in the streets any wires for the transmission of electricity without the consent of the local authorities, and provision is made for appeal from the decision of the local authorities to the Board and its decision is final. (Section 156-160, inclusive, Chapter 742, Acts of 1914.) In such cases on appeal the Board has the power to determine to what extent, if at all, competition should be permitted.

It was suggested on behalf of both companies that an arrangement similar to that established in connection with the entry of the Transmission Company into Clinton would be satisfactory. There being no opposition, the Board, without reviewing the holdings in the Clinton case, made an order in accordance with this suggestion, by which the Transmission Company is to be restricted to the supply of electricity to the Adams Gas Light Company, electric railroads and railways, but shall not, directly or indirectly, supply electricity to any other customer whose aggregate rated capacity shall be less than 300 electrical horsepower, and whose annual consumption shall be less than 450,000 horsepower-hours.

In the Clinton case (Twenty-Seventh Annual Report, p. 39), which is referred to as the basis of its order in this case, the Board discusses a similar situation, as follows: "It has been the established legislative policy of the Commonwealth, that so long as such an agency for the distribution of electricity in any given territory is adequately and properly performing its public duty, the public interest is better served by public supervision and regulation than by competition. The advent of the Transmission Company into communities already supplied, for the purpose of selling electricity primarily to large consumers for manufacturing and mechanical uses, and to a considerable extent as 'secondary power,' has developed a novel and important phase of the problem with which the Board in administrating the legislative policy previously described has already had to deal. In each instance which has been brought to the attention of the Board the local authorities, as in this case, have attempted to preserve competitive relations between the new company and the one already established, but have hesitated to compel it, as a condition of admission, to observe the duties and obligations of a public servant, to serve all with adequate facilities without discrimination, and for no more than a reasonable compensation, since such a requirement, being obviously not included in the company's purpose, might discourage or wholly prevent the entry of the new company into the field for any purpose whatsoever. Anything short of an insistence on this condition must, however, inevitably fail to give the entire community the advantage of two sources from which electricity for mechanical and manufacturing purposes may be purchased. On the other hand, an insistence on this condition will probably ultimately result in no greater advantage to the community than its supply by one public service agency properly regulated and supervised."

"To put the matter more concretely, the Transmission Company came into Clinton to reach the Lancaster Mills and the Marlborough Electric Company at the Berlin line. Without these objectives it would never have sought admission to Clinton. Unless compelled by law, any sale of electricity by it to small power users will be casual and incidental merely to its primary purpose. If compelled by law to supply any one customer, there is no sound reason why it should not be required to supply all who may desire its service, and to extend its lines so far as may be reasonably necessary for this purpose. In that event, for reasons fully discussed in the Board's prior decisions, there is at least doubt whether it can charge much if any less than the prices at which the gas company can afford to sell electricity to small users of power. If, however, the Transmission Company should serve all who might require a supply of electricity from it, and should sell electricity for all purposes other than light, at prices less than charged by the Gas Company, the numerically few users of power might benefit, but the numerous users of electricity for light, including the community itself, as the most important consumer of all, would gain no advantage. In fact, inasmuch as experience has developed that low prices for electricity for light are dependent upon the extent and diversity of the use of electricity for other purposes, it seems fair to conclude that any attempt to compel these two companies to observe competitive relations may not result in any advantage to small users of power, and if it does, then only at a corresponding disadvantage to the community as a whole."

NEW YORK—Second District.

The Eighth Annual Report of the Second District Commission has been issued in bound form, covering the work for the year 1914. The report contains a discussion of telephone rate cases before the Commission, from which is quoted the following: "The art of telephony is comparatively new, and there is as yet little scientific basis or well grounded theory for telephone rate making. In common with other

Digitized by Google

regulative bodies, this Commission finds no unquestioned precedent or admittedly established principle by which to determine the reasonableness of any telephone rate. The telephone rate cases are beset with more complex and intricate problems than in the case of any other public utility.

"There is some tendency on the part of complainants to cite certain prevailing rates in other localities, states, or even foreign countries, which are lower than their own, with a consequent indication of impatience that the Commission does not forthwith order a reduction to the lowest level. But study has failed to develop such a similarity of conditions in any two points as to warrant a decision by comparison alone, except in a very few cases. To add to the difficulties of speedily disposing of these cases, the Commission lacks the necessary funds with which to make appraisals and examinations of the books of the respondent companies."

In the investigation of the rates of the New York Telephone Company the Commission was handicapped by the lack of funds. The company asked for an appraisal of its property, and offered to place moneys, up to $200,000 to the credit of this proceeding. The Commission refused the offer, which was in the opinion of its counsel unlawful. A resolution was adopted by the Commission in which it said that "it is deemed unwise and improper for the Commission to accept or use in its administration any private funds, particularly from a company whose practices and changes are under investigation and determination by the Commission." Later, a sum of $100,000 was appropriated by the legislature for the purposes of this particular case.

OREGON.

Hood River Gas and Electric Company. The Commission has rendered a decision fixing rates for electric service furnished by the Hood River Gas and Electric Company and the Hydro Electric Company. The petition asked that rates between city customers in Hood River and rural customers in Hood River Valley be equalized.

This is the first complete electric rate case to be decided by this Commission.

Former Competition.—The Hood River Gas and Electric Company, operating its system as a lessee of the Pacific Power and Light Company, was the first company in the field. The Hydro Electric Company entered the field as a competitor. The Commission says: "Immediately there began a competitive war, with the usual incidents to such form of commercial activity * * * rebates, rate cutting, flat rates entirely disproportionate to the service rendered, free service, and even physical interference with the system of the competitor. The population of Hood River City and Valley, and the nature of the local industries, largely centered around the growth and sale of apples, were entirely insufficient to support two utilities so competing for the limited amount of business which the territory could offer. Bankruptcy for both companies was inevitable. The approval of the public utilities act, November, 1912, imposed heavy penalties for a continuance of the rate cutting, rebating and grossly unjust discriminations which had been the usual strategy, and brought about a stalemate. On January 15, 1913, less than a year from the time the Hydro Electric Company commenced commercial service, the interests which controlled the Pacific Power & Light Company and the Hood River Gas and Electric Company bought the outstanding capital stock of the Hydro Electric Company. A semblance of competition between the two companies was maintained thereafter until the report of the Commissioner who audited their accounts was produced at the hearing in the present proceedings, when the Commission recommended the prompt consolidation of the two companies in fact, in the interest of economy in operation." * * *

The two companies are now both ultimately controlled, through stock ownership, as is also the Pacific Power and Light Company, by the American Power and Light Company, and there is physical connection and interchange of current between the three plants.

Losses Due to Competitive Warfare.—Under "development cost" the Commission discusses the claim of the Hydro Electric Company that during the period of operation it had failed to pay depreciation charges, operating expenses, and 8 per cent on its investment, by the sum of $29,680. The details of the computation were not presented. The Commission says: "No certain shortage can be precisely computed or accurately estimated as having actually taken place. It is, however, apparent from the record that the defendant from its organization until after its stock was acquired by the American Power and Light Company was engaged in reckless cut-throat competition with an existing utility serving the same small community; that defendant voluntarily established and long maintained rates which were not remunerative; that no attempt was made to adjust its rate so that the same should be remunerative or equal until after the utility had been purchased by the interests which controlled its competitor, and an order was made by this Commission forbidding such discriminatory and unreasonable rates; that the defendant practiced unjust discriminations forbidden by law for a considerable period after the taking effect of the Public Utilities Act; that before the consolidation of interest the defendant had consistently employed such construction methods and had so engaged needlessly in a system of competitive warfare that its fixed charges and operating expenses were unduly and improvidently increased, and that this policy prevented defendant from getting the return from its service it might otherwise have had; that since the competitive war ceased an unnecessary semblance of competition was maintained through duplicate organizations until after the hearing herein, when on the recommendation of the Commission an actual merger for operation was effected. If any shortage, of the magnitude of that claimed by the utility could be found to exist it would unquestionably be due, in chief part, to the voluntary and improvident and unnecessary actions of the owners of the utility. Under the circumstances shown in the record a shortage of return of the size of that claimed by the utility would not in any sense represent a reasonable or proper cost of developing the utility's present business or a shortage of a fair return upon the actual investment foregone by the utility pending the building up of a business. Such wasteful expenditures represent nothing of value, and have added nothing to the usefulness of the utility's physical plant.

Development Costs.—"While the Commission has been unable to ascertain the historical development cost of the utility's business, it is evident that some shortage of return would have existed, even had the utility maintained reasonable rates for its product and conducted its affairs with economy and prudence. What the precise amount would have been cannot be found as a separate item or sum to be considered as an addition to the original cost estimate made. However, reasonable consideration has been given to this item, and an allowance therefore has been included in the reproduction-cost-new estimate, as representing a normal shortage in return upon the investment represented by the reproduction-cost-new of the plant, after completion, and until the utility's business has been put upon the same basis as it now is."

Value as Basis on Rate-Making.—The valuation on which the new rates are based is $78,500 for the Hydro Electric Company and $140,506 for the Hood River Company, making a total of $219,006 for the combined plants. The value of certain duplicated property is excluded, and the original cost estimate

Digitized by Google

excludes expense items incurred in an attempt by the Hydro Electric Company to break into the field already occupied by the Pacific Power and Light Company in the neighboring City of Dallas, in 1912. The decision says: "Sums so spent, representing nothing of benefit to any consumer, are not, under the Commission's classification of accounts chargeable either to capital account or to operating expenses; but are direct charges to the corporate surplus or deficit account, and should be borne by the stockholders, whose chosen directors use such tactics in a competitive war." * * *

Minimum Charge.—"A calculation has been made as to the appropriate minimum charge for each customer under the schedules under investigation. Account has been taken of all items of expense which vary with the customer, viz.: Setting and Removing Transformers and Meters; Repair to Meters and Services; Indexing Meters; Commercial Department Salaries and Expenses, and Rent, and a fair proportion of the cost of Superintendence of Distribution and of Repairs to Miscellaneous Distribution Equipment. In addition, a ratable proportion has been taken of Production Costs, which vary with output, including operation, maintenance, and depreciation upon Production Capital and of a fair return upon such Production Capital, as representing the total expense of producing the normal average minimum amount of electricity consumed in any month, per customer. Allowance has been made for the depreciation annuity upon individual customers' meters and services, and for a fair return upon the average amount of capital invested in customers' meters and services.

"The monthly costs so computed show that the normal minimum customer costs (including depreciation and fair return) are, for Hood River customers, 91 cents, and for rural customers, $1.13. The differentiation between residence lighting and commercial lighting will not be great, and has been absorbed in the foregoing average figure.

"It is apparent that some reduction in the customer costs of rural customers can be made by the practice of quarterly instead of monthly reading of meters, with either intermediate monthly collections upon an average bill basis with quarterly adjustments, or else intermediate monthly bills based upon a reading by rural customers, transmitted by postal card to the utility, with quarterly check and adjustment by the utility's own meter readers.

"Under the circumstances in these cases, minimum monthly charges of $1.00 for Hood River customers and $1.25 for rural customers, are just and reasonable, and the utilities minimum monthly charge of $1.50 to rural customers is unreasonable and excessive."

Value of Service.—Under the heading, "Value of Service to Rural Customers" the Commission says: "It is apparent from the record, and is a fact, that any schedule of rates which might be fixed by the utilities or by the Commission so that the rural customers mentioned should pay under Schedule I a sufficient amount to yield the same return upon investment as other classes of customers, would defeat itself, because the rates necessary to yield such return would be above the value of the service, and would be in and of themselves unreasonably high, and because the effect of the attempt to impose such rates would be to decrease the consumption of the patrons to such an extent that the utilities would derive less revenue therefrom than at present."

Rates.—The rates prescribed for city residence lighting are: Eleven cents per kilowatt-hour for the first 15 kilowatt-hours per month; 9 cents for the next 15 kilowatt-hours per month; and 5.5 cents for all over 30 kilowatt-hours per month. For commercial lighting the rate is eleven cents per kilowatt-hour for current used equivalent to or less than the first 30 hours' use per month of the customer's demand; 5.5 cents per kilowatt-hour for all in excess of 30 hours' use per month of the customer's demand.

A separate schedule was prescribed for rural domestic lighting and power, as follows: Thirteen cents per kilowatt-hour for the first 30 kilowatt-hours used per month; 9 cents per kilowatt-hour for the next 30 kilowatt-hours used per month, and 7 cents per kilowatt-hour for all over 60 kilowatt-hours used per month.

Under the rates for residence lighting cooking appliances may be connected not exceeding a total connected load of 2 kilowatts. An optional cooking rate was provided of 5 cents per kilowatt-hour subject to a minimum charge of $1.00 per month.

The above rates are gross, and there are prompt-payment discounts in each schedule. These rates are effective as of August 1, 1915.

WEST VIRGINIA.

Standards of Service. The Commission has adopted and published in pamphlet form rules and regulations governing electric, gas and water utilities, to be effective as of August 1, 1915. General rules for electric utilities, applying to operation and maintenance, provide that each utility shall maintain its plant and system so as to furnish safe and adequate service, and that construction shall be in accordance with the National Electrical Code and good standard practice. Rules are given governing the location of meters, the testing of meters, and meter records and reports. A copy of the complete schedules of rates, a copy of the Commission Law and a copy of these rules and regulations are to be provided in the office of every utility for the information of the public, and the rules also provide for information to consumers regarding reading of meters, consumers' bills, lamp service and kinds of service furnished by the utility. Other rules apply to standard voltage, standard frequency, voltage and current surveys and records, station records and interruption of service, and accident reports. The following are a number of the rules applying to meters and meter testing and other matters of general interest:

The Commission rules that after January 1, 1916, no electricity shall be furnished and sold within the state of West Virginia, except by metered service. This does not apply to window, outside decorative lighting, street lighting, transient consumers where the wiring furnishing such service is entirely separate from the wiring inside of buildings, used for general lighting purposes, and limited service as now furnished by the use of excess indicators or similar devices. For good cause shown, the Commission will allow exception to this rule in special cases.

Another rule applying to electric utilities provides that: "Any utility may require from any consumer or applicant a minimum cash deposit of $2.50 or other guaranty of an amount not to exceed the estimated 60-day bill of the consumer. Interest thereon at the rate of six per cent per annum, payable upon the return of the deposit, shall be paid by the utility to every consumer making such deposit, for the time such deposit was held."

Rules for testing of electric meters cover installation tests, periodic tests, request tests, and complaint tests.

"No watt-hour meter that has an error in registration of more than two per cent, plus or minus, at either light load or heavy load, shall be placed in service. Whenever, on installation, periodic or any other test, a meter is found to exceed these limits, it must be adjusted so as to register correctly to within two per cent at light load and at heavy load and to be without creep, and refund made."

For the determination of the average percentage of accuracy the meter is to be tested at two loads, one-tenth of the full rated capacity, and full rated capacity. The average of these tests is taken to be the condition of the meter.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 296.—High Cost of Rendering Bills.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

No. 297.—Electric Stabilizer for Steamships.—I have heard that motor-driven gyroscopic stabilizers have been used with success on some German steamships to diminish their rocking during violent storms. In view of the appalling disaster to the Steamship *Eastland* in the Chicago River on July 24, would the use of such an electric stabilizer have prevented the rapid listing of the boat and been more reliable than water ballast?—T. M. E., Evanston, Ill.

No. 289.—Gelatinous Battery Electrolyte.—In some types of small storage batteries made especially for use where they are likely to be upset there is used some sort of jelly-like paste instead of the ordinary liquid electrolyte. What is this paste composed of? Does it increase the internal resistance of the battery? What effect, if any, has it on the efficiency, capacity and life of the battery? —C. M., Jackson, Mich.

No. 299.—Protecting Third Rail.—What effective means, aside from using the inverted third rail, can be used at highway crossings of an electric railway equipped with the ordinary upright third rail to prevent pedestrians from entering on the right of way at the crossing and coming in contact with the live rail? This right of way is fenced in except at the crossing gaps, where the third rail is interrupted and cattle guards are provided at each side of the crossing.—W. R. A., Elmhurst, Ill.

Answers.

No. 287.—Powdered Coal as Central-Station Fuel.—Recent experimental trials with powdered coal as steam-boiler fuel are said to have given almost ideal results from the standpoint of combustion efficiency. Has this fuel been tried on any extensive scale under the boilers of any large or medium-sized central station? Is the method applicable advantageously to all kinds of coal? Is the cost of the crushing plant offset by the increase in efficiency?—B. A. M., Toledo, O.

While considerable data are available covering the use of coal-dust in metallurgical plants, reverberatory furnaces, etc., little has been published concerning its use under central-station boilers. Perhaps the chief reason for this is that pulverized coal or coal-dust is only being used to a very limited extent, and only in isolated cases, by central-station companies, and then on a comparatively small scale. In the early stages of the development of burners for coal-dust much trouble was encountered, but it was incidental rather than fundamental. The chief sources of difficulty were due to the stoppage of the flues due to an accumulation of ash, and interruptions and irregularities in the quality of the coal supply; both of these were directly traceable to lack of appreciation of the importance of uniform fineness of the coal-dust supply. However, these troubles are now of the past. For satisfactory results to be obtained with powdered coal there are several points that must be taken into consideration. While the choice of coal, as with any other form of burning, should depend upon the heat value, ash, moisture, volatile matter, fixed carbon, etc., it may be said, speaking generally, that any coal will be satisfactory so long as it contains enough volatile matter to give the required combustion. There are numerous grades of powdered coal in use in many different parts of the country, in various makes of burners, furnaces and boilers, that are giving satisfaction. The choice of coal has little bearing upon the operation, as compared with the importance of the design of the installation. It is important, however, that the coal be dry, the drier the better, if the looked-for efficiencies are to be obtained. With any form of coal, all moisture must be evaporated before the coal will burn. The furnace is the most expensive place in which to dry the coal on account of the loss of thermal efficiency thereby. With coal-dust firing a separate drier should be used; it not only increases the efficiency of combustion but results in a saving in power consumption of the pulverizer, since dry coal takes less power to crush than does moist coal. Coal surface and burning efficiency are very closely related, and the importance of grinding the coal sufficiently cannot be emphasized too strongly. The effect of pulverizing the coal is well brought out by C. D. Demond, testing engineer, Washoe Reduction Works, who said, "The approximate diameter of a one-pound lump of bituminous coal is three inches, and its total surface one-quarter of a square foot, while one pound of coal ground so that 95 per cent will pass through a 100-mesh sieve and 82 per cent through a 200-mesh sieve has a total surface of 8,000 square feet, more or less, depending upon the physical characteristics of the coal, or 32,000 times the area of the single lump." The commercial standard of fineness for pulverized coal is that 85 per cent must pass through a 200-mesh sieve, and 95 per cent through a 100-mesh sieve. With any fuel it is necessary that proper quantities of air be admitted at all times, if the thermal efficiency is not to be lowered; this is particularly so in the case of firing with coal-dust. If too much air is admitted the gases are diluted and the temperature is lowered; whereas if insufficient air is allowed to enter part of the fuel is incompletely burnt, resulting in a loss in efficiency.

In a plant utilizing coal-dust or pulverized coal the auxiliary apparatus is greater than would otherwise be required. The apparatus should be of the best, and should be carefully chosen so that each part performs properly its function. When burning coal-dust trouble to one piece of equipment will affect the whole installation usually. In a coal-dust-fired plant the disposal of the coal is somewhat as follows. From the coal-storage bins the coal is fed to the crusher, where it is broken up into pieces about one-inch maximum. The coal is then conveyed to the drier, going thence to the pulverizer, where it is crushed to the desired size. It then is conveyed, usually by forced air, to the storage bins above the boiler or furnace. The use of coal-dust results in higher furnace efficiencies being obtained, it is more easily regulated, and requires less labor expense than when lump coal is used. On the other hand the investment in auxiliary apparatus is greater. Whether the extra cost is justified is a matter that can be determined only for each individual case. The indications are that it is in an increasing number of cases.—I. L. K. R., Chicago, Ill.

No. 289.—Combination Electric Radiator.—I have just heard of a newly patented electric radiator which resembles a hot-water radiator and has an electric coil heat the water in the pipes; it is said to be more economical than a straight electric radiator. I fail to see this and would like to have it proven. —W. T., Cleveland, O.

In the case of straight electric resistance heaters, as soon as the current is turned off the heat leaves the heater very rapidly. In the case of a heater in which water is used, the heat is stored up in the water and given out more slowly, hence, where it is necessary to keep constant temperatures with a fluctuating current or where it is desired to turn off the current in the evening the heat energy stored in the water is given out as the room temperature lowers. This helps keep the temperature from falling below a certain value. The reason for

Digitized by Google

the use of water for heat storage is on account of its high specific heat compared to metal. In a comparison of two heaters of equal heating value I have computed the following: Heat stored with bare heaters, 455 British thermal units; heat stored with 25 pounds water in heater, 5,200 British thermal units; time required to attain room temperature from equal starting temperature above that of the room—without water, 12 minutes, with 25 pounds water, 2 hours and 10 minutes. If W. T. will test the radiators he can see for himself that the water type would be best where it is necessary to cut off current and still maintain heat. Where instantaneous heating, however, is requisite a non-water type must be chosen.—H. E. W., Chicago, Ill.

No. 291.—Insulation of Underground Piping.—It is often claimed that covering underground pipes with a coating of paint is an effective measure against electrolysis. Since paint is supposed to be an insulator, why is it not more often used?—G. D. K., Chicago, Ill.

Speaking generally it may be said that covering an underground pipe with paint will afford very little protection against electrolytic action for any length of time. When trouble first was encountered from electrolysis it was thought that paint, on account of its being classed as an insulator, would be most efficacious for mitigating the evil effects of the electric current. It was tried very extensively. In some cases it proved apparently quite satisfactory, in others again it deteriorated rapidly and the pipes were found to have been attacked more severely than if no paint had been used at all. In some instances when tried in the same town, in one locality the paint offered protection for a time while in another locality it failed utterly in a very short while. In practically all instances the result was finally the same, namely, utter failure after comparatively short service.

The deterioration of paint when used underground may be traced to either of two causes, the chemical action of the soil, or electric currents. Of the two, though both may exist at the same time, experience indicates that the latter is by far the more deleterious, the chemical action of the soil having comparatively little effect. Practically no paint is absolutely impervious to moisture, and it seems now to be quite generally thought that this is the source of the comparatively short life of paint-covered pipes and metals. More or less moisture is usually present in soils, with the result that where it exists for any length of time it will permeate the coating of paint. Under these circumstances the covering is no longer an insulator but becomes a conductor, or semi-conductor, of electricity. If a difference of potential exists, a current will flow. At first this current will probably be very small, but with the electrolytic action taking place gas formation will also occur; the gas given off, as it increases in volume, will finally rupture the covering of paint, thereby permitting a greater current to flow, which still further increases the electrolytic action.

In a number of instances covering pipes with paint has been found to cause more damage than had the pipes been left exposed. The reason for this is that the paint breaks down at isolated places. At such leaks the current density will tend to be high, with the result that severe pitting and corrosion takes place at one or two places instead of being over a more extended area. The life of the pipe is thus shortened by painting. In practice it is not uncommon to have trouble with a pipe that looks to be in first-class condition on a superficial examination, but on scraping away the paint the metal is found to be badly eaten away. This is explained by the fact that the covering of paint is porous, thus allowing the gas which is given off during electrolytic action to escape as fast as generated.

It has been shown that covering pipes with paint is not really an effective way of eliminating damage from electrolysis, and that furthermore its use may cause a more rapid disintegration than would otherwise occur. There is a field, however, for the use of paint as a protective coating, where it might be used to good advantage. It is in those cases where pipes are neutral or negative to the earth. Under these conditions the paint will tend to prevent the current from taking to the pipes or, if it does, little harm results. When a paint can be made that is impervious to moisture and that will remain so for a reasonable length of time, an immense step will have been made toward solving the problem of electrolysis and corrosion of pipes in our large cities.—K. R., Chicago, Ill.

The plan of painting the surface of pipes, cables and other underground metallic structures has been used in a great many cases in the past as a possible means of protection against electrolysis, and this method is still used in some cases. It has been found by experience, however, and may be shown by experiment, that the use of paints or insulating varnishes for this purpose is unreliable and may in some instances become actually injurious. This does not, of course, apply to protection against soil corrosion where there is no difference of potential between the metal and the surrounding soil, and in such cases the application of several carefully applied coats of good water-resisting paint will be very effective.

The conditions are very different whenever stray currents are present, for the reason that, so far as is known, no paint is commercially available which is absolutely impervious to moisture. Therefore, when a metallic structure, such as a gas pipe, water main or lead cable, is painted and placed in the earth in the presence of water a slight trace of moisture ultimately permeates the coating. When this occurs at any point, the coating becomes slightly conductive and if there is any difference of potential between the metal and the surrounding soil, a trace of current will flow, giving rise to a slight electrolytic action accompanied by the generation of more or less gas beneath the coating. As the action continues the gas increases in amount, resulting in an eventual rupture of the coating, after which the current flow is greatly increased at the point of breakdown and rapid electrolysis of the exposed metal usually follows.

If the coating is porous, thus permitting the gas to escape, the coating may remain intact and the electrolytic action may continue and may finally eat through the metal without giving any superficial evidence of the condition. Furthermore, if the coating is sufficiently porous to permit the escape of gas, the action would be considerably more rapid than would otherwise be the case, due to the greater absorption of moisture and consequently greater degree of conductivity. On the other hand, if the coating is not sufficiently porous to permit the escape of gas, the rupture or cracking of the coating above mentioned will take place at isolated points, so that the discharge of current from the metal is concentrated and the pitting is therefore likely to be more serious than if paint were not used at all. Ordinarily, evidence of electrolytic action on painted underground metallic structures is given by the presence of blisters or cracks on the painted surface.

The foregoing refers entirely to structures which are positive to earth. There might be some benefit derived from the use of insulating paints, if they could be applied to the structure at points where it was continuously negative to earth, i. e., where the tendency of the current was always to flow from the soil to the underground structure, as in this case the total current flow in the structure would be somewhat reduced and the electrolytic action in the positive area would therefore be decreased. Points where an underground metallic structure is continuously negative to earth seldom occur in practice, due to changes in distribution of load on the trolley system or other source of the stray currents, and areas which are negative at one time become positive at another. In general, therefore, the use of paints as a means of protection against electrolysis of underground metallic structures cannot be considered a satisfactory plan.

A long series of tests on this matter were made some time ago by McCullom and Peters of the United States Bureau of Standards and are published by the Bureau as Technologic Papers No. 15, entitled "Surface Insulation of Pipes as a

Digitized by Google

Means of Preventing Electrolysis."—H. S. P., Bloomfield, N. J.

No. 292.—Sunspots, Magnetic Storms and Weather.—A short time ago a statement appeared in the newspapers that an exceptionally brilliant display of the aurora borealis was connected with great activity in the sunspots and that it also produced serious disturbances on telegraph circuits and magnetic compasses and accounted for our prolonged rainy weather. Has any definite conclusion been reached by astronomers, meteorologists and other scientists as to the interconnection of these phenomena? Is there any basis for ascribing an electrical or magnetic relation between them?—F. L., Beloit, Wis.

The correlation between sunspots and the earth is perfectly proved. During the greatest activity of sunspots (i. e., when they are most numerous or occupy the maximum portion of the sun's surface) magnetic disturbances, commonly called "magnetic storms," are most numerous and intense, and, as W. Ellis in the *Philosophical Transactions* and before the Royal Society of London has shown, the regular *daily* variations of terrestrial magnetism are also greatest; in many instances also (but not always) notable disturbances upon the sun have been accompanied by violent magnetic storms and earth currents, with brilliant displays of the aurora polaris (as, for example, in the years 1859 and 1883). The fact of the connection between terrestrial magnetism and solar disturbances is beyond doubt, though the exact nature and mechanism of this connection is still a matter of debate. As far as the authorities to the writer's hand are concerned it is not definitely known whether the solar disturbance causes the terrestrial, or whether both of these are due to some external influence, as, say, that of the planets in general, or extra-solar systems.

There also has been a great deal of discussion on the relation between solar disturbances and possible effects upon the earth's meteorology, upon its temperature, barometric pressure, storminess, and amount of rainfall. Here again it only can be said that the matter is still on debatable ground, though the last work of Simon Newcombe before his death in 1909 discussed the meteorological evidences as to variations of radiation of heat from the sun, ending with the conclusion that the minimum temperature on the earth occurs 0.65 year after the maximum of sunspots, whereas our maximum temperature occurs 0.33 year before the minimum of sunspots. He infers that there may be fluctuations of plus or minus two-tenths of one per cent in the earth's temperature, but, as above intimated, whether this terrestrial phenomenon is due to variations of solar radiation or of atmospheric conditions is still problematical. A number of other excellent authorities have seemed (at first glance) to have established conclusive facts, but other evidence would refute them as far as we at present know. Thus, "while some particular investigations appear to show a correspondence for a time, others contradict them." On the other hand, "it is not antecedently improbable that some real connections exists."

As to theories of sunspots and their effects on the earth's meterology and magnetism, there are quite a number; only those of magnetic or electrical foundation will be mentioned here.

E. W. Maunder collected and arranged data which he regarded as demonstrating that magnetic disturbances originated in the sun. He regarded the solar action as arising from active areas of limited extent on the sun's surface, and as propagated along narrow, well defined streams. The active areas he believed to be also the seats of the formation of sunspots, but believed that activity might precede and outlive the visible existence of the sunspot. Maunder did not discuss the physical nature of the phenomenon, but his views are at least analogous to those propounded somewhat earlier by Svante Arrhenius, who suggested that small negatively charged particles are driven from the sun by the repulsion of light and reach the earth's atmosphere, setting up electrical currents, manifest in auroral and magnetic disturbances. Kr. Birkeland believes the vehicle to be cathode rays, while Ch. Nordmann similarly has suggested Roentgen rays. In line with the last two theories, evidence is accumulating to show that the sun and stars are radio-active bodies, and that emanations proceeding from the sun, and reaching the earth, have important relations to the phenomena under discussion. The electron theory has been extended to include the present case, and auroral displays have been performed in the laboratory with radio-active apparatus.—P. B. W., Verbena, Ala.

No. 293.—Bell-Ringing Transformers and Lightning.—Recently we installed several bell-ringing transformers and a number of them have already been burned out during a lightning storm. Is there any simple and yet positive way of protecting them against lightning? We will be much pleased if some one will answer this through your Questions and Answers columns.—H. P., Hillsboro, Ill.

If the transformers and their secondary lines are inside, it would indicate that your power line was poorly protected and I would advise more, or at least some, lightning arresters on the lines as well as at the station. If the bell-ringing or secondary lines are run outside, use an extra-heavy telephone arrester, such as used for block signal, telegraph and telephone composite systems.—H. E. W., Chicago, Ill.

No. 294.—Alarm for Air-Blast Transformers.—A railway substation has a bank of air-blast transformers that are now unprotected against failure of the forced ventilation at times of heavy load. What is the simplest and most reliable alarm system for this purpose?—N. P. C., Indianapolis, Ind.

Probably the best solution would be the use of the Thermo relay, either as a closing device from alarm circuit or for operating directly a circuit-breaker and cutting out the transformer bank. The Thermo-relay devices are made by the Baruch Electric Controller Corporation, 111-117 Kearney Street, San Francisco, Cal.—H. E. W., Chicago, Ill.

Air may fail to pass through air-blast transformers either because the dampers of the transformer are closed or on account of cessation of the air supply due to the stopping of the blower. To assure the opening of the dampers, many companies have a very strict rule requiring that operators must always pass round a transformer bank, feeling the air, as soon as the bank is placed in service. And further, that transformers must be inspected for temperature and continuity of air supply every half hour during heavy load periods, and at hourly intervals at other times.

A very simple and inexpensive device for indicating the passage of air through a transformer consists of arranging two feathers somewhat like the arms of a windmill, fastening them on a piece of wood which is placed in the air passage on the top of the transformer. A piece of tape about a foot long also answers.

Another method is to install a U-shaped tube in the transformer air duct, or where desired. This gauge may be calibrated in pounds per square inch, if desired. Also it may have contacts placed in it that will close a bell circuit at the cessation of the air supply or a reduction thereof. Some companies place these gauges at the operator's desk, others install contacts for an alarm circuit.

Probably the tape or feather methods are the most usually installed. The gauge method, whether working as an indicator or as an alarm is good, but rather expensive to install. The most desirable combination is to install a gauge fitted with an alarm in the blower passage, and place tapes on the individual transformers. It is not enough that the air should flow, but it is very important that the temperature of this air be kept below safe limits. That is the reason, in a large part, for the periodic inspection discussed above. It has been found by experience that it is not a good policy to remove too much responsibility from the operators.—K. R., Chicago, Ill.

Good Roads to Reduce Cost of Living.

Taking the country as a whole, it is said that three-fourths of all the freight our railroads haul must sooner or later be moved over the public highways, and every ton so moved is costing at an average rate of 23 cents per mile. This is a powerful argument for good roads in order to reduce the cost of living.

Digitized by Google

Convention of Ohio Electric Light Association.

Cedar Point is Scene of Twenty-first Annual Meeting, July 20 to 23.

The twenty-first annual convention of the Ohio Electric Light Association was held at the Breakers Hotel, Cedar Point, O., July 20-23. The total registration of active and associate members, ladies and other guests, was 392, which is but little short of the records of previous years. The customary program of business sessions was carried out, and the entertainment features arranged in the usual way. A banquet was held on Wednesday evening and dancing was indulged in on Tuesday and Thursday evenings, preceded by musicales rendered by Mrs. Clara T. Grimes. On Wednesday afternoon an illustrated lecture was given by Cy B. de Vry, superintendent of the Zoological Department of Lincoln Park, Chicago. On Thursday afternoon there was a bathing party, with a ball game, duck races and other contests. Bowling and card parties were provided for the ladies.

The first session was called to order by President C. V. Hard on Tuesday at 2:20 p. m. Vice-president W. J. Rose was called to the chair while Colonel Hard delivered the presidential address, in which he pointed out the growth of the industry and of the association, which now has over 300 members. He stated that over $100,000,000 is invested in central stations in Ohio, and if all electrical industries are included the figures exceed $225,000,000. The work of the various committees was referred to, great activity having been manifested by all. Referring to the relations between the utilities and the public, he said that the choice lay between government ownership and government regulation, and the latter is decidedly preferable. Government ownership should be actively opposed.

The report of D. L. Gaskill, secretary-treasurer, showed the association to be in good financial condition, there being a surplus for the year of over $500. The *Monthly* is self-supporting. The work of the Appraisal Committee should be continued. He read a list of contributions to the special fund of $2,735 raised for this work, to which $329 was added from the general funds.

This report was referred for audit to a committee consisting of L. K. Funkhouser and F. J. Jackley.

J. C. Martin made an oral report for the Executive Committee, referring especially to the legal work and efforts to influence legislation. Municipally owned utilities are now required to keep accounts the same as privately owned utilities. Only one financial report a year is now required for all state purposes. No adverse legislation was passed by the last legislature. Co-operation with other utilities is desirable in this work.

New members were then elected. A Nominating Committee was appointed by the Executive Committee, as follows: G. E. Miller, of Cleveland; E. A. Bechstein, of Sandusky; O. H. Hutchings, of Dayton.

S. E. Doane then presented the report of the Illumination Committee. This was very brief, as letters in the *Monthly* from time to time have kept members informed of important developments. Correspondence has also been carried on directly with members on various phases of illumination.

The discussion by D. L. Gaskill, O. H. Hutchings, L. C. Anderson, F. C. Jeannot, W. R. Power and Mr. Doane, brought out that while the light source in type C Mazda lamps is smaller than in earlier types, it is aimed to get the same distribution of light by reflectors of the prismatic and mirror types. Street lamps on Euclid Avenue, Cleveland, have the two elements of the refractor sealed, so that dust cannot accumulate between. With alternating current, type C lamps can be operated in series with arc lamps, but this has not been successful with direct current, especially with magnetite lamps. Mr. Power, however, claimed satisfactory operation in the latter case, with a life of over 1,000 hours.

Mr. Doane also presented the report of the Committee on Standardization of Voltages.

Standardization of Voltages.

This report shows the reasons for the choice of a variety of operating voltages in the early days and the desirability of reducing this to a limited number now that lamp manufacture is better standardized. Steps to secure this result should be taken by operating companies and a full discussion of the question is asked and action proposed to bring all Ohio central stations within the range of 110 to 120 volts, concentrating upon 110, 115 and 120. It is also recommended that other state organizations should be induced to take similar action and the change made general throughout the country. The various factors to be considered in this connection are discussed and an appendix given showing the effect of increased and of decreased voltage on various apparatus. The question is also raised as to what extent the co-operation of isolated plants should be solicited.

This was discussed by L. C. Anderson and G. E. Miller. Mr. Doane stated that replies from manufacturers of heating devices indicated little interest in the subject. A motion was passed accepting the recommendations of the committee and instructing the secretary to request similar action by other state organizations. It was also voted to continue the committee.

D. L. Gaskill then made a report for the Insurance Committee, urging its continuance to cover liability insurance.

T. O. Kennedy, of Masillon, stated that boiler insurance formerly covered both property and casualty damages. Under the present law, injury to employees is no longer covered, but the rates are as high as before.

There was a discussion as to whether an employee has the option of a suit for damages under the compensation law, indulged in by D. L. Gaskill, F. C. Dunbar, E. A. Bechstein, G. E. Miller and J. C. Martin. The latter stated that he has this option unless he has filed an application with the Industrial Commission, in which case he is barred. Employers should take an interest in the amount of allowances for injuries, since these affect their future premiums and those of the entire industry as well.

The session on Wednesday morning opened with a general discussion of "Every-Day Problems Confronting the Central-Station Manager."

D. L. Gaskill, of Greenville, spoke regarding public policy. Much of the present antagonism to utility corporations is due to the lack of such policies twenty years ago. The problems are entirely different in the large and small companies. In the latter the personality of the management is a large factor. In the former, printer's ink, courteous treatment by employees, and good service count heavily. The confidence of the public is a great asset and should be retained as far as possible. Good service is the first essential, but the public should be kept informed of what the utility is doing for the public benefit. Utilities should convince the public that they are trying to be fair.

Weare Parsons, of Springfield, spoke on organization. A manager must see that service is rendered and must be able to stand abuse. He must also protect the people he represents. He should be able to select and discharge his assistants, and should be able to take up the details of the work when necessary. Mr. Weare advocated rivalry between different departments, and the computing of unit costs by each. The manager must also deal

Digitized by Google

with municipal and state bodies. He had found the latter satisfactory, but difficulties with the former are often due to indefinite franchise provisions. In ruling with respect to extensions, neither extreme is desirable. He thought extensions were warranted only when the gross annual return is equal to the capital outlay. It is not desirable to strive hard for suburban business. Rates should be flexible enough to meet all cases, and should be promptly quoted. A study of load-factor and station load curve will often indicate lines of business which may profitably be taken on.

W. R. Power, of Huntington, W. Va., cited cases of courteous treatment by employees and the reverse and showed how public sentiment is influenced by such things. He favored liberal extensions.

T. O. Kennedy, of Masillon, agreed with Mr. Gaskill that present troubles are largely due to past misconduct. The company organization should first be convinced that the old attitude has changed, and then the public should be convinced. Let them know what you are doing. Chautauqua meetings might be a good medium for public information. It is a fine thing to have such cordial relations with customers that one can call on them to block malicious legislation.

G. E. Miller, of Cleveland, discussed extensions and said that many had been made in Cleveland suburbs where the annual gross revenue was only 10 to 25 per cent of the investment.

Mr. Parsons said that if gross revenue did not equal investment, extensions were made in Springfield only when customer paid for extension, this being refunded when business reached the required value. There is no reason why the company should carry such an investment.

F. C. Caldwell, of Columbus, suggested that when an extension is not feasible, a farm-lighting outfit be recommended.

J. C. Martin, of Columbus, spoke on municipal ownership, which is likely to be agitated in every community at one time or another. It should be forestalled by appropriate publicity. He cited one large corporation which gets all newspaper clippings referring to its operating companies. If these are untrue, they are refuted through the same channels. If they are favorable they are reprinted in other papers. An example of publicity work was given in connection with the opening of the transcontinental telephone line, which was heralded all over the country. The association should consider organized work along this line.

George Whitely urged a clean house and good service. Then the public will stand by the utility.

There was then some discussion as to permanent representatives in Columbus and the need for utility managers being in touch with legislators.

M. H. Wagner then presented the report of the Committee on Transmission and Distribution.

Report on Transmission and Distribution.

This report emphasizes the necessity for care in handling insulators as the smallest nicks reduce the factor of safety. Changing insulators after a line is in operation is much more expensive than the first installation. To handle without chipping carriers should be supplied which prevent the rocking of the insulator. When placed upon the ground they should be in such a position that they will not accumulate rain which by freezing might cause cracking. Insulators usually fail for mechanical reasons. A demonstration was given of a set of tools which permits changing a high-tension pin-type insulator without interruption of service. A megger is useful for detecting defective insulators in service. Insulators in guy lines should be omitted where the voltage exceeds 5,000, the anchor itself forming a ground. A discussion is given of the desirability of single and of duplicate lines and of the location of trouble and emergency repairs. A ground wire and electrolytic lightning arrester are advocated for high-voltage lines. For outdoor installation the electrolytic arrester has the drawback that the electrolyte freezes at about 15 degrees Fahrenheit. Multigap arresters are advocated where an attendant is not at hand to charge the arrester daily. Guards are proposed on farm lines to prevent boys from climbing the poles. Apparatus at transformer stations should be fenced in. Greater attention should be given to primary and secondary distribution lines by small companies. The unit method of distribution is proposed with the use of one large transformer for a district rather than a large number of small transformers. No service wire smaller than No. 8 should be used. Different types of insulators should be used for primary, secondary and arc lamp lines. Terminal boards should be eliminated from transformers. A discussion is given of the relative desirability of single-phase two-wire or three-wire, three-phase three-wire and three-phase four-wire distribution from a three-phase primary. Tests on different forms of grounds are given, showing the contact resistances. It is concluded that secondary systems should be grounded to water pipes wherever possible, and when this is not possible, two or more ground connections should be provided.

The discussion was opened by W. E. Richards, of Toledo, who questioned the advantage of double circuits on the same poles. He referred to the grounding of secondary circuits, which should be done at only one point when electric railways are in the vicinity, or else stray currents will be circulated in the system. He also discussed underground transmission, which was not considered in the report. This gives greater continuity of service and is feasible up to 25,000 volts.

E. E. F. Creighton, of General Electric Company, discussed insulators. He stated the requirements for the porcelain, which must be vitrified at a higher temperature than table ware. Damage is occasioned by the metal fittings on account of the difference in expansion and contraction with temperature. To detect faulty insulators the oscillator has been developed. It utilizes 500,000 cycles from a Tesla transformer. The test does no harm to good porcelain, but breaks down the cracked ones, even when these would pass a 60-cycle test. Another test is to measure the insulation resistance with a megger. This test will detect defective insulators when moisture is in the cracks, but not when dry, as is sometimes the case with pin-type insulators. There are several sizes of oscillators, the smallest being portable and suited to testing insulators in position on the line. This should be done once a year.

C. R. McKay, of Cincinnati, submitted written discussion.

H. H. Rudd, of the Westinghouse Electric & Manufacturing Company, spoke of the choice of a secondary distribution system, which must be suitable for a small or large system, must supply both lighting and power at standard voltages, must operate at a voltage high enough for economy and low enough for safety, must have a neutral point grounded, and must provide for fuses. The report gives four possible systems: two-wire, single-phase; three-wire, single-phase; three-wire, three-phase; four-wire, three-phase. Where polyphase current is required, he suggested as superior to any of the above a five-wire, two-phase system, which meets all requirements for single-phase and polyphase, neutral wire, and standard voltages.

A. O. Austin, of the Ohio Insulator Company, said the importance of insulators was two-fold: with increasing age of line they are likely to give greater trouble, and as lines increase in extent, the same percentage of faults occasions more interruptions. Insulators are worked at a low factor of safety, considering which the results are remarkably good. He explained the weaknesses of insulators and the troubles from expansion. Trouble is often occasioned by tying in an old and crippled line with a new one. The cripples should be weeded out by testing in position. Most troubles occur in warm weather from lightning.

At the close of the session Professor Creighton gave a demonstration of testing insulators with the oscillator, a portable type weighing 200 pounds being used.

R. P. Anderson, with the help of a crew of three men, gave a demonstration of replacing insulators and cross-arm on a live line using pin-type in-

Digitized by Google

sulators. Three insulators were removed, a cross-arm replaced and wires tied up to new insulators in 25 minutes. The necessary tools have been used for some time without accident on the 33,000-volt line of the Western Ohio Railroad. The tools for this work are made by the Cronin Electrical Appliances Company, Wapakoneta, O.

At the session on Thursday morning Vice-president Rose occupied the chair. E. Burt Fenton presented a paper entitled "Snuggling Up to John Smith." This discussed the best methods of securing the good will of the community and creating public sentiment favorable to the utility corporation. An abstract of this paper was given in the last issue.

The discussion was opened by Thomas F. Kelly, of Dayton, who complimented the paper and pointed out that some managers accept the principles laid down, but fail to carry them out in their own organizations. Every manager should find out what is being done in his own company. He proposed a suggestion box in the company's office for the use of customers, as done at Dayton, where the "public-be-pleased" policy is in force. He gave a list of "Don'ts" to be observed by meter readers.

E. W. Doty, now with the Columbus Railway, Power & Light Company, pointed out the necessity of pleasing the women. The attitude of meter readers is more important than that of managers. The suggestions of the paper constitute an effective campaign against municipal ownership. It is necessary to let the public know what the company is doing and why it is doing it.

H. B. Bixler, of Akron, also considered Jane Smith an important factor. The more frank you are with customers, the better they like you. If people take time to come and ask questions, time should be taken to satisfy them. He has found the minimum charge a large source of complaint.

T. O. Kennedy, of Massillon, emphasized the necessity for publicity. The association should take up the matter of a state-wide campaign, and have a lecturer available for club luncheons, meetings of chambers of commerce, etc.

D. L. Gaskill, of Greenville, said that John Smith must be convinced that the company is trying to please him. He advised every manager to look over his business and remove any irritations that might exist. He considered a written application for service entirely unnecessary for new customers. The public must be educated along utility lines even though they do not know it. Central-station men should be proud of their business and ready to talk about it at any time to club meetings, etc. They should also buy advertising space in newspapers, and tell the public about their business, even in the smallest communities. Great attention should be given to the metermen, as they are continually in contact with the public. In small towns, the company president should know a large proportion of the customers personally. There should not only be inspection of premises on complaints, but periodic visits to see if service is satisfactory.

Mason H. Lytle, of Piqua, thought some educating of the public should be done with respect to rates, and why they are different for power and residence lighting. The customer should be convinced that there is no more profit in the latter than the former.

W. R. Power, of Huntington, agreed with Mr. Gaskill that a written application is not a necessity, but he regarded it as desirable for getting correct names, etc. His company takes the application blank to the customer upon telephone request. One or two chronic kickers are useful in keeping an organization keyed up to the highest efficiency. Delinquent notices should be worded as diplomatically as possible and not be irritating. Managers and commercial representatives should be good mixers, and should be members of local organizations.

F. C. Caldwell, of Columbus, said it was desirable to provide means for a customer to get a complaint out of his system. Complaints are useful to the company in pointing out defects in service and weak points in methods. Employees should realize that they can be public educators on electrical matters.

H. Whitford Jones, of Cleveland, cited an example of publicity in connection with a rate adjustment. In one case where municipal ownership was under discussion, a report on costs, with comparison of company service, was sufficient to defeat it. It pays to explain things fully to the public.

The report of the Meter Committee was then presented by A. H. Bryant.

Report of the Meter Committee.

This report consists mainly of a paper by W. A. Halliday, presented at one of the committee meetings, on methods of test and errors involved in metering loads requiring instrument transformers. An error of five per cent may be introduced by the use of transformers not adapted to the work. Opening the secondary circuit of a current transformer may affect its accuracy and is also a source of danger. Four methods of testing are considered: (1) testing meter only and neglecting errors of transformers; (2) testing meter only but applying average correction of type of transformer used; (3) testing meter only and applying predetermined corrections of particular transformers used; (4) testing meter and transformers together as a unit. The first method permits large errors and the average error may be as much as 2.5 per cent. By the second method the errors should be kept under 0.6 per cent. Phase-angle errors may be added to these errors of ratio when the power-factor is low. The accuracy of the fourth method depends upon the testing apparatus used. It may seem ideal, but has the disadvantages of danger, necessity of extra equipment, difficulty of controlling load, complications in determination of standard values, liability of interruptions to service, and additional cost of testing. The first method is the simplest, and will do for some installations. Otherwise the second method is to be preferred for all except special cases. Interconnections of secondaries should be avoided wherever possible.

The committee has also drafted a suggested set of rules and regulations governing watt-hour meters, which are given in the report. This was done at the request of the Executive Committee for presentation to the Public Utilities Commission.

The discussion was opened by William Bradshaw, of Westinghouse Electric & Manufacturing Company, who spoke of instrument transformers, a subject of national importance. Cheap transformers should not be secured for important installations, but rather those with good characteristics, whose errors can be neglected in testing. While corrections can be accurately determined, the conditions of use, such as power-factor, are variable, so that the result is only an approximation anyhow. The manufacturer calibrates both transformers and meters for average conditions. He knew of one man being killed by opening the secondary of a current transformer. He favored approximate methods of testing instrument transformers as the central station is hardly justified in the expense of apparatus for null methods. He did not favor self-contained meters for currents as high as 300 amperes, as they are difficult to test and more sensitive to external fields and to short-circuits.

E. A. Wagner, of the Fort Wayne Electric Works, spoke of the sources of errors in instrument transformers. In potential transformers the primary winding is of greatest importance, while in current transformers the secondary is of more importance. The range of errors in different models is greater than ordinarily supposed. He showed curves of variations of ratio and phase angle with load and power-factor in Fort Wayne and other meters. Transformers with a small range of errors should be selected, as a combination of errors might result in a bill 10 per cent too low. It pays to get the best.

John K. Himes, of Dayton, said that

Digitized by Google

in Detroit the meter and transformer are tested as a unit at long intervals, and the meter alone at shorter intervals. He favored full tests of secondary standards by some testing laboratory.

The proposed meter rules were discussed by L. C. Anderson, Weare Parsons, R. S. Graves, John K. Himes, F. C. Caldwell, H. B. Dates, George F. Snider and W. J. Rose.

Mr. Anderson, of Middletown, spoke from the standpoint of the small company and favored requiring secondary standards of utilities having over 1,000 meters, instead of 250 as proposed by the committee. An outside check is better for the smaller companies. In case of meters found more than 4 per cent fast, the refund should be computed from half of the consumption, instead of the total.

Mr. Graves, of Cincinnati, called attention to the objectionable rules adopted in other states.

Professor Dates, of Case School, said rotating standards should be checked every day against secondary standards, which should be maintained by every company having a separate meter department.

The effect of shipping meters after test was discussed by several, Mr. Parsons insisting that calibrations might be changed in transportation, and hence outside checking was useless.

Before the session adjourned, a telegram was read from Frank L. Tait, who regretted his inability to attend and sent wishes for a successful convention.

At the afternoon session an address was made by Beecher W. Waltermier, chairman of the Public Utilities Commission of Ohio. Mr. Waltermier sketched the development of American life to its present complexity and showed the dependence of the people upon the service of the public utilities, as well as the dependence of the latter upon the public. Both have a common interest, which can best be promoted by concord, not by discord.

Election of Officers.

The final session on Friday morning was called to order by President Hard, and the report of the Nominating Committee was presented by G. E. Miller. This report was adopted and the following officers elected for the ensuing year:

President, W. J. Rose, Alliance.

Vice-president, L. C. Anderson, Middletown.

Secretary-treasurer, D. L. Gaskill, Greenville.

Executive Committee: C. V. Hard, Wooster; F. J. Derge, Toledo; O. H. Hutchings, Dayton; Elam Fisher, Eaton; Robert Lindsay, Cleveland.

Advisory Committee: W. W. Freeman, Cincinnati; R. P. Stevens, Youngstown; E. A. Bechstein, Sandusky.

Finance Committee: D. J. Hard, Cleveland; T. O. Kennedy, Massillon; A. L. Thuma, Ironton.

Meter Committee: A. H. Bryant, Cleveland; George F. Snider, Toledo; Ray Wolford, Newark; John K. Himes, Dayton; Adrian Tobias, Youngstown.

Editorial Committee: D. L. Gaskill, Greenville; W. A. Wolls, Columbus; W. J. Rose, Alliance.

Illumination Committee: S. E. Doane, Cleveland; L. C. Anderson, Middletown; F. C. Caldwell, Columbus.

Transmission and Distribution Committee: M. H. Wagner, Dayton; S. M. Rust, Greenville; H. W. Hough, Cleveland; W. R. Power, Ironton; W. S. Smith, Tiffin.

New Business Co-operations Committee: J. E. North, Springfield; J. R. McCoy, Columbus; W. A. Wadsworth, Cincinnati; A. K. Young, Toledo; F. C. Morrison, Newark; H. B. Bixler, Akron; H. C. Gillie, Cleveland; W. E. Quillan, Alliance; F. B. Steele, Dayton.

W. J. Rose.
President, Ohio Electric Light Association.

Mr. Rose is general manager of the Alliance Gas & Power Company, Alliance, O., having occupied this position since 1908, when he left Cleveland. Last year he was president of the Alliance Board of Trade, and has been prominent in civic affairs. He was one of the founders of the Alliance Advertising Association and has been prominent in the Chamber of Commerce, upon whose Executive Committee he is now serving. Mr. Rose is also a director of the Alliance Country Club. He is a technical graduate of Columbia University.

Committee on Standardization of Voltages: S. E. Doane, Cleveland. W. C. Anderson, Canton; O. H. Hutchings, Dayton; E. H. Beil, Youngstown; H. L. Wallau, Cleveland.

Insurance Committee: L. K. Funkhouser, Dayton; F. C. Dunbar, Columbus; A. P. Martin, Cleveland.

Advertising Committee: T. F. Kelly, Dayton; W. E. Richards, Toledo; E. A. Bechstein, Sandusky; W. J. Rose, Alliance; R. H. Wright, Cleveland.

Station Operating Committee: Henry B. Dates, Cleveland; W. P. Hurd, Urbana; William Long, Toledo; Thomas B. Coughlin, Scranton, Pa.; N. G. Reinicker, Detroit, Mich.

L. K. Funkhouser then reported for the Auditing Committee that the accounts had been found correct. This report was adopted.

President-elect Rose was then called upon and voiced his appreciation of the honor conferred.

B. W. Waltermier, when called upon, recited an original poem, entitled "The Sons of Cain."

The report of the Committee on New-Business Co-operations was then presented by Thomas F. Kelly. This report detailed the meetings which had been held by the committee during the year, giving titles of papers presented and list of companies represented. It was recommended that a member of the next committee collect power data of installations in the state, and compile them in form for distribution, and a report be made upon them at the next convention. It was also recommended that meetings of this committee, the Meter Committee and the Transmission Committee be held on successive days in the same town, to accommodate those who would like to attend all. These meetings should be held in the smaller cities.

In opening the discussion Mr. Kelly pointed out that attention to power problems had predominated at the committee meetings. The attendance at these meetings totaled over 400. The Industrial Electric Heating Association was born at these meetings, and this subject will no doubt soon be a big factor in gross revenue.

J. E. North, of Springfield, emphasized the great interest which had been shown in the committee meetings. The paper on raw-water ice making had assisted the Springfield company to get a contract of this character. This also benefited the public, as the price of ice was reduced. He suggested that for the next year's work the committee be divided into three sections for the different classes of service.

F. B. Steele sent in a written communication favoring the collection of data by the committee. The smaller companies often have no trained power engineer and hence fail to secure business otherwise obtainable. His company has loaned an engineer for this purpose and he considered the practice advantageous to both companies.

C. I. Crippen, of Wheeling, W. Va., suggested that meetings of the committee be carried over into the evening, so that personal relationships could be improved around the dinner table while details were discussed informally. He favored the collection and tabulation of data, and knew of contracts which could have been closed if

Digitized by Google

the necessary information had been available.

O. B. Welch referred to raw-water ice and said there was no more excuse for a separate ice plant in a town than for an additional central station. Information for this process should be prepared beforehand, analysis of water made and trial cakes frozen. A change to this process in one plant had saved enough to pay interest on the entire investment.

Mr. Gilbert, a Detroit manufacturer of ice-making machinery, said that merchantable raw-water ice can be made from any water supply except the alkaline water of Texas and Oklahoma. He had many data on electrically driven plants, which were available to the central stations. An ice plant is a very desirable load. The plants installed in Detroit had increased the central-station revenue by $65,000.

A. K. Young, F. H. Stambaugh, D. L. Gaskill, S. F. Messer and Weare Parsons also joined in the discussion.

H. O. Loebell then gave a talk on "Industrial Electric Heating" with special reference to the work accomplished in Toledo, where a load of 20,000 kilowatts has been connected, representing a consumption of 7,500,000 kilowatt-hours per month, with a good load-factor. In this field it is necessary to first study present methods and find how much heat is wasted. The efficiency usually depends upon the temperature at which the operation must take place. If this temperature is high, most of the heat developed by fuel will go up the flue. In low-temperature operations extra air is usually introduced, which also wastes heat. Strong points for electric heating are the ease of regulation, cleanliness and convenience. In considering a prospect of this kind, an analysis should be made of the load, the cost and the effect on the power station. Suitable apparatus must be developed and a rate made which will hold the business. If the load is not permanent, its acquisition will be a detriment. In the Overland plant at Toledo enameling ovens are in operation in sizes 7 by 8 by 10 feet up to 20 by 40 by 8 feet. The standard heating unit is operated on a 440-volt circuit and has a capacity of 10 kilowatts. The cost is greater than for heating with fuel, but the advantage is a greater and more uniform output. Spoiled material is greatly reduced on account of the close temperature control and comparatively low temperature of the source.

The report of the Electric Vehicle Committee was then presented by C. H. Chappelle. This committee has been working up information which will soon be distributed. Improvement in details of vehicles and storage batteries is noted, as well as progress in standardization. The small industrial truck represents a promising field.

The discussion was opened by George D. Smith, of the General Vehicle Company, who pointed out that the experimental stage was past, and the manufacturer now knows what to recommend for any specific service. Certain parts of the country have special requirements, and the vehicle must be adapted to the work. Only four per cent of the central stations in the country are operating electric trucks. More trouble has been experienced in adapting trucks to the needs of utility companies than in any other service. Their requirements are varied and usually they do not know what they need, nor use the trucks merely for the purpose ordered. Examples were given of the abuse of trucks in central-station service and of savings in expense where used to advantage.

Mr. Drake's discussion will be given in greater detail in a subsequent issue.

F. B. Neely, of the Electric Storage Battery Company, explained the construction of the plates now used in Ironclad Exide batteries. One such battery has reached an age of 51 months in service.

D. L. Gaskill advocated co-operation in the work of the New-Business and Vehicle Committees.

L. T. Block, manager of the Utilities Indemnity Exchange, explained the activities of the concern in respect to liability and fire insurance.

The meeting passed a vote of thanks to Colonel Hard and a motion endorsing Electrical Prosperity Week and at noon the convention adjourned.

Kentucky Mines to Operate Electrically.

Definite developments are noted in the project to establish a large central power station at Hazard, Ky., to supply power to the mining operations in that section within a radius of 25 miles. Edward O'Toole and Howard N. Eavenson, of Gary, W. Va., well known coal and power operators, and Baltimore interests are financing the project, which, it is stated, will cost more than $250,000. The power plant of the East Tennessee Coal Company has been taken over, an additional unit will be installed, and the plant operated temporarily to supply the development needs, while the permanent station is being constructed. R. D. Baker, of Hazard, connected with the Kentucky River Power Company, is also interested in the project, and stated in Lexington that the central station would be in operaion inside of 90 days. It is said that numbers of the coal mine operating companies, which have secured their leases from the Kentucky River Coal Corporation, a new coal combine, have contracted for service. At Hazard, R. L. Cornell is in charge of the project, though it is stated that Mr. Baker will supervise the actual construction.

A reinforced concrete central plant is the permanent improvement in progress, to house a turbo-generator unit, running condensing, with automatic stokers and ash-handling equipment, etc. A transmission line is to be built through the heart of the mining country from Hazard to First Creek, to be carried on 40-foot white chestnut posts with galvanized cross-arms.

Effective Resistance and Inductance of Iron and Bimetallic Wire.

When a direct current flows in a wire, the distribution of the current is uniform over the cross-section of the conductor. When, however, an alternating current flows in a wire there is a tendency for the current to crowd to the outside. This phenomenon becomes more pronounced the greater the number of alternations of the current in a given time and, in iron wires the greater the current in the wire. In some cases the flow of current is confined almost entirely to a thin shell on the outside of the wire and hence arises the term "skin effect" for this phenomenon. The effective resistance of the conductor increases as the frequency of the alternations increases and at the same time the inductance, which depends upon the magnetic field, is diminished.

When the conductor is of simple form and the magnetic permeability of the material is known, the effective resistance and inductance can be calculated. The investigation, the results of which have been published by the Bureau of Standards, in Scientific Paper No. 252, was concerned with the skin effect in conductors containing iron. Two classes of conductors were considered in particular: the iron telegraph and telephone wires and copper-clad bimetallic wires. The latter have a core of steel surrounded by a shell of copper. The effective resistances and inductances of these conductors were determined experimentally for different strengths of current and for frequencies up to 3,000 alternations per second. The results for iron wires obtained with very small currents were compared with values computed by known formulas.

Formulas are developed in this paper which permit a similar comparison between measured and computed values for the copper-clad wires. The paper concludes with wire tables computed by means of the new formulas.

Digitized by Google

THE THREE MOST IMPORTANT PRICE-FIXING CASES NOW BEFORE THE PUBLIC—THE FORD, VICTOR AND KELLOGG CASES.

By Elton J. Buckley.[1]

I have just been reading in the United States Court reports the first intelligent information I have had as yet as to the real gist of the court's decisions in the three recent celebrated price-fixing cases—the Ford automobile case, the Kellogg corn-flake case and the Victor talking-machine case. In all these cases the manufacturers tried with the utmost ingenuity to tie up both jobbers and retailers so that the wholesale and retail prices on their various products would not be cut. The United States Court decided against all of them. In the Kellogg case the decision was not final or complete, but indicates the mind of the court on the main question whether a manufacturer may compel a retailer, whom he has not sold direct, to sell at a price which the manufacturer dictates.

Some attention was paid to these three cases by the newspapers, but as usual, the reports were badly garbled, and in order that the business world, which is so keenly interested in the subject from one standpoint or the other, should have a clear conception of the progress of legal events, I will briefly give the point involved in each of the three cases.

The Ford Case.

The Ford Motor Company has always tied everybody up to sell Ford cars at retail at regular list prices. One of its agents or sellers in Ohio cut the price and Ford at once asked for an injunction and damages. The Ford plan of limiting the price was to do what is called licensing its dealers, the condition of the license being that they should resell at regular Ford prices. Of course Ford's idea was that if anybody violated that condition and cut the price, he would revoke the license to sell and get an injunction preventing the cutter from selling any more cars that he might have on hand.

The plan did not succeed. The court held that in spite of the "licensing" scheme, Ford had actually parted with the title to his cars, and the buyer therefore had the right to do as he pleased with them. The court said it was true Ford had made a contract with his dealers not to cut the price, but it was illegal and he could not enforce it. This case enforces the doctrine laid down by the United States Supreme Court in the Sanatogen limited-price case, that whether an article is patented or not, a seller who has actually sold it, and parted both with possession and title, can not interfere with the retail selling price.

[1] Copyright, 1915, by Elton J. Buckley.

The Victor Talking-Machine Case.

The scheme used in this case was even more ingenious than the other. The Victor concern has of course patented its machines and its records. Everything, in fact, about its whole enterprise is tied up with patents. Every machine and every record had printed on it a notice that they were not sold, but that the Victor Company merely licensed the right to use them. The title to both machine and records remained in the Victor Company until the patents expired, according to this clever scheme. Here, too, this "license" could be revoked the minute somebody—buyer or licensee, whichever you like—broke the Victor Company's rules, the most important of which was of course the rule to sell at a fixed price. And if the price was cut the Victor Company, under its contract, could go in and take its goods back.

The "license to use" was granted upon the payment to the Victor Company in the beginning of a sum which the Victor Company called a "royalty," but which corresponded exactly with the price charged both for machine and records.

Macy & Company, the New York department storekeepers, cut the price of Victor records, and the Victor Company promptly revoked their license to sell and demanded the return of all unsold goods on the ground that breaking the price condition constituted an infringement of its patents! Macy & Company resisted, and the Victor Company then applied for an injunction, damages, etc., to prevent Macy & Company from continuing to cut prices. Here, too, the plan failed. The court said that inasmuch as the Victor Company had collected the whole royalty in the beginning, instead of in installments like royalties are usually collected, it showed that it was after all not a license, but a sale, and being a sale, the Victor Company could not interfere with the retail selling price.

The Kellogg Case.

The Kellogg Company is a manufacturer of toasted corn flakes and has always been particularly earnest in its effort to compel jobbers to sell retailers at a uniform price, and retailers to sell consumers at a uniform price. Its latest plan was to get a patent on some feature of the carton in which its corn flakes were packed. It could not patent the corn flakes. The company only sells jobbers that will agree to sell to retailers at the company's fixed price. It did not deal with retailers direct, so it printed a notice on each carton that the retailer who sold below 10 cents would be considered an infringer on the company's patents. Here the question was opened by the United States Government, who began suit against the Kellogg Company on the ground that its plan of limiting prices was a violation of the Sherman act. The first decision on this case has just been handed down. Although only on a part of the case, it is significant in that it declares that the fact that the carton is patented is immaterial in determining whether the company's plan of maintaining prices is a violation of law.

From these three cases, which are the latest and the most important at the moment before the public, the crux of the limited-price campaign may easily be seen. The manufacturer who wishes to enforce a fixed selling price is trying by every possible means to hold on to his goods until they get into the consumer's hands. That is, not hold actual physical possession, but hold the title. The reason is of course clear. As long as he holds the title, the goods are his to do as he pleases with, including fixing and holding the price at which they shall be sold. To reach this result the manufacturers license and patent and make agreements, but the trouble with all of their plans is that they want the cake and the penny too. They want to sell and not to sell. They want to collect the purchase price of their products and still say it is not a sale. The United States Supreme Court and several lesser United States Courts have repeatedly said, in the last few years, that this cannot be done. If the transaction is really a sale, no matter what it is called, the manufacturer is helpless to control the selling price in the hands of anybody who has acquired both title and possession.

There is only one way for a manufacturer to do what he wishes to do, and that is to actually hold title to his goods until they are sold to the consumer. He can do that by regarding retailers as his agents and actually—not by a legal fiction, but literally—consigning his goods to these agents, taking his pay only when they are sold. If he is willing to do that he can control the selling price clean to the limit, but he has not been willing to do it up to this time, owing to the enormous trouble and work which it involves.

Oklahoma produced 3,988,613 short tons of coal in 1914, valued at $8,204,015. This was a decrease of 4.25 per cent in quantity and 3.97 per cent in value from the production of 1913, and was due to the displacement of coal by petroleum and gas as fuel.

Digitized by Google

ANNUAL CONVENTION OF ELECTRICAL CONTRACTORS.

National Association Meeting at San Francisco Preceded by Meeting of California Association.

The fifteen annual convention of the National Electrical Contractors' Asso-tion of the United States was held at San Francisco, Cal., July 21 to 24. Headquarters were at the Clift Hotel. A special train bringing delegates from the East arrived at ten o'clock on Sunday morning, July 18. July 19 and 20 were devoted to a meeting of the California Association, a report of which follows:

The sixth annual meeting of the California Association of Electrical Contractors and Dealers was held in San Francisco, with headquarters at the Clift Hotel, July 19 and 20. An executive meeting was held Monday morning at 9:30 o'clock. At 12:15 luncheon was served at the Hof Brau Cafe. A regular meeting was scheduled at 2 p. m. at the Civic Auditorium. President C. V. Schneider presided and W. S. Hanbridge was secretary. The secretary reported the association has 16 new members added during the year and had held seven monthly meetings. Reports, including auditor's and financial report were approved and found satisfactory.

The reports of the vice-presidents of the different districts followed. L. R. Boynton, for San Francisco district, said a hard problem is being faced to bring around a better understanding, which would be to the advantage of every one concerned. L. Giltin reported for the Oakland district, saying Oakland has had good meetings and well attended. We have eliminated a good deal of evil by attending these meetings of jobbers and contractors. F. Somers, of San Jose district, said it is better to have the good will of our customers than the bad, and power companies would help us in our district; co-operation pays because it pays to say "I am a member." C. Lovebay, Santa Barbara, says the interest is rather low in his district. It was then voted that the acts of the Executive Committee be approved.

Albert Elliott, attorney of San Francisco, then addressed the convention on his favorite topic, "Co-operation between central stations and contractors." There is a distinction between self interest and selfishness. A self interest will always be first, but the question is: "Will you eliminate your selfish and narrow horizon?" Self interest is broad and has a wide horizon. Selfishness says: "The more business I can get the better off I am. I am the gainer." One grabs from the other and thinks this is business and fights on a price-cutting basis. Now about self interest. He does not grab business but the way to do it is to go out and make *new business*. Be not selfish. You have got to see that one is selfish because of ignorance. Self interest is much better. Educate yourself as a bidder, to make a reasonable profit. Education is the true co-operation. It is the soundest of all business propositions, so this education along these lines of co-operation must be good for the electrical business.

After Mr. Elliott's talk a discussion on "Estimates" was indulged in by several members.

Then followed the annual election of officers, with the following result:

President, C. V. Schneider, Sacramento.

Vice-presidents, L. Boynton, San Francisco; F. Nagle, Oakland; Frank Somers, San Jose; C. Lovebay, Santa Barbara; H. C. Reid, San Francisco; N. D. Powell, Stockton.

Secretary-treasurer, W. S. Hanbridge, San Francisco.

Mr. Schneider acknowledged with words of appreciation his election for the third time.

The dinner and regular monthly meeting of the California Association of Contractors and Dealers was held Tuesday evening, July 20, at Clift Hotel. Mr. Schneider, presiding, introduced first Mr. Hope, who read a paper prepared by a Joint Committee on Co-operation, whose principles had been adopted as the recognized principles of the California Association. Following this, Mr. Hillis and Mr. Berry made short addresses.

Stanley Walton, of the Pacific Gas and Electric Company, followed, saying that co-operation is coming for all interested. Lack of co-operation is a great drawback, but now there is a fairly good understanding. This condition has been brought about by a few men and to bring about this has always been hard work. In this understanding the Pacific Gas and Electric Company will make good on its side.

The chief speaker of the evening, W. L. Goodwin, vice-president and general sales manager of the Pacific States Electric Company, made a lengthy address which was closely listened to and received with applause, he dealing chiefly with the principle of co-operation.

J. R. Galloway, president of the National Electrical Contractors' Association, was introduced and said: "I want to express the great joy I have in being here. It is a privilege and an honor. Co-operation is a good rule to go by. I am much impressed with your individual ideas. You have made a practical demonstration of co-operation here. You teach us a great lesson. I extend my thanks and the East will reciprocate your welcome in the future."

Left Half of Group of Electrical Contractors at San Francisco Convention, July 21-24.

W. S. Hanbridge, after a few appropriate remarks, presented Mr. Galloway with an album of views as a closing feature.

On Tuesday, July 20, a meeting of the National Directors and Executive Committee was held at the hotel. On Wednesday, July 21, at ten o'clock, at the Civic Auditorium, was held an open session of the National Association. The address of welcome was made by E. F. Butte, president of the San Francisco Association. With a complimentary allusion he introduced James Rolph, Jr., mayor of San Francisco, who made a fine address to the assembled delegates, saying in part: "You are welcome to San Francisco and honor us by visiting our city. In my short life I have seen the electrical industry grow to one of the largest."

Mayor Rolph was followed by C. V. Schneider, president of the California Association, in a few remarks. The reply to Mayor Rolph's welcome was made by John R. Galloway, president of the National Electrical Contractors'

Digitized by Google

Association, saying it gave him great pleasure to meet so many electrical men and especially glad to see Western members who are alive to Association work and show interest by their presence. He could make no adequate reply for the warm expression of good fellowship. The electrical men have added to the service and luster of the exposition.

After this, Mr. Galloway presiding, followed an illustrated lecture with lantern slides by G. C. Holberton, of the Pacific Gas & Electric Company. Prefacing the exhibition of the pictures, Mr. Holberton said that in hydroelectric lines the Pacific Gas and Electric Company has invested $300,000,000. It pays out $12,500,000 annually, serving a territory of 40,000 square miles. Several hundred slides were exhibited to show the industrial development.

C. C. Moore, director-general of the Panama-Pacific International Exposition, being unable to be present, was represented by O. H. Cowell, who said: "The exposition is a celebration of American genius of this age, and it is our purpose to make this exposition for our own day, and therefore we desire the methods of modern progress, and therefore we are pleased to have you here as an integral part of this exposition, and although the exposition will decay the spirit of this convention will remain. Your convention is one of the epochs of the period and your work is valuable for human service. We believe you work for human betterment and your meeting will be an inspiration to you and to us."

James R. Strong, of New York City, gave a short talk on the objects of the Society for Electrical Development. The Society is developing and succeeding; its theory is really practical co-operation. He also spoke of Electrical Prosperity Week.

T. C. Bliven, general manager of the General Electric Company, then addressed the convention. Mr. Bliven reviewed briefly the history of the electrical business. Edison, Brush and others had to market their products at the start, and after a time turned this over to the contractors; then the manufacturer had his hand in the business, but manufacturers found that the contractor could do the business better. The contractor has made great progress. He then spoke of the province of the manufacturer, jobber, contractor and central station, all interdependent, and their work should be done with profit to each other. Co-operation does not mean lack of competition. We should cease criticism of each other; forget our differences, and help the one who is trying to help himself. We should strive to bring about this spirit of toleration, for it is the best for all of us.

At the Executive Committee meeting on Thursday, July 22, P. H. Jaehnig, chairman of Legislative Committee, spoke of the good done by the issue of 6,000 copies of his report, which have been distributed free to many cities.

G. M. Sanborn, of Indianapolis, reported on the Uniform Data and Sales Book. The distribution of this book will also be continued. V. C. Gilpin, of Brooklyn, N. Y., master of transportation, spoke commendatory words of praise for their reception in state and city.

J. R. Strong expressed his appreciation of the reception by Californians.

J. F. Maron reported for the Membership Committee.

P. H. Jaehnig presented a report urging all employees to avail themselves of the benefits of liability insurance.

The final business session was held at ten o'clock on Friday, July 23. At this meeting New Orleans was selected for the convention of 1917. The officers for the ensuing year were elected as follows:

President, John R. Galloway, Washington, D. C.

First vice-president, W. L. Hutchinson, Kansas City, Mo.

Second vice-president, J. C. Rendler, Los Angeles, Cal.

Third vice-president, J. S. Musser, Harrisburg, Pa.

Treasurer, James H. Hilton, Syracuse, N. Y.

Secretary, George H. Duffield, Utica, N. Y.

Sergeant-at-arms, James F. Burns, Schenectady, N. Y.

According to a change in constitution and by-laws, national directors can be voted for only by members of the National Association. State members have no vote. One-cent letter postage was endorsed by the Executive Committee, as well as by the convention.

Robley Stearnes, who is the personal representative of Governor Hall, of Louisiana, and officials of that state, spoke words of appreciation for the convention going to New Orleans in 1917. It was voted to have the annual meeting not in July, but the third Wednesday in October.

Ernest McCleary spoke on the Code, 99 changes in which occurred in March. The Bureau of Standards, at Washington, has undertaken a new code of safety rules; these rules will be made up by well informed men. The National Association has played its part well in the building of the Code.

A paper was read on liability insurance; it was strongly recommended to members and through committee efforts the cost has been reduced one-half. The association adopted a resolution to take up this subject amongst its members. This reduction in rates is practically in effect in three states now.

Group of Electrical Contractors at San Francisco Convention—Right Half.

An interesting feature of the convention was the fact that eight of the original fifteen charter members at Buffalo were present at this meeting.

On Saturday, July 24, through the courtesy of J. J. Carty, chief electrical engineer of the American Telephone & Telegraph Company, the members enjoyed the unique experience of a long-distance talk between San Francisco and New York at the booth of the company on the exposition grounds.

Entertainment Features.

On Monday, July 19, a tea was given at the Fairmont Hotel. On Tuesday, July 20, the ladies were entertained with a luncheon at Tait's. At 7:30 p. m. a trip was made through Chinatown. On Wednesday, July 21, there was a card party for ladies at the Clift Hotel. In the evening a reception and dance for all was held in the main dining room of the Clift. On Thursday, July 22, there was an auto ride for ladies and guests through the Presidio and Golden Gate Park, tea

Digitized by Google

being served at the Japanese Gardens in the park. In the evening was held the National Electrical Contractors' Association night at the Zone. The party left the Clift Hotel on special cars at eight o'clock. Various places were visited and the fun was fast and furious. On Friday a ladies' auto ride took place through Oakland. On Friday evening there was a dinner-dance and vaudeville at Hales Pompeiian Court. On Saturday, July 24, the members and ladies gathered at the Clay Street wharf for a trip around San Francisco Bay. They landed at the exposition grounds at 2:15 p. m., where President Galloway was presented the official plaque of the exposition. There was a large committee on entertainment which did its work in a very satisfactory manner.

The next annual convention will be held in New York City.

Demonstration of Electrical Appliances by Tasmanian Hydroelectric System.

Arrangements are being made by the Hydroelectric Department of the Government of Tasmania to hold a practical demonstration of the economy and convenience of cooking, heating, and lighting by electricity. This demonstration will be given during October in the new auditorium at Hobart, Tasmania, and every effort will be made to arouse the interest of the people, to whom admission will be free.

The object is to increase the uses of electricity by giving the people an opportunity of seeing the various uses to which it can be applied. As electricity will be much cheaper when the Government hydroelectric plant is completed, this demonstration is very opportune, as it will show many new ways in which electric power can be utilized.

The Government is asking local firms who carry electrical appliances to cooperate in this work by furnishing the various appliances for the demonstrations. As this will be a great advertisement for such dealers, there is no doubt as to their participation.

Likewise, this will be a unique opportunity for manufacturers to bring their goods to the notice of the buying public, and while without doubt many American electrical appliances will be displayed by local dealers, yet some additional displays by American manufacturers would prove to be of exceptional publicity value, and also would bring our goods prominently to the notice of the buying public at a time when the demand for such goods will be on the increase. The demonstration is in charge of Mr. Butters, engineer in chief of the Hydroelectric Works, Hobart, Tasmania.

ELECTRIC WELDING.—III.

By Gordon Fox.

Miscellaneous Welding and Associated Processes.

One of the most common electric welding processes is "spot welding." Spot welding, as its name indicates, is the method of joining together metal sheets or plates by welded spots serving the same purpose as rivets. Machines for spot welding comprise the same essential parts as machines for butt welding, but they differ materially in shape, because of the different nature of the work and different character of stock handled. A spot-welding machine includes a transformer for reducing alternating-current power to 1 to 3 volts in pressure; a switch for connecting and disconnecting the circuit; means for regulating the voltage; and means for applying pressure. In these respects butt welders and spot welders are similar. In spot welding the article is not clamped as for butt welding. Pointed copper electrodes, properly shaped to suit each class of work, introduce the current. The operator places the lapped stock between these copper die points and brings the points against the stock by means of a hand lever. He then connects the electric power, causing a heavy flow of current from one die point, through the metal to the other die point. The resistance of the stock causes local heating under the die points. When welding temperature is reached the dies are squeezed more firmly, the plastic metal is forced together and sets, causing a union of the two sheets over a circular area of approximately one-fourth inch diameter. The pressure is relieved, the die points opened, the stock moved to a new position and the operation repeated.

The field for spot welding is very broad. Almost any sheet-metal job where riveting is done on quantities of duplicate parts, can be handled to better advantage by spot welding. The variety of applications can best be shown by enumerating some products utilizing the process in the course of manufacture. Kitchen ware affords many illustrations; handles are welded upon coal hods, waste cans, pails, pans, cups and many similar articles. Elevator buckets, oil cans, letter boxes and stove pipe are a few small articles utilizing the method. Among the larger products are: Stoves, filing cabinets, refrigerator linings, automobile tonneaus, metal culvert, sleds and runners. Spot welding is used extensively in the manufacture of steel railway cars, particularly for the interior work and trim. Fig. 17 shows several other spot-welded products.

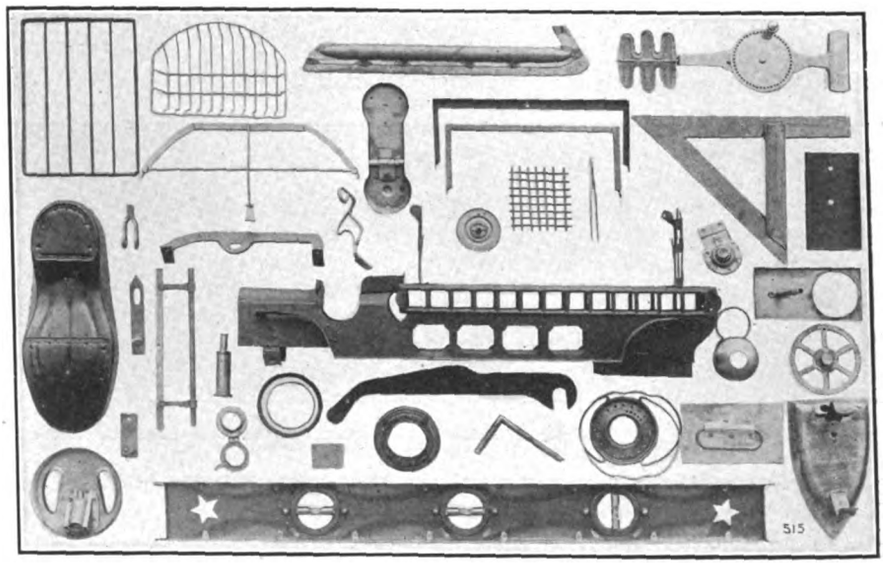


Fig. 17.—Examples of Spot Welding.

Nearly all the metals can be successfully spot welded. Sheet iron and sheet steel are the materials most commonly used, and are very easy to weld. Galvanized iron can be welded, although it will burn off the zinc at the spot where the weld is made. No. 28 gauge galvanized iron is about the lightest weight that can be successfully welded, since, with the lighter weights, there is insufficient stock under the zinc. Tin can be welded to tin or to sheet iron. A discoloration occurs at the weld, however. Sheet brass and bronze can be welded to sheet brass or to sheet steel. German silver, zinc, nickel and many alloys can be successfully welded. Sheet aluminum can be spot welded, but the surface is left slightly roughened under the die points. It is rather difficult to weld sheet copper, due to its low electrical resistance, but it can be done.

Spot welding is essentially a sheet-metal process. It is necessary to have

Digitized by Google

the two pieces of metal touch each other at the point where the weld is to be made. If the stock is very heavy slight buckles or depressions in the surfaces will prevent good, concentrated contact, the pressure of the dies being insufficient to force the heavy stock into intimate contact under their points. It is, therefore, difficult to weld heavy-gauge sheets, except in large, special machines. Light gauges of metal can be easily welded to heavier gauges, or even to solid pieces, the single die forcing the light-gauge metal into proper, concentrated contact. Another difficulty arising when it is endeavored to weld heavy stock, is the fact that when enough current is conducted through the copper die points to heat heavy sheets the copper points themselves tend to soften and wear more rapidly.

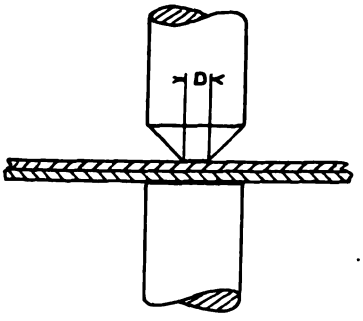


Fig. 18.

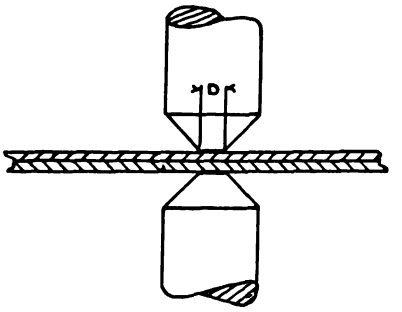


Fig. 19.

It is necessary that the die points be properly proportioned and maintained to insure good results in spot-welding work. The shape and size of the die points is important. Tables II and III show the proper dimensions for the dies for different weights of metal, the shape of the dies being shown in Figs. 18 and 19. When it is desired to secure a smooth surface upon one side of the welded article that side is placed upon the flat die. There will then be a slight depression upon the reverse side. When welding galvanized iron it is imperative that both dies be pointed to prevent an accumulation of zinc and consequent roughened die points.

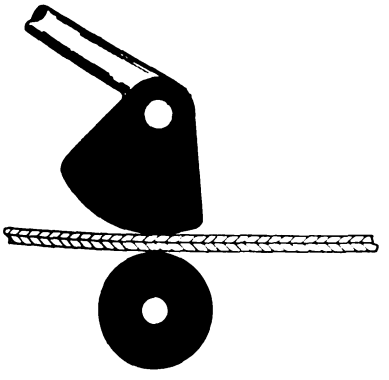


Fig. 20.

Spot welding is a process which competes with riveting, double seaming, flame welding, brazing or soldering, according to the nature of the work. It is superior to all these manufacturing processes in strength and cost of production. Spot welds can be made very rapidly, as many as 1,000 welds per hour being not unusual on plain work. One man cannot approach this number of inserted rivets in an equal time, aside from piercing the necessary holes and furnishing the rivets. In appearance of the job the spot weld excels, because it leaves a smooth, flush surface. A rivet requires a head, seaming is unsightly and flame welds or soldering leave a fin, which must be removed. Spot welds are not affected by temperature, hence will hold tight joints, whereas rivets expand and loosen under heat.

The energy required for spot welding is not great. Considerable power is involved in each weld, but the duration is so short that the resulting consumption of energy is low. Table IV gives a basis for calculating the power cost for spot welds of clean sheet steel. The table also shows the time that the power is applied. The number of welds per hour depends upon this figure in conjunction with the rate at which the machine can be fed. The rate of feed depends largely upon the particular article.

Fig. 21.

TABLE II.—SIZE OF POINT IN FIG. 18 FOR IRON OR STEEL.

Gauge No.	Diameter D in Inches
28	0.125
26	0.125
24	0.125
22	0.125
20	0.188
18	0.188
16	0.188
14	0.25
12	0.25

TABLE III.—SIZE OF POINT IN FIG. 19.

Iron or Steel. Gauge No.	Diameter D in Inches
10	0.25
9	0.31
8	0.31
7	0.31
6	0.38
5	0.38
4	0.38
3	0.44
2	0.44
1	0.44
0	0.44
Galvanized Iron.	
Gauge No.	Diameter D in Inches
22	0.125
20	0.125
18	0.188
16	0.188
14	0.188
12	0.250
10	0.250
9	0.375
8	0.375
7	0.375

TABLE IV.—SPOT-WELDING DATA.

No. of Steel	Kilowatts Required	Seconds per weld	Power Cost per 1,000 Welds at 1 cent per Kilowatt-Hour
28	5	0.3	$0.004
24	7	0.5	0.01
20	9	0.7	0.018
18	10	0.8	0.022
16	12	0.9	0.030
14	14	1.0	0.039
12	16	1.3	0.058
10	18	1.5	0.075
8	23	2.5	0.16
6	28	4.0	0.31
4	33	6.0	0.55

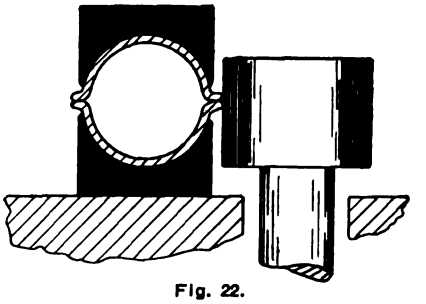


Fig. 22.

The highly intermittent spot-welding load is not particularly desirable for central-station lines. It has been claimed that in many cases the duration of the peak is so short that integrating meters fail to record the entire energy consumed, due to their retarded action. Special rates are, therefore, sometimes arranged for spot-welding service.

Fig. 23.—Portable Welding Outfit.

The cost of spot welding is almost entirely labor cost. The cost of power is usually less than the cost of rivets. No greater skill is required for spot welding than is needed for riveting. A man can produce several times as many

Digitized by Google

spot welds in a given time as he can insert rivets, hence, from a cost viewpoint, the welding is to be preferred.

The strength of spot welds is excellent. It is possible by spacing the welds fairly close to weld two sheet-steel strips so that the weld is stronger than the strip itself. Tests on strips both welded and riveted have invariably shown failure at the riveted joint first. Moreover, the spot weld, being a union of the metal, is less subject to corrosion than a rivet joint having interstices to retain moisture.

An interesting and rather new development of electric welding similar to spot welding, is now employed in manufacturing handles, casters, pulley sheaves and similar products where the article can be readily stamped in two halves, the two pieces being welded together. Bosses are punched upon the stampings so that, when assembled, they form points or lines of contact along which the welding current is concentrated. The procedure is the same as in spot welding, the result being a weld between the two parts, along the bosses. Fig. 21 shows the method of welding pulley sheaves. Automatic machines are now built which perform this operation at considerable speed.

Another welding method coming into vogue is termed "seamless" welding, the purpose generally being to make a continuous weld in place of a seam. One method of seam welding employs roll electrodes to replace the die points used in spot welding. The lower electrode is a roll, the upper either a roll or a sector of a circle. The same principles apply here as in spot welding, except that a continuous seam results instead of a spot. For this work it is necessary to use only pickled stock, so that the roll may be assured intimate contact. See Fig. 20.

Another method of seam welding is illustrated in Fig. 22. Here one electrode is a roll mounted upon a vertical axis. The other side of the circuit is connected to the top surface plate of the welding machine. The work to be welded is clamped between blocks and the seam projections brought into contact with the slowly revolving center roll. These projections are thus heated and pressed into the work so that a seamless weld results. A notable example of this style of welding is a teakettle spout.

There are a number of cases where welds of light wire or ribbon stock are desired. A portable equipment for such service is illustrated in Fig. 23. A pincer-shaped clamping device is provided, which suffices to grip the ends to be joined, switch on the current, produce the thrust and disconnect the current, all automatically.

Aside from welding proper, electric heating methods of similar character are now used in a number of manufacturing processes. In the annealing of armor plate and machine tools preparatory to drilling or machining operations the same principles are involved. To anneal a section the electrodes of a low-voltage transformer are brought into contact with the plate, the current is switched on and increased until the desired heat is obtained, after which it is gradually reduced to zero. If the current were discontinued suddenly, rehardening of the annealed spot would be probable.

Electric heating is now resorted to in some cases for preheating, as in heating tubing uniformly over a given section previous to bending. If a bar of steel be placed between the clamps of a butt welder and heated and subjected to axial pressure, a considerable upset may be made in that portion between the jaws. If swaging blocks are now brought into play the upset may be formed into desired shape while hot.

The electric heating method is excellent in connection with brazing work. The article is clamped in the jaws of a butt welder, the current turned on and regulated until the desired temperature is attained, after which the spelter flux is applied. The heat is under perfect control with the stock in full view. The method is also superior to heating with torches, because a torch always burns out some of the zinc from the spelter and oxidizes the copper.

Hardening and tempering of steel can be easily and effectively done by clamping the stock in suitable dies of the butt welder, bringing it up to the proper temperature to produce the desired color and cooling in the usual manner. Since the metal is in plain sight of the operator and the heat is under perfect control, this method is ideal for work adapted to clamping.

Riveting and heading of rivets can be done in a machine having the same general characteristics as a welder. A cold rivet can be inserted into its hole and the two electrodes brought against the two ends of the rivet. When the current is applied the rivet is instantly heated, pressure being exerted to cause the upset and to form the head. This method has a number of points of superiority.

It has been attempted to set forth briefly the many applications of electric welding, and to explain the principles and methods involved. There is hardly an industtry which cannot derive benefit from the utilization of one or more of the electric welding or heating processes. In the foundry, locomotive shop and repair shop the arc welding processes are particularly useful. The automobile industry employs butt welding extensively, and many others of similar characteristics could well adopt it. The sheet-metal industries find spot welding a boon.

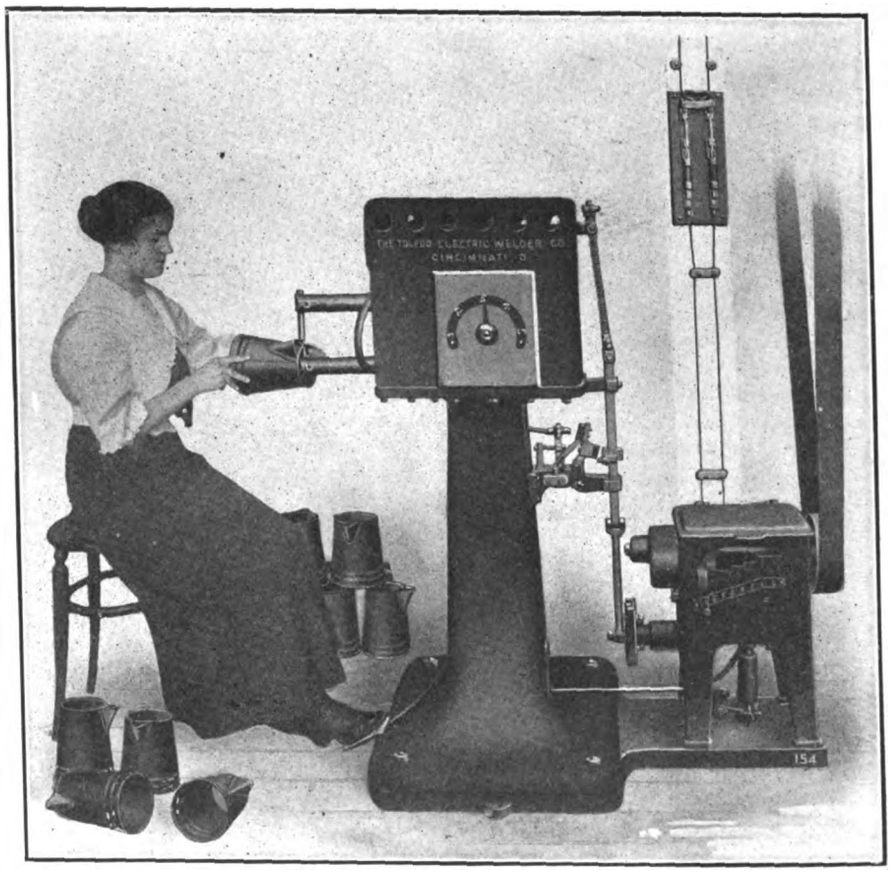


Fig. 24.—Spot-Welding Machine.

Digitized by Google

Vail Celebrates Seventieth Birthday—A Long-Distance Interview.

The New York *Times* publishes a very interesting account of a long-distance interview with Theodore N. Vail, president of the American Telephone & Telegraph Company, on the occasion of his seventieth birthday, Saturday, July 14. The story follows:

"On his estate, Speedwell Farms, Lyndonville, up near the Canadian line in Vermont, Theodore Newton Vail, president of the American Telephone & Telegraph Company, celebrated his seventieth birthday yesterday. There were thirty guests in a house party at Speedwell Farms, and Mr. Vail spent most of the afternoon driving with them. He found time, however, to read 300 letters and telegrams of congratulation and to answer many of them. He also received over the long-distance telephone the felicitations of his friends in San Francisco and other cities in the South and West. Over 550 miles of wire from New York, Mr. Vail received the congratulations of the New York *Times* and gracefully submitted to an interview on matters of great public interest.

"'I thank the *Times* for its well wishes," said Mr. Vail in a strong, clear voice over the telephone. 'I am 70, and I am having one of the happiest birthdays of my life. I had a very pleasant drive this afternoon, and I have been receiving the kind wishes of my friends. Seventy years? Well, I never felt better.

"'I have had several hobbies in my life, but just now my hobby is getting the best out of life. Do I contemplate giving up active business life? I can't. They won't let me. It is not a question of choice. Naturally if I consulted my own feelings entirely I would like to drop the harness. "Like" is hardly the word, for I do not mean I would like to give up work as long as I can do good.

Chances for Young Men.

"'There are still chances for doing well. Look around at the yong men of today. Their chances were never so big as they are now. In electrical science we have not yet begun to find out the capabilities for development.

"'The opportunities are still wonderful, and we shall continue to progress in adapting electricity to the service of man. There is much to be done, and I expect to do some of it. I have talked to San Francisco today, and I am now being interviewed over 550 miles of wire. This is an index of what has been done, and is also a hint to those who have faith of what can be done in the future. I believe electricity is going to be adapted more and more to our daily service. All we have done is but a beginning.

"'I do not predict any sudden discoveries. Electrical progress will not be an outbreak, but an evolution. The things we do now we are going to do better and more quickly. Ten years or more ago an interview like this would have been impossible. Now it occasions no surprise. The telephone illustrates what I mean by evolution. This ability to talk over great distance has been developed mile by mile, not by jumps of 200 to 500 miles, but in 10-mile stretches. We work on, bit by bit, to the perfect accomplishment.'

"'Have you in mind any improvements in telephonic communication?' Mr. Vail was asked.

"'No,' he replied, 'we never tell what work we are doing until we have made an improvement complete, ready for public use.'"

"Pull" No Longer Effective.

"Returning to the subject of the chances of success for young men, Mr. Vail said that while opportunities had increased, the time had also come when only merit in business life would win success. 'Father's sons' and 'somebody's relatives' can only make good by work and ability.

"'The young man who is willing to work and has ability and a good education, is the one who is going ahead,' continued Mr. Vail. 'There was a time when, because a person was the son of an old friend or had influence, he would be given a good position and boosted along. That day is past. Too much is involved in big business to have its affairs retarded because of a friendship. It has been discovered that one cannot run a business under the present high pressure by favoritism or nepotism. I don't mean that young men with friends are not given chances, but I say they have to make good or get out. Opportunities? Why, sir, the world is still full of them.'

"Mr. Vail is going to give many men opportunities to fit themselves for this strenuous battle of life. One of his hobbies has been to encourage farmers' sons to stay on the farms. He has lured many an unsuccessful country boy away from city careers to the farm. At the Lyndonville Institute, which he founded, there are at present 300 boys and girls, all learning, as he said, 'to become boys and girls for life.'

Holding Boys on Farms.

"'I have a real school here in Vermont,' Mr. Vail said, 'and the boys are expected to go back to the land. That is where the real wealth of the country lies, and I want the boys to share in it. I am educating them to be good farmers.'

"Sometimes, when Mr. Vail becomes reminiscent, he talks of the early days when he studied medicine under the direction of his uncle.

"'Had I remained in my uncle's office,' he said, 'I imagine I should now be a country doctor. Still, I have often said that the favorite employment of man is to speculate over what might have happened had he done something else.'

"Years ago, when Mr. Vail retired from the street railway business in Buenos Aires, he intended to retire from active business. He did not find time. The nearest he came to it was to take up farming as a recreation, a pursuit which his father wanted him to take up when his school days ended. Since 1893 Mr. Vail has had a country home at Lyndonville. Mr. Vail finds great pleasure on his farm.

"Mr. Vail some years ago turned his mind to scientific agricultural study, and he has maintained an experimental station at which the possibilities of the land are carefully tested. The neighborhood reflects the result of this work. New England pasture land, he thinks, demands sheep for its adornment. On the hills at Lyndonville graze the best herds of the district. On his 5,000-acre estate Mr. Vail also raises fine cattle."

Water Softener Effects Economy in Central-Station Plant.

A water softener recently installed at the power plant of the Mineral Point Public Service Company is giving excellent satisfaction.

After using the soft water in the boilers for a month, one of the boilers was opened and it was found that all the scale had disappeared, leaving the black iron clean. When the soft water was started, the tubes contained three-sixteenths inch of very hard scale.

The water being treated contains 22 grains per gallon of incrusting solids and daily tests of the softened water show from 4 to 5 grains per gallon.

As would be expected, several leaks were opened up in the boilers, which required calking, due to the elimination of the scale.

It also appears that a saving in coal of $350 for the month of June over the month of May has been made, even with an increased load in June over May of 23,550 kilowatt-hours generated. In other words, this is a decrease of 7.9 per cent in the coal bill, with an increase of 5.5 per cent in the load.

The softened water is also used with great satisfaction in the turbine glands, which have previously given much trouble from scaling and thus preventing sealing.

The Mineral Point & Northern Railway is also using this water in its locomotives with good results.

An interesting feature of the water

Digitized by Google

softener installation is that it is used for a feed-water meter. The water is delivered to the softener through an orifice at a controlled constant head, and the orifice is calibrated. By means of a recording voltmeter attached to the softener operating float, the number of minutes per day that the softener operates is recorded. It is necessary to make a correction for the exhaust steam condensed in the heater, which is done by a calculation of the interchange of heat units, based on the temperatures of the water entering and leaving the feed-water heater. This requires on an average in the Mineral Point plant 11.5 per cent of the water fed to the heater from the softener. So far, no bad foaming has taken place, and it may be said that the softener has fully met the hopes of the operators.

The softener was installed and is operated under the direction of H. G. D. Nutting, public utility expert and engineer, Milwaukee, Wis.

Wireless in Australasia.

A scheme for connecting Australia and the Pacific Islands by wireless telegraphy was formulated some years ago by representatives of Australia and New Zealand. The High Commissioners for the Western Pacific, Fiji, the Admiralty, and the Pacific Cable Board, met in conference at Melbourne in 1909 to consider a scheme which received the approval of the Commonwealth Government, and which comprised the erection of stations at Sydney, Doubtless Bay (New Zealand), Suva (Fiji), Ocean Island, Tulagi (Solomon Islands), and Vila (New Hebrides). The scheme was, however, not approved by the Imperial Government and no further concerted action was taken, but the majority of the stations recommended have since been erected by the Governments interested. A Commonwealth scheme of wireless telegraphy includes three high-power stations for long-distance communication, and seventeen low-power stations, at such intervals round the coast as to allow intercommunication from ship to shore. The high-power stations at Sydney and Perth are open for traffic, and are worked on the Telefunken system. Preliminary arrangements have been made for the erection of a third power station at Darwin, capable of communicating with Singapore. The following low-power stations, with the exception of Roebourne and Wyndham, are now in operation, and are worked under the Balsilie system: Victoria—Melbourne; Queensland—Brisbane, Rockhampton, Cooktown, Thursday Island, and Twonsville; South Australia—Adelaide and Mount Gambier; Western Australia—Geraldton, Roebourne, Broome, Wyndham, and Esperance; Tasmania—Hobart and Flinders' Island; Northern Territory—Darwin; and Papua—Port Moresby. It is intended to increase the number of stations to 32.

Coking of Coal at Low Temperatures.

In view of the importance now attaching to by-products from the increasingly used distillation and recovery process for making coke, the following summary of an investigation conducted at the Engineering Experiment Station, University of Illinois, by S. W. Parr and H. L. Olin, is of special interest.

Coke resulting from the low-temperature process contains from 18 to 22 per cent of volatile matter but retains none of the tar-forming constituents. In domestic appliances it kindles readily and burns with a bright, smokeless flame. A suction-gas-producer test made with this fuel compared favorably in ease of operation and efficiency with similar tests of anthracite.

The tar has a specific gravity of 1.069, contains less than 2 per cent of free carbon and is rich in low-boiling substances, many of which are suitable for use in internal-combustion engines. Its adaptability to wood-preservation processes is shown by its high content of tar acids, which constitute nearly 30 per cent of the crude material. The pitch residue amounts to 30 per cent and is low in precipitated carbon. Naphthalene is absent.

Results of these studies show that the coke, tar and gas have specific properties of especial value, and indicate that the process of coking at low temperatures could be established successfully on a commercial basis.

The full report on this investigation is published as bulletin No. 79 by the Engineering Experiment Station, and can be obtained on application to its acting director, C. R. Richards, Urbana, Ill.

New Municipal Electric Plant for Manchester, England.

Details have been made public of a big electrical scheme that is being promoted by the municipal authorities of Manchester, England. The local newspapers announce that the Local Government Board has agreed to the application of the authorities to borrow the sum of $2,104,615 for a new electricity generating station which is to be erected at Barton, near Manchester.

It is thought that perhaps the scheme in question might probably benefit American electrical concerns, as so many of the competing English firms are engaged in the manufacture of war munitions, and, in consequence they will possibly be unable to compete for the business.

BOOK REVIEWS.

"Applied Electrochemistry and Welding." By Charles F. Burgess and George W. Cravens. Chicago: American Technical Society. Cloth, 224 pages (5x8¼ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.50.

This volume consists of two separate books bound together. Applied electrochemistry is treated by Dr. Burgess, who is one of the best authorities upon this subject in the country, but who is erroneously stated upon the title page to be professor at the University of Wisconsin, a position which he has not occupied since 1913. The various subjects which are taken up are necessarily treated briefly, but a good idea of electrochemical applications may be obtained from the descriptions and the numerous illustrations. About half of the pages are devoted to electric furnace work, and the remainder to electrolysis and electroplating.

The subject of welding, as treated by Mr. Cravens, covers not only electric welding, but other processes for attaining this end. The advantages of the electrical method are brought out and the features of the different systems are given with illustrations of the various welders put out by different manufacturers. A few figures are given on the necessary energy for arc welding, which are of value on account of the scarcity of such data. This portion of the volume is also profusely illustrated, and constitutes a very useful summary of the existing state of the art.

"Practical Applied Mathematics." By Joseph W. L. Hale. New York: McGraw-Hill Book Company, Incorporated. Cloth, 206 pages (4¼x7 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This book was prepared for use by railroad-shop apprentices, and is a presentation of problems arising in shop work in the mechanical trades. The use of mathematics as a tool is shown. The material included has been made sufficiently broad to be useful in schools devoted to other trades and vocations, or even in the technical courses of public schools. There are 20 chapters, each dealing with a definite arithmetical subject, and the ground covered includes the mensuration of simple solids, elementary algebra and the extraction of cube root.

Electrical Exports to Argentine Republic.

May exports to Argentina from the port of New York included $63,000 worth of electrical supplies. To Brazil, there was sent in May from New York, $34,000 worth of electrical material and supplies.

Digitized by Google

New Electrical and Mechanical Appliances

Electric Ditcher for Removing Track Obstruction.

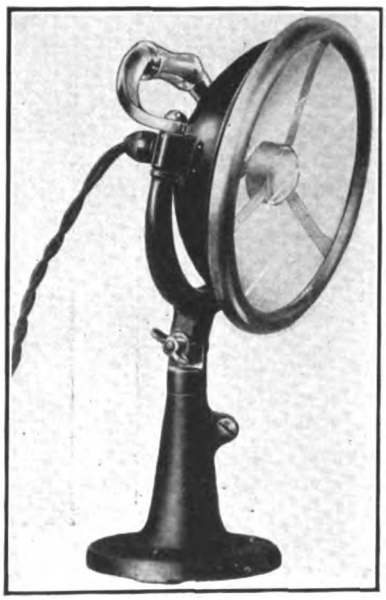
An electrically operated ditcher and dump car was the "salvation" recently of the Kansas City, Clay County & St. Joseph Railway, in the predicaments resulting from heavy rains. The downpours had caused unprecedented slides, whole hillsides moving in cases as much as 14 feet and taking the track with them, or overflowing the rails. The situation was such that hand labor would require weeks to remove the obstruction, and traffic meanwhile would be seriously discommoded even when parts of the track were cleared. The company, however, had already purchased a ditcher and two dump cars from the American Hoist & Derrick Company, the ditcher being one of the first electrically operated machines to be put out by the company. This equipment was on hand, set up and ready to work when the slides came, and it was hurried out on

Electric Ditcher at Work.

the line. In two days it had cleared the track so that cars could get through; and it proceeded with the removal of threatening masses of earth while interurban schedules were maintained. The equipment, getting power from the trolley, and easily handled, could quickly be shunted to a side track on the approach of passenger cars. The ditcher has an Ideal motor, 1,200 volts, fed direct from the trolley wire. The side-dump cars, one in front and one behind the ditcher, are operated by compressed air from the work car which moves the ditching equipment. The ditcher takes bites of three-fourths of a yard, and loads 35 to 40 yards an hour; it loads and removes two dump cars between the hour-schedules of the passenger cars.

New Searchlight for Use With Dry Cells.

There are numerous uses for a vehicle searchlight that may be operated successfully from dry-cell batteries. The new Pittsburgh searchlight, illustrated herewith, employs a powerful focusing lens in connection with an 8-inch parabolic reflector, which produces a beam of light with ample thrust for automobile and motorboat use for a current consumption of only one ampere, thus making it possible to use ordinary dry cells as the source of current supply. The lamp is a six-volt Mazda and can therefore be used with



Bracket-Type Searchlight for Trouble Wagon.

any six-volt lighting system, as well as with ordinary dry cells.

Different types of brackets are furnished with the lamp, making it suitable for use on pleasure cars, motor trucks, motorcycles, motorboats, and trouble wagons. For automobile use it may be mounted on the door or wind shield. It not only serves as a searchlight for reading sign boards, turning and backing, but answers the purpose also of an auxiliary headlight for use in emergency cases. For motorcycles it affords a satisfactory headlight that can be attached to any machine without the expense of installing a lighting system.

It enables the motorboat operator to pick out obstructions in any direction and at the same time affords him a strong light for landing. The motorboat outfit includes an extra bracket for mounting the lamp in the cabin when it is not required as a searchlight.

Its utility as a searchlight for trouble wagons will be apparent to central-station operators. This particular outfit consists of two brackets, one for mounting on the dashboard and another for use on the ground or wherever needed. The lamp gives ample light from its position on the ground or motor truck, for the use of a workman at the top of the tallest pole.

The lamp is manufactured by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.

Flush Wall Switch and Receptacle Combination.

The device illustrated herewith is primarily designed to provide an attachment-plug receptacle controlled by

Combined Receptacle and Switch.

a switch, which can be installed complete in a regular flush outlet box. If the combination is installed with the feed wires coming through the switch end, it will control the device connected to the attachment plug, making it unnecessary to break the circuit by removing the plug. This permits a quick make and a quick break. The switch has an indicator which is especially valuable when it is used in connection with a device which of itself does not show whether current is being used.

This switch and receptacle combination may also be installed with the receptacle end toward the feed wires, when current can be taken off of the receptacle independently of the switch. In such a case the switch can still be

Digitized by Google

used for controlling other outlets. It is possible, therefore, to place one of these devices in a single outlet box previously used for a switch only, and take off current at this point by means of the receptacle unit. In some instances it will be found desirable to install this type of switch, even though it may not be anticipated that a receptacle will be useful at that particular point, as the face of the plate without the plug inserted is flush and the small black porcelain boss of the receptacle is not at all objectionable. In very many instances an outlet at a point where a switch has been installed is found convenient if only for temporary use and the plug with a cord and socket attached is often as desirable for a trouble lamp in the household as in the automobile.

This fitting is known as the Bryant type O switch and junior receptacle combination. It is manufactured by the Bryant Electric Company, Bridgeport, Conn.

Economical and Efficient Electric Hammer.

The "Do It Electrically" spirit of the present day has brought with it an entirely new set of conditions surrounding contracting work. In this electric age there is hardly a location where electric current is not available, and instead of making his power as he formerly did, the contractor buys it and applies it through motors at the most advantageous points.

Western Electric Hammer.

One of the special applications of electricity comes in the use of electric hammers, replacing the man with the sledge or hammer and star drill and the air compressor with its piping and hose.

The line of hammers that is being marketed by the Western Electric Company can be operated at a power cost that is practically negligible, ranging from two cents to five cents an hour and depending upon the size of hammer used. The equipment investment is small, only the first cost of the tool having to be considered.

To use one of these hammers it is only necessary to connect the tool to the nearest lighting outlet or wires. The low first cost of the equipment combined with the ease of operation, makes its use advantageous and practicable, not only where pneumatic tools have heretofore been used, but on a large class of work whose magnitude did not make it economical to install an air outfit.

A man with an electric hammer may be expected to do about as much work as six men working by hand. This is easily explained by the fact that a man with a hammer strikes from 50 to 80 blows a minute while the electric tools strike from 1,400 to 4,000.

These electric hammers have long since passed the experimental stage and are being used successfully by companies installing switchboards, pneumatic-tube systems, piping, railings, sprinkler systems, fire escapes, fire doors, etc. One large contractor tells of the great saving through the use of these tools in taking out the mortar between bricks for repointing, another of using them in breaking up old engine-bed foundations and sidewalks. Paint mills use them for dressing mill stones, ice plants and central stations for chipping scale off condenser tubes. In fact, wherever a rapid succession of blows makes for saving, these electric hammers are being used successfully.

Old Manual Sledge Method.

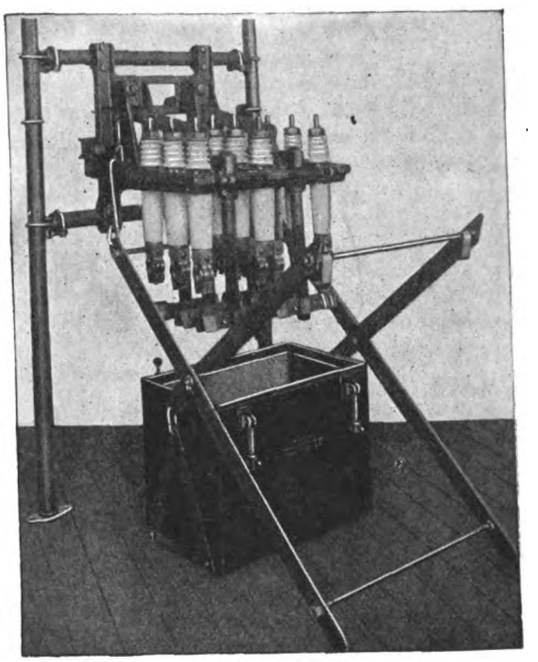
New Electric Hammer Method.

Tank Lifters for Small-Sized Oil Switches.

While a tank with oil for a comparatively small switch is not especially heavy, the character of the load makes it somewhat cumbersome for one man to manage. The result of this is that often the oil-switch contacts are not inspected as regularly as they should be to insure the most satisfactory operation. For this reason oil-switch tank lifters are a great convenience, particularly in stations where a large number of such oil switches are installed.

The tank-lifting arrangement manufactured by the General Electric Company provides a simple and easy means for lifting quickly an oil-switch tank either up or down the entire distance between the switch frame and the floor. The lifter is made in two widths, one for single and the other for double-throw switches, and differs only in the lengths of the three rods that join the parallel operating arms. This is necessary owing to the difference required in the dimensions of the oil tanks.

To fasten the tank lifter to the switch frame and lower the tank, two hooks attached to the inner ends of the longer pair of operating arms are placed over the ribs of the switch frame, the operating arms are raised and the tank supports fitted under the tank. Then the wing nuts that secure the tank to the frame are turned to unfasten the tank, and the arms are lowered to the floor. Finally two catches on the cross rod between the inner set of operating arms are released, and these arms are raised until the tank reaches the floor.



Tank Lifter for Oil Switch.

The tank supports are separate from each other and attach to the tank by continuations of the two equal sides of each strap-iron triangle, which are bent upward to fit over the rim on the bottom of the tank. Each support is removed from a tank by lifting an end of the tank a few inches from the floor and sliding the support from under. To place the tank on the oil switch, the operation is carried out in the reverse manner.

Digitized by Google

Underground-Conduit Exhibit of G. M. Gest.

Occupying about 900 square feet of floor space in the Palace of Machinery at the Panama-Pacific International Exposition, San Francisco, Cal., the exhibit of G. M. Gest, contracting conduit engineer, has attracted widespread interest, not only among those in engineering circles, but also every one interested in the betterment of street conditions in the cities by the removal of all overhead wires.

The exhibit comprises systems of underground conduit and cable construction, maintenance and operation, and is very instructive in showing all features of this branch of the electrical field. Not only are systems shown that are used in this country, but also many phases of methods used in other countries.

The exhibit shows the different materials, apparatus and methods of construction of underground conduit and cable systems, also distribution systems laid in solid, such as the armored cable and the Edison tube. Everything for the distribution of electrical energy, light and power, signaling and communication is present in a comprehensive form.

The various methods of installing underground conduit for draw-in systems are shown, including fiber, pump-log (creosoted wood), iron pipe, clay conduit in both single and multiple, square and round-bore type, also methods employed in Europe, including the one known as the trough system, in which either cast iron, asphalt or tile trough is used.

Manholes are represented for telephone, light and power cables, also the type of manhole used for transformers, usually called transformer vault. These are in brick and also in concrete construction. Shown complete are the various forms of apparatus for the proper distribution of electrical energy for the several systems, such as transformers, junction boxes, cutouts, switches and cable terminals, all installed as in actual operation. In addition to the different types of cable and other apparatus installed in the manholes are shown a street pillar and kiosk, also an ornamental lighting system with method of feeding by means of underground distribution system.

Augmenting the practical side of the underground work, drawings are shown of the plans for complete underground systems, also a collection of lantern slides showing special features of construction, also lighting systems in various parts of the country.

Having made a specialty of underground construction work for the past twenty years, Mr. Gest has been identified with many of the largest installations of conduit in this country and Canada. Operating from offices in New York, Cincinnati, San Francisco, Montreal, Winnipeg and Vancouver, there are few cities where this organization has not executed one or more contracts. At the present time they are engaged in installing several systems throughout the country.

In recognition of what Mr. Gest has done in developing conduit systems and for his methods of installation, the International Jury of Awards at the Exposition has awarded his American and Canadian organizations a gold medal the highest award in this special class.

Those who are looking for information along the lines of underground conduit construction, as well as ornamental lighting, should not miss any opportunity of seeing this interesting exhibit at the Exposition.

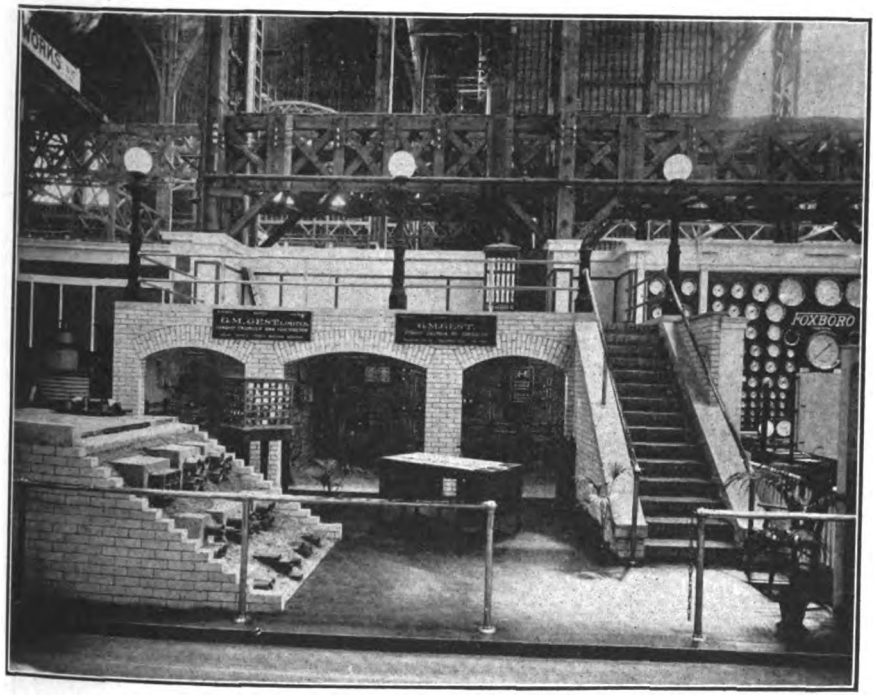


Exhibit of Underground-Conduit-Construction Engineering Firm.

Telephone for Use on Aeroplanes.

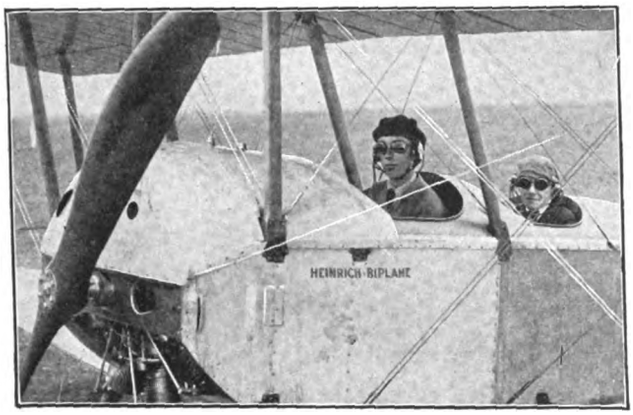
The rush of the wind and the deafening roar of the propeller practically prevent conversation between the pilot and the passenger in an aeroplane. A newly devised special telephone equipment makes such conversation possible, however.

The apparatus, which is called the "Aero-phone" and has been developed by the Western Electric Company, consists of two double-head telephone receivers and two special types of chest transmitters. The receivers are held against the ears by the spring headband so that practically all of the disturbing noises are excluded. The spring tension, however, is such so that the entire outfit is not uncomfortable. The special transmitters are provided with soft rubber caps, and are strapped to the chest at a point below the collarbone and above the third rib. In speaking, the chest muscles transmit the voice vibrations to the transmitter, thus enabling a telephone conversation to be carried on comfortably between the two occupants of the aeroplane.

Aviator Equipped With Aero-phone.

The receivers and transmitters are connected by suitable cords which terminate in a small plug. As the aviator or passenger takes his seat, the plug is inserted in a jack mounted in the framework of the aeroplane. One of these jacks is provided for each occupant. The battery required consists of three standard telephone dry cells

Digitized by Google



The Aero-phone in Use.

which will provide continuous service for 100 hours without any appreciable loss of transmission quality.

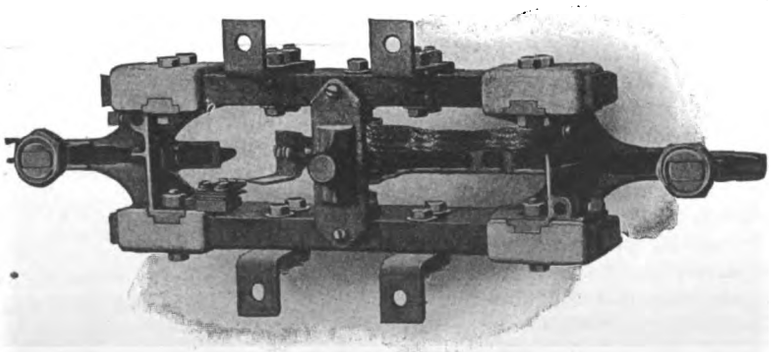
The simplicity and efficiency of this apparatus is sure to find favor in aviation circles, especially in the military branch of aerial work, modern aerial warfare having made it necessary that aviator and passenger be in communication at all times.

Automatic Trolley-Sectionalizing Insulator.

United States patent No. 1,126,092 has recently been granted to William Schaake, of the Westinghouse Electric & Manufacturing Company, on an automatic section insulator. These insulators are inserted in trolley wires where it is desirable to energize a section when the trolley passes onto it and to de-energize it when the trolley passes off. They are used extensively in mining installations where a branch is to be energized only when the locomotive is on that branch. Leakage losses and dangers of contact by persons passing under the trolley wire are thereby averted when the locomotive is not on the branch. Street-railway companies sometimes use them in the same way.

The circuit is opened and closed by a switch blade mounted on a rocker that the trolley operates. In one position the blade connects with copper contactors. In the other there is no connection. A brass plunger pressing against a steel roller gives a position-centering action and prevents the rocker from remaining in an intermediate position. There is no arcing at the switch contact, because the rocker is always energized and the switch connection is always opened or closed while the trolley wheel is on the rocker.

Side bars of impregnated hickory take the stress. All metal parts are either sherardized or of bronze. Wedges are used to hold the trolley wire and an internally threaded chuck, like that used in the Westinghouse Cleveland splicer, supplements these. A flexible woven-copper bond carries current to the switch blade on the rocker.



Top View of Trolley-Sectionalizer.

Effective Window Display of High-Efficiency Lamps.

An example of effective co-operation to boost electric-lamp sales ocurred a few months ago in Marinette, Wis. The Lauerman Brothers Company operates a large department store in that city and during the month of April conducted an educational advertising campaign on many lines of goods sold in the store which were not only manufactured in America but were of national reputation throughout the country. Special window displays were to form part of the scheme. One of the department managers, Robert E. Douglas, conceived the idea of making one of the these displays consist of Bryan-Marsh National Mazda lamps. He got in touch with A. E. Stadtbauer, of the well known electrical supply house of Julius Andrae & Sons Company, Milwaukee, Wis., which handles these lamps.

Lamp Display in Store Window of Lauerman Brothers Company.

Through this co-operative effort, special display matter was sent to Marinette and the display installed in the window, as shown in the accompanying illustration. The window is 12 feet high, 16 feet wide and 7 feet deep. A 1,000-watt Photolite, the lamp specially adapted to photographic work, formed an important feature of the display. The photograph, from which the illustration herewith was reproduced, was made taken with this lamp at 8:45 p. m. April 19. The camera was placed 11 feet from the window and the exposure was 3 minutes and 43 seconds. This display attracted much attention.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

INSULATING MATERIALS.—C. P. Lovering Company, East Cambridge, Mass.

Condensite and No. 1 Composition.

These molded insulating materials are practically non-absorptive; are not strictly non-combustible, but are not affected by continued moderately high temperatures; can be easily worked with tools; are of good dielectric strength and are unaffected by oils and acids.

Manufacturers desiring to use this material (for small parts of electric wiring devices, especially such as require considerable mechanical strength and durability as well as non-absorption and insulating properties of such materials as slate and marble) should submit samples in commercial form for tests.

Listed June 24, 1915.

PANELBOARDS. — Empire Engineering & Supply Company, 227 Fulton Street, New York, N. Y.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed July 6, 1915.

PANELBOARDS.—Hatfield Electric Company, 102 Meridian Street, Indianapolis, Ind.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed June 29, 1915.

PICTURE MACHINES AND APPLIANCES.—Feaster Film Feed Company, 687 Boylston Street, Boston, Mass.; Byron Chandler, Incorporated, sole representative, 1482 Broadway, New York, N. Y.

Feaster Film Feed Machine, a special horizontal upper magazine and reel so designed that by unwinding film from center of reel it can be repeatedly exhibited without rewinding it. Two types, for attachment, respectively, to Power's Cameragraph No. 6 A., made by the Nicholas Power Company, New York, N. Y., and to Simplex Projector, made by The Precision Machine Company, New York, N. Y.

Listed July 2, 1915.

PICTURE MACHINES AND APPLIANCES.—Precision Machine Company, 317 East Thirty-fourth Street, New York, N. Y.

Alternating-current motor for Simplex Projector made by Fidelity Electric Company, ⅛ horsepower, 110 volts.

Listed June 19, 1915.

RECEPTACLES, Standard.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

Paiste, 660 watts, 250 volts.

Conduit box, catalog Nos. 4251, 4253, 4255, 4257, 4258, 50721, 50722.

Listed July 6, 1915.

RECEPTACLES, Standard. — Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. brass-shell, closed or slotted bases. Key, 660 watts, 250 volts.

Cleat, catalog No. 613.

Concealed, catalog Nos. 615, 617, 618, 619 and 627.

Conduit box, catalog Nos. 601, 611, and 620-623 inclusive.

Molding, catalog No. 625.

Also above types with shadeholders attached; key type with composition or insulated metal key, or with "Shurlok" attachment.

Listed July 6, 1915.

RECEPTACLES, Standard.—V. V. Fittings Company, 1910 North Sixth Street, Philadelphia, Pa.

Keyless, 660 watts, 250 volts.

Conduit box, catalog No. 613 R.

Listed July 2, 1915.

ROSETTES, Fuseless.—V. V. Fittings Company, 1910 North Sixth Street, Philadelphia, Pa.

Conduit-box rosettes.

3 amperes, 250 volts, catalog No. 516 C, consisting of no-splice connection block, catalog No. 516, with blank or rosette cover, catalog No. 615. Also covers for same with ⅛-inch to ½-inch nipples, catalog Nos. 615M, 615F, 616M, 616F and 617M.

Listed July 2, 1915.

SHADEHOLDERS. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Uno shadeholders. These shadeholders are designed to thread over spiral socket shells, as supplied on Bryant or Perkins sockets and receptacles. Catalog Nos. 532, 535, 536.

Listed June 19, 1915.

SIGNS, Eletric.—P. Pause & Company, 404 West Erie Street, Chicago, Ill.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed June 24, 1915.

SWITCHES, Automatic. — Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Pressure regulator switches, 40 amperes, up to 600 volts, direct or alternating-current, type O. B.

These devices are rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as a recognition of the devices for use in connection with automatic sprinklers or similar fire protective equipment for which service their merits have not been investigated.

Listed June 23, 1915.

SWITCHES, Automatic.—Ingersoll-Rand Company of Illinois, 1505 Peoples' Gas Building, Chicago, Ill.

Double-pole, double-break, spring-controlled switch for use with motor-driven air compressors up to 5 horsepower, 250 volts. Switch is operated by air under control of a regulating valve. "Imperial."

These devices are rated standard as being in compliance with requirements of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as a recognition of the device for use in connection with automatic sprinklers or similar fire protective equipments for which service their merits have not been investigated.

Listed July 2, 1915.

SWITCHES, Push-Button Flush.—Hydro Electric Specialty & Supply Company, 211 Yonge Street, Toronto, Ont.

Push-button flush switches shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, have labels attached.

Listed June 17, 1915.

SWITCHES, Push-Button Flush.—Hydro Electric Specialty & Supply Company, 211 Yonge Street, Toronto, Ont.

Single-pole, 5 amperes, 125 volts, catalog No. 9.

Three-way, 10 amperes, 125 volts, catalog No. 18.

Listed June 18, 1915.

SWITCH BOXES.—Wurdack Electric Manufacturing Company, 19 South Eleventh Street, St. Louis, Mo.

Pressed-steel switch boxes.

For use in mounting flush switches and receptacles and having detachable sides to facilitate assembly for use in gangs.

Listed June 21, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

BROCKTON, MASS. — Henry W. Safford and others in the board of aldermen have filed a petition calling for a commission of five to investigate and report on a plan for a municipal plant for light, power and heat, with the exception that no power shall be sold for operation of an electric railway.

MIDDLETOWN, CONN.—The Waterbury Power Company is connecting this city with Berlin, Plainville, Southington and Waterbury by a high-voltage, overhead cable, which will be carried over steel towers about 100 feet high.

LAFARGEVILLE, N. Y.—The Public Service Commission has approved the application of the Lafargeville Electric Light Company to construct a power plant, and distribute electricity through the towns of Orleans and Theresa. The company was incorporated in 1908, the incorporation papers being broadened and amended last May. The management is about to extend the operation of the company into territory adjoining Lafargeville.

LEBANON, VA.—The Lebanon Light and Power Company has been organized to construct an electric light system.

KINSTON, N. C.—The city will expend $40,000 to improve the electric light system. Address mayor.

COOLIDGE, FLA.—The city will vote on August 16 on a proposition to issue $4,500 bonds to construct an electric light system. Address G. T. Knight, mayor.

NORTH CENTRAL STATES.

CINCINNATI, O.—City Electrician Kleine is preparing complete electric lighting systems for installation in the three city markets, beginning with the Sixth Street market, to take the place of the old gasoline torches which are still used. L.

STRASBURG, O.—The Public Utilities Commission has authorized the sale of the Strasburg Electric Company to the Ohio Service Company of Coshocton. The Ohio Service Company will pay $10,000 for the Strasburg property.

TIFFIN, O.—Attica, Bloomville and New Washington, villages of approximately 1,000 inhabitants, and each of which has a municipally owned electric light plant, are considering installing a central power house to supply the three towns with current. Attica, which is eight miles from each of the other villages and midway between them, would have the central power house. The towns would have 24-hour service, which they can not afford to have at present.

YOUNGSTOWN, O.—In connection with a considerable expansion in its plants, including the installation of two additional open-hearth furnaces and two tube mills, the Republic Iron and Steel Company will install at its Haselton plant a 2,400-kilowatt generator to provide the necessary additional current for the operation of the new units. L.

NORTH VERNON, IND.—Electrification of its furniture factory at this point has been decided on by the North Vernon Lumber Company, which will equip an isolated plant to generate the power. Generator, motors, etc., will be purchased. The company will add a 40 by 50 foot, two-story addition to the plant.

ROCKFORD, ILL.—The Rockford city council is investigating the matter of establishing a municipal electric lighting plant which will also furnish power to the city pumping station. Ross P. Beckstrom, superintendent of the water works department, has been instructed to make a report on the approximate cost of such a plant.

SPRINGFIELD, ILL.—Bids will be received by the State Board of Administration at the Capitol, Springfield, until 3 p. m., August 16, for electric wiring, motors and accessories at the Soldiers' Orphans' Home at Normal, Ill. Mrs. C. E. Bassett, acting managing officer of the home, has the specifications.

WARSAW, ILL.—The merchants and the council will install a white way. Address Mayor Marsh.

SPARTA, MICH.—$12,000 will be expended for an electric plant. Address town clerk.

HALLOCK, MINN.—The City Council is planning to install a $15,000 electric light system. Address village clerk.

ROCHESTER, MINN. — The common council and public utility board will advertise for bids soon on a new city electric lighting plant. Address A. F. Wright, city clerk.

BANCROFT, IOWA.—Bonds to the amount of $10,000 have been voted for an electric lighting plant. Address city clerk.

FARLEY, IOWA.—Elections held at Farley and Dyersville resulted in franchises being voted to the Easton Iowa Electric Company, Dubuque.

HAZELTON, IOWA.—The proposition to issue bonds for an electric light plant was carried. Address town clerk.

SAC CITY, IOWA.—On August 18 the citizens will vote on the proposition to issue $7,500 in bonds for the extension of the electric light wires from Lake View to Wall Lake so that the latter may be supplied with current from the Sac City plant.

CONCEPTION JUNCTION, MO.—The council is considering taking electric light and power service from the Maryville Electric Light & Power Company. Address town clerk.

SHELDON, N. D.—An electric lighting franchise has been granted to C. D. Udell, F. A. Barnard and E. L. Udell, all of Enderlin, and owners of the Enderlin Power & Heating Company. It is the plan of the Enderlin company to string wires across the country and furnish this city its light from the power house at Enderlin.

MOBRIDGE, S. D.—Gus Smith has sold his half interest in the Mobridge Electric Light, Heat and Power Company to B. S. Hill and J. W. Harris. Smith and Hill built the plant four years ago.

SEWARD, NEB.—The municipal light plant was struck by lightning and razed to the ground.

ATCHISON, KANS.—Muscotah has voted $8,000 in bonds to be used to build a power line which will carry electricity from Atchison to Muscotah. The line will be connected with the line which now runs from Atchison to Effingham. It is believed the lights can be turned on for the first time by October 1.

ROBINSON, KANS.—At a recent meeting of the city council it was decided to purchase current for the town's electric lighting system from Hiawatha, instead of installing a small plant in the town. A $10,000 bond issue was authorized for electric lights.

LOUISVILLE, KY.—The Market Street Improvement Association, an organization of retail merchants, which is maintaining an elaborate white way and doing other co-operative electrical advertising, has incorporated so as to carry out its mutual benefit work more satisfactorily. Arnold Levy, of Levy Brothers, is president. The company has no capital and the debt limit is $2,500.

SOUTH CENTRAL STATES.

OXFORD, MISS.—At the recent election, authority was given the commissioners to issue certificates of indebtedness to the amount of $6,500, to improve the light plant.

MARMADUKE, ARK.—The city has granted a franchise to the Crystal Ice Company, of Paragould, to furnish electric light and power.

KAPLAN, LA.—Bonds have been voted to install a municipal light plant.

BOSWELL, OKLA.—$14,000 will be expended for electric light plant. Address J. T. George, engineer in charge, Ada, Okla.

BRANDON, TEX. — The Texas Power and Light Company, of Dallas, will construct an electric lighting system here. Its power transmission line will be extended from Milford to this place. D.

LOCKHART, TEX.—E. B. Coopwood, a banker of this place, is at the head of a company that is being organized, to have a capital stock of $100,000, for the purpose of constructing an electric light and water works.

Digitized by Google

WESTERN STATES.

PROVO CITY, UTAH.—Plans whereby this city can have its own power plant and operate the same are under way and preliminary surveys have already been made by City Engineer Geo. C. Swan.

ALBION, IDA.—Preliminary steps toward the construction of a municipal lighting plant have been taken by the city council, and according to authentic information active construction will be undertaken early in the fall, providing a bond election to vote money to finance the improvement carries. The election will be held August 23. The proposed plant will cost about $10,000.

ST. ANTHONY, IDA.—The construction of a municipal lighting plant is being considered by the city council, and the council recently appointed a committee to confer with the Utah Power and Light Company with a view of purchasing a light plant of that company's in this city. According to reports, if the contemplated deal is made, extensions to the plant and additions to the distribution system will be made. O.

AZUSA, CAL.—The Board of Trustees has passed a resolution preparatory to placing ornamental lighting on certain streets of this city.

RIVERSIDE, CAL.—This municipality is considering rebuilding the old power plant of the Pacific Light and Power Company, which was recently burned, at a cost of $12,000. The cost of installing a transmission line from the present plant to the city substation would be $7,567.75.

SANTA BARBARA, CAL.—W. A. Brackenridge, of the Santa Barbara Gas & Electric Company, announces that his company will install conduits and ornamental lights along West Boulevard at a cost of $4,000.

SAUSALITO, CAL.—The town trustees have passed a resolution of intention preparatory to placing an electrolier system on a number of streets. A total of 65 standards with the necessary globes, lamps, etc., is involved.

JOSEPH, ORE.—The Wallowa Lake Amusement Company has applied for permission to take water from the Wallowa River to use in operating a small hydroelectric power plant.

PORT ORCHARD, WASH.—The Bremmerton-Charleston Light and Fuel Company has applied to the Board of County Commissioners of Kitsay County for permission to establish a transmission line along the county highways on Bainbridge Island.

REPUBLIC, WASH.—George S. Bailey has made application for an electric lighting and power franchise along the streets and other highways of this place.

PROPOSAL.

CONDUIT AND WIRING SYSTEM.—Sealed proposals will be received August 12 for furnishing and installing a conduit and wiring system and furnishing and installing interior lighting fixtures in the United States marine hospital at Cleveland, O. Address Jas. A. Wetmore, acting supervising architect, Washington, D. C.

FINANCIAL NOTES.

A special meeting of stockholders of the New England Telephone and Telegraph Company will be held on August 5, 1915, for the purpose of voting upon an increase in authorized capital stock from $50,000,000 to $75,000,000. The transfer books will be closed from Monday, July 26, to Thursday, August 5.

Dividends.

	Term.	Rate	Payable
Boston Elevated	Q	1.5 %	Aug. 5
East St. Louis & Sub. pf.	—	0.75%	Aug. 2
Jacksonville Trac.	Q	0.75%	Aug. 2
Kellog Switchboard	Q	3 %	July 31
Kings Co. Elec. Lt. & Pr.	Q	2 %	Sept. 1
Mononga. V. Trac. pf.	S	2.5 %	Aug. 2
National Carbon pf.	Q	1.75%	Aug. 14
Nev.-Cal. Elec. pf.	—	$2	Aug. 10
North American	Q	1.25%	Oct. 1
Ohio Traction pf.	Q	1.75%	Aug. 2
Pacific Pr. & Lt. pf.	Q	1.75%	Aug. 1
Sierra Pac. Elec. pf.	Q	1 %	Aug. 2
South. Calif. Edison	Q	1.5 %	Aug. 15
Tampa Elec.	Q	$2.50	Aug. 16
Texas Pr. & Lt. pf.	Q	1.75%	Aug. 2

Reports of Earnings.

PACIFIC GAS AND ELECTRIC COMPANY.

	1915	1914
June gross	$1,453,959	$1,358,083
Net earnings	670,367	556,128
Balance after charges	338,611	303,039
Surplus after division	324,917	163,012
Six months' gross	9,203,498	8,428,313
Net earnings	4,276,025	3,664,037
Balance after charges	2,119,181	1,309,493
Surplus after division	1,673,848	1,009,493
12 months' gross	17,687,873	16,413,577
Net earnings	7,926,070	6,339,636
Balance after charges	3,462,855	1,813,954
Surplus after division	2,703,338	1,213,954

CITIES SERVICE COMPANY.

	1915	1914
June gross	$ 294,520	$ 269,586
Net	280,497	260,369
Surplus after charges	239,663	231,472
12 months' gross	3,977,733	3,399,186
Net	3,829,563	3,308,202
Surplus after charges	3,339,562	3,010,139

CONSUMERS' POWER COMPANY (MAINE).

	1915	1914
June gross	$ 298,690	$ 255,055
Net	189,438	167,100
Balance after preferred dividends	61,393	47,343
Six months' gross	1,820,758	1,680,624
Net	1,243,170	1,120,510
Balance after preferred dividends	470,654	393,286
12 months' gross	3,555,536	3,297,579
Net	2,339,635	1,965,399
Balance after preferred dividends	809,542	534,091

DETROIT EDISON COMPANY.

	1915	1914
June gross	$ 541,561	$ 454,479
Net earnings	177,088	139,272
Surplus	89,402	70,618
Six months' gross	3,730,731	3,155,816
Net earnings	1,407,422	1,112,372
Surplus	900,036	702,745

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 26	July 19
American Tel. & Tel. (New York)	121½	121
Commonwealth Edison (Chicago)	132½	134½
Edison Electric Illuminating (Boston)	234	235
Electric Storage Battery, common (Philadelphia)	52	53
Electric Storage Battery, preferred (Philadelphia)	52	53
General Electric (New York)	175⅛	166¾
Kings County Electric, (New York)	119	119
Massachusetts Electric, common (Boston)	5	5¼
Massachusetts Electric, preferred stamped (Boston)	33	33½
National Carbon, common (Chicago)	135	130½
National Carbon, preferred (Chicago)		120
New England Telephone (Boston)	131	132
Philadelphia Electric (Philadelphia)	23⅝	23¾
Postal Telegraph and Cables, common (New York)	75½	70
Postal Telegraph and Cables, preferred (New York)	64	64
Western Union (New York)	68	69½
Westinghouse, common (New York)	106⅜	103½
Westinghouse, preferred (New York)	122	120

PERSONAL MENTION.

MR. RUPEN EXKSERGIAN AND MR. LEON H. WEBER have been appointed research assistants in the electrical engineering department of the Massachusetts Institute of Technology.

MR. FRANK C. AUSTIN, who until recently had charge of the West Penn Electric Light Company's station at Woodlawn, Pa., has been advanced to the superintendency of the Kittanning, Pa., district, with offices at that place.

MR. J. H. MITCHELL, superintendent of the meter department of the Columbus Railway, Power and Light Company, Columbus, O., has been appointed manager of the new-business department of the East St. Louis Light and Power Company, East St. Louis, Ill. Mr. D. C. Jones succeeds him at Columbus.

MR. C. D. WHEELER, advertising manager of the Fort Wayne Electric Works, of the General Electric Company, for the past six years, resigned his position July 17 to go with the Santo Manufacturing Company, Philadelphia, Pa., as advertising and assistant sales manager. This company manufacturers the well known Santo line of electric vacuum cleaners of the stationary, portable, and small sweeper types. Previous to entering the technical advertising field Mr. Wheeler was connected with different advertising agencies in Chicago.

C. D. Wheeler.

MR. ROBERT MONTGOMERY, commercial manager of the Louisville Gas and Electric Company, and Mrs. Montgomery, and R. E. Brian, manager of the Louisville branch of the Federal Sign System, Electric, and Mrs. Brian form a party of four which has gone for a motor boat trip up the Ohio River to the Kentucky River and on up the Kentucky River on an indefinite jaunt.

MR. B. M. DOWNS, general sales manager of the Hemingray Glass Company, Covington, Ky., who was obliged to submit to an operation about five weeks ago, has left the hospital, the operation having been attended with successful results. A host of friends and acquaintances of the genial "Bertram," well beloved of many in the electrical field, will be happy to know that he has returned to business, and expects to shortly be in better health than for many months.

Digitized by Google

MR. DAY BAKER, for several years New England manager of the General Vehicle Company, with offices at Boston, has been advanced to the position of manager of agency sales, foreign sales and the central-station department of the company. Mr. Baker has been one of the foremost electric-vehicle promoters in New England, and has made a host of friends. He has been, since its organization, treasurer of the Boston Commercial Vehicle Association, for four years president of the Boston Electric Motor Car Club and for three years treasurer of the New England Section, Electric Vehicle Association of America. Under his management the General Vehicle Company's business in New England territory has grown by leaps and bounds.

MR. WILLIAM E. MOORE, vice-president and general manger of the West Penn Traction Company, with which he has been associated since 1903, has resigned his office for the purpose of establishing a consulting engineering business in Pittsburgh, Pa. During the past twelve years that Mr. Moore served the company, the growth of the West Penn interests has been remarkable, the few railway lines and lighting plants which the company owned at the time Mr. Moore became identified with the properties having formed the nucleus of an interconnected railway, lighting and power transmission system, which today ranks among the first in the country in point of size, efficiency of service, progressivness and popularity with its patrons. The territory covered by the company's activities totals more than 3,000 square miles; the municipalities served with lighting and power number over 100; the industrial operations embrace electric drives in large steel mills, coal mines and miscellaneous manufacturing concerns. The gross income of the company, under Mr. Moore's direction, has grown from less than $500,000 to approximately $5,000,000 per annum. Mr. Moore will retain an advisory connection with the West Penn Company. While conducting a general engineering practice Mr. Moore will give special attention to electric railway, power and lighting business.

OBITUARY.

MR. JAMES P. McQUAIDE, one of the organizers of the National Conduit and Cable Company, of New York, died in England, on July 10, of heart disease. Mr. McQuaide retired from active business in New York City some 10 years ago and moved to England, where he purchased the historic mansion known as Pope's Villa, at Twickenham, and was residing there at the time of his death. Pope wrote his "Essay on Man" in this house, and at one time it was owned by Labouchere. Mr. McQuaide was quite widely known in electrical circles, beginning with the formation of the National Conduit and Cable Company in 1887. He and Mr. E. S. Perot, the present president of the company, were the organizers and today the company is one of the largest manufacturers of copper wires and cables in the United States, though starting with small capital and having to overcome many vicissitudes in the early development of the electrical industry.

DATES AHEAD.

American Association for the Advancement of Science. Summer meeting, San Francisco, Cal., August 2-7. Secretary, L. O. Howard, Washington, D. C.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23, 24 and 25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

With the Electrical Manufacturers

Roller-Smith Company, 203 Broadway, New York City, has ready a series of new data sheets covering its complete line of direct-current and alternating-current instruments and circuit-breakers. These give dimension diagrams and data, as well as net and shipping weights.

Crouse-Hinds Company, Syracuse, N. Y., has issued Bulletin 1,000C. This gives a full list of all new and special Condulet fittings, each of which is illustrated and described. Special illustrations are given showing admirably the use of many of these Condulets. The bulletin contains 32 pages of valuable and systematically arranged information on these fittings.

The Standard Paint Company, Woolworth Building, New York City, has been awarded the Gold Medal, or highest award, by the International Jury of Awards at the Panama-Pacific Exposition, San Francisco, for the company's Impervite cement-waterproofing compound. This compound is an asphaltic emulsion and in the tests which preceded the San Francisco award, as well as in other similar tests, proved distinctively superior to competing compounds.

The Robbins & Myers Company, Springfield, O., has issued a booklet entitled "Flashes From a Live Wire." This is an illustrated account of an interview between the company's advertising manager, C. H. Clark, and the general superintendent of the Addressograph Company, J. P. Jackson. Several hundred Robbins & Myers motors are in use in the Addressograph factory, performing exacting service and they are installed on the machines put out by the Addressograph Company. Views of other typical machines operated by these motors are given, also an explanation of what is meant by Robbins & Myers service.

Westinghouse Lamp Company, 1261 Broadway, New York City, has issued Nos. 2 and 3 of its salesmen's lamp handbook series. No. 1 of this set was referred to in these columns several weeks ago. No. 2 is called "The Lighting Dictionary" and is a condensed glossary of electrical terms, particularly those met with in the incandescent-

Digitized by Google

lamp industry and in illuminating engineering. No. 3 is entitled "Modern Lighting Practice" and gives many valuable suggestions on the successful application of light prepared by a prominent lighting specialist. The branches particularly touched on are residence lighting, store lighting, and display-window lighting. A number of illustrations help to make these suggestions more clear. These salesmen's handbooks can be obtained free on application to the company, which is to be commended for getting up such an educational series.

DeLaval Steam Turbine Company, Trenton, N. J., has issued a 64-page book dealing with centrifugal blowers and compressors for all pressures from 5 inches of water, as in mechanical draft service, up to 125 pounds per square inch, as for compressed-air distribution in mines, machine shops, shipyards, etc. The development of the high-efficiency, high-speed centrifugal blower or compressor has followed improvements in materials, shop practice and design, such as are employed in the building of high-grade steam turbines. It is now possible to run blower and compressor wheels safely and satisfactorily at peripheral velocities of 450 to 600 feet per second. In the present publication numerous charts are given showing curves for the compression of air and characteristic curves of single and multistage blowers and compressors. The influence of impeller design upon the form of the characteristic is discussed. Particulars are given concerning the application of centrifugal blowers to various purposes. The illustrations show numerous examples of blowers and compressors directly connected to steam turbines and to electric motors.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., reports the following orders recently received: Western States Gas & Electric Company, Placerville, Cal., one 1,875-kilowatt, 2,300-volt, three-phase, 60-cycle, water-wheel generator for an extension of the present plant. Union Light, Heat & Power Company, Fargo, N. D., two 1,875-kilowatt, 2,300-volt turbogenerator units. Consolidated Gas, Electric Light & Power Company, Baltimore, Md., one 6,825-kilovolt-ampere, synchronous frequency-changer set to take power from a 13,000-volt, 25-cycle line and transform it into 4,000-volt, 62.5-cycle energy; this set is practically a duplicate of a Westinghouse set now installed. Citizens Light & Power Company, Johnstown, Pa., one 6,250-kilovolt-ampere, 4,000-volt, 60-cycle, turbogenerator unit with necessary auxiliary equipment. Merchants Heat & Light Company, Indianapolis, Ind., one 6,250-kilovolt-ampere, 4,000-volt, 60-cycle, turbogenerator unit complete with auxiliaries. Counties Gas & Electric Company, Norristown, Pa., one 3,125-kilovolt-ampere, 2,400-volt turbogenerator unit complete with auxiliaries. The Hartford Electric Company, Hartford, Conn., two 2,500-kilovolt-ampere, single-phase, 60-cycle, 11,000-2,400-volt, forced-oil-cooled transformers. Ogden, Logan & Idaho Railway Company, Ogden, Utah, two stationary substations, each consisting of a 500-kilowatt motorgenerator set, direct-connected exciter; three 235-kilovolt-ampere, single-phase transformers, and a switchboard to control same; also a portable substation with similar equipment. Stevens County Power & Light Company, one 900-kilovolt-ampere, 11,000-volt, three-phase, 60-cycle, horizontal generator for water-wheel drive, direct-connected exciter; several high-tension transformers and a six-panel switchboard for the control of same. Tug River Power Company, Sprigg, W. Va., one 1,800-kilowatt, three-phase, 60-cycle, 3,400-volt, turbogenerator unit with direct-connected exciter; three 500-kilovolt-ampere, single-phase, 33,000-2,300-volt transformers and 21 smaller, single-phase, 60-cycle transformers. Toledo Railways & Light Company, Toledo, Ohio, one 20,000-kilowatt, three-phase, 25-cycle, turbogenerator unit; one 25,000-square foot surface condenser with auxiliaries; two 2,000-kilovolt-ampere, single-phase, 60-cycle, 33,000-4,000-volt transformers. Public Service Electric Company, Newark, N. J., one 1,000-kilowatt, 600-volt direct-current, six-phase, 60-cycle, rotary converter; three 365-kilovolt-ampere, air-blast, single-phase, transformers; one 350-kilovolt-ampere, single-phase, 60-cycle, 60,000-2,000-volt testing transformer; one 350-kilovolt-ampere, single-phase, 60-cycle, 2,000-440-volt regulating transformer; one 2,500-kilovolt-ampere, single-phase, 30,000-volt inductance coil. Northern Virginian Power Company, Worcester, Va., one 900-kilovolt-ampere alternator, vertical water-wheel type, three-phase, 60-cycle, 6,600 volts. Lackawanna & Wyoming Valley Railroad Company, Scranton, Pa., five 200-kilovolt-ampere, single-phase, 25-cycle, 22,000-440-volt transformers.

Record of Electrical Patents

Issued by the United States Patent Office, July 13, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,145,881. Door-Operating Mechanism. J. S. Doyle, assignor to Consolidated Car Heating Co., New York, N. Y. Motor-operated sliding door with limit switch.

1,145,899. Ammunition Hoist. J. D. Ihlder, assignor to Otis Elevator Co., Jersey City, N. J. Motor-driven gearing for hoisting ammunition and adjusting gun inclination.

1,145,900. Hydro-Extractor or Like Centrifugal Machine. T. K. Irwin, London, England. Dynamo driven by impulse rotor of centrifugal hydro-extractor.

1,145,901. Electric Signaling Apparatus. O. G. H. E. Kehrhahn, New Rochelle, N. Y. Special structure of rotatable contactor for producing flashes.

1,145,911. Controller for Door-Motors. J. F. McElroy, assignor to Consolidated Car-Heating Co. Electromagnetic control of fluid-operated door motor.

1,145,914. Elevator. A. Magnuson, assignor to Otis Elevator Co. Taut wire extends along hatchway and guides slack conductors running to car.

1,145,926. Brush for Dynamo-Electric Machines and the Like. E. O. Schweitzer, Chicago, Ill. Carbon brush has lubricating device.

1,145,940 and 1,145,942. Relay. N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Different structures wherein switch operated by magnet armature opens after predetermined time, if armature remains retracted.

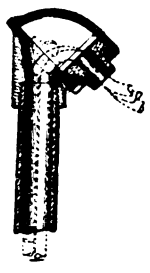
1,145,941. Fire-Alarm-Telegraph System. N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co. Local receiving circuit controlled by relays as above, transmitter breaking relay circuit for several different periods of time.

1,145,950. Galvanic Cell. S. M. Ward, Jr., assignor to Hall Switch & Signal Co., New York, N. Y. Container is negative electrode and lined with insulation except at one spot, and insulating barrier between exposed spot and positive.

1,145,976. Supervisory System for Telephone Lines. W. W. Dean, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Supervisory relay energized by cord connection to display signal and further energized on use of subscriber's instrument to render signal inoperative.

1,145,977. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. For chafing dish; has means for raising and lowering.

1,145,978. Telephonic Transmission-Circuit. H. G. Dorsey, assignor to Western Electric Co., New York, N. Y. Telephonic relay and shunt circuit resonant to frequencies above maximum telephonic.



No. 1,146,118.—Entrance Fitting.

1,145,988. Electric Heater. W. S. Hadaway, Jr., New Rochelle, and E. N. Lightfoot, New York, N. Y. For heating bottom of liquid receptacle, especially percolator.

1,146,002. Telephone System. E. Land, assignor to Kellogg Switchboard & Supply Co. Relates to automatic trunk connections.

1,146,064. Electric Circuit-Controlling Switch. E. Oppenheim and T. J. Burns, Rockford, Ill. Arrangement for operating and locking sets of contacts in series.

1,146,019. Vacuum-Producing Method and Means. A. H. Pfund, Baltimore, Md. High-potential alternating current discharges caused between metal and gas-absorbing material to restore or accentuate vacuum.

1,146,040. Trolley Head. W. Volpe, Philadelphia, Pa. Is provided with guard wheels.

1,146,049. Telegraphy. W. M. Bruce, Jr., Springfield, O. Current impulses of equal duration but opposite polarity transmit message and resistance is varied as time interval between impulses is changed.

1,146,064. Electric Circuit - Controlling Switch. W. E. Gorton, assignor of one-half to W. F. Hoffman, St. Joseph, Mo. Oscillating, quick-break switch.

1,146,067. Check-Controlled Music-Playing Device. P. Hansel, assignor to Ludwig Hupfeld Aktiengesellschaft, Böhlitz-Ehrenberg near Leipzig, Germany. Electrical means for positioning the note records.

1,146,074. Telephone-Exchange System. M. L. Johnson, assignor to Frank B. Cook Co., Chicago, Ill. Semi-automatic.

1,146,075. Process of Treating Zinc-Bearing Materials. W. McA. Johnson, assignor to Continuous Zinc Furnace Co., Hartford, Conn. Electric furnace used in treatment of ores containing lead and zinc.

1,146,082. Authorizing Method and System. J. J. Leidigh, assignor to National Cash Register Co., Dayton, O. Credit-authorizing system comprising punching mechanism at substations electrically operated from central stations with signaling means, etc.

1,146,084. Electric Current Tap. C. D. McLean and G. H. Holt, Berlin, N. H. Lateral tap in lamp socket.

1,146,113. Accounting System. C. H. Tallmadge, assignor to W. R. Heath, Buffalo, N. Y. Electrically operated indicating and printing registers with decumulating and accumulating mechanism, respectively.

1,146,118. Entrance Fitting or Pipe Cap for Electric Service Pipes or Conduits. W. D. Woolley, assignor to Killark Electric Mfg. Co., St. Louis, Mo. Overhangs to prevent moisture entering. (See cut).

1,146,140. Magnetic Separation or Ore.

Digitized by Google

F. B. Dutton and B. E. McKechnie, assignor to Pennsylvania Steel Co., Philadelphia, Pa. Material is magnetically separated beneath water, into which it is fed and from which magnetic material is carried by belt.

1,146,141. Magnetic Separator. F. B. Dutton and B. E. McKecknie, assignors to Pennsylvania Steel Co. Electromagnetic apparatus for carrying out above process.

1,146,142. Process of Chlorinating Aromatic Hydrocarbons Including Toluol. C. Ellis, assignor to Chadeloid Chemical Co. New York, N. Y. Ultra-violet light is employed in making benzyl chlorid.

1,146,151. Electric Time-Switch. W. B. Garrett, Thermopolis, Wyo. Details of clockwork-operated switch.

1,146,164. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Cooking device with heat storage.

1,146,165. Electromagnetic Controlling Device. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. For signal-setting motors, the current through motor being decreased when signal is set.

1,146,167. Circuit-Breaker. D. B. Hughes, assignor to Citizens Savings & Trust Co., Cleveland, O. Details of cam-operated switch.

1,146,172. Variable - Rate Integrating Electricity Meter. V. Karapetoff, assignor to Chicago Electric Meter Co., Chicago, Ill. Multiple-rate meter controlled by maximum demand.

1,146,177. Telephone System. E. Land, assignor to Kellogg Switchboard & Supply Co. Relates to automatic selecting switch.

1,146,189. Insulating Material. H. B. MacFarland and R. Shoemaker, said Shoemaker assignor to said MacFarland, Chicago, Ill. Mixture of fibers of *zostera marina* and hydrocellulose derived from such fibers made into a felted sheet.

1,146,190. Method of Producing Insulating Material. H. B. MacFarland and R. J. Shoemaker, said Shoemaker assignor to said MacFarland. Treatment to form above.

1,146,201. Electric-Wire Insulator. S. Nunn, Portland, Ore. Details of pin insulator.

1,146,203. Trolley - Wheel Mount. S. Parent, Adams, Mass. Details of harp.

1,146,204. Electric-Signal Switch. W. A. Pearce, Virginia, Minn. Particular structure of rotary drum controller.

1,146,212. Compound for Treating Lumber. J. P. Sullivan, Memphis, Tenn., assignor of E. E. Bookmiller. For coating the electrode-engaging surfaces of timber to be electrically treated.

1,146,214. Protective Coating and Method of Applying Same. C. P. Townsend, Washington, D. C. Electrolytic method of coating conductors with a phenolic condensation product.

1,146,234. Telegraphy. W. M. Bruce, Jr., assignor to United Telegraph & Cable Co., Springfield, O. Signals transmitted by characters having their beginnings and ends marked by impulses of equal duration but of opposite polarities, respectively.

1,146,242. Game. W. F. Garaughty, Columbus, O. Switches in pockets of pool table, and closed by balls therein, control buzzer circuit.

1,146,268. Headlight. F. F. MacLean, Syracuse, N. Y. Converging reflector with electric lamp, whose bulb has selected parts translucent and other parts transparent.

1,146,274. Printing-Telegraph Apparatus. F. D. Pearne, Chicago, Ill., assignor of one-half to J. E. Martine. Keys control relays governing connections to the line of impulse circuits of different characteristics.

1,146,292. Therapeutical Electrode. R. H. Wappler, assignor to American Cystoscope Makers, Inc., New York, N. Y. Adapted for insertion into the body.

1,146,294. Contact Mechanism for Electric Alarm Systems. J. P. Williams, assignor to Duplex Electric Co., New York, N. Y. An operating bar common to several depressible contacts may be swung out of operating position.

1,146,298. Insulating Support for Storage Batteries. C. Ambruster, Roslyn, Pa. Details of structure of glass insulator mounted on earthenware pedestal.

1,146,300. Method of Forming Phenolic Condensation Products. J. W. Aylsworth, assignor to Condensite Co. of America, Glen Ridge, N. J. Details of process for obtaining a condensation product from phenol and a methylene-containing substance.

1,146,310. Electrically Heated Apparatus. O. A. Colby, assignor to Westinghouse Electric & Mfg. Co. A cook stove has a container for material kept fluid by electric heat and admitted to and withdrawn from the different heating surfaces as desired.

1,146,320. Automatic Timing Device. A. L. Fish, Flushing, N. Y. Stop watch electrically controlled by the gases from the starting pistol and by a passing racer.

1,146,323. Device for Producing Images. H. S. Gay and E. W. Duke, assignors to Stereo-Annunciator Co., Los Angeles, Cal. Electrical slide-operating mechanism for projectors.

1,146,325. Connecting Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Structure of attachment plug for sliding insertion and locking in usual screw-threaded socket.

1,146,326. Switching Device. D. D. Gordon, assignor to Yost Electric Mfg. Co. Structure of quick-movement pendent switch.

1,146,328, 1,146,329 and 1,146,330. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. First patent, electric cooking range having electrically heated heat-storing body in a heat-insulated chamber. Second patent, modification with heat conductors from storage body to hot plates. Third patent, modification having structure for bringing cooking utensil into association with storage body.

1,146,339. Draft Mechanism. S. J. Matthews, Port Clinton, O. Gear-driven by electric motor inclosed in the housing.

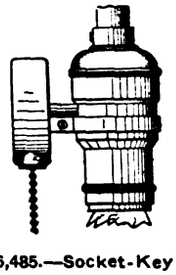
1,146,340. Remote-Control Switch. W. S. Mayer, Taunton, Mass. Electromagnetically opened and closed.

1,146,348. Electrical Conductor. F. H. Pritchard, assignor to General Electric Company, Schenectady, N. Y. Conductor rectangular in cross-section and subdivided to prevent deleterious induction.

1,146,361. Illuminated Sign. W. H. Spencer and H. C. Storm, assignors to G. F. Spencer, New York, N. Y. Line-filament lamp in a housing into which fits edge of transparent sign plate.

1,146,371. Computing-Machine. J. N. Thornton, assignor to J. T. Underwood, Brooklyn, N. Y. Driving-motor controlling switch interlocked with control of clutch for connecting motor to mechanism.

1,146,434. Egg-Testing Device. T. McLaughlin, assignor to G. V. Carrol, Chicago, Ill. Arrangement of reflector, lamp and egg-holder.



No. 1,146,485.—Socket-Key Operator.

1,146,471. Lamp-Globe Fixture. C. Bertram, assignor to Morreau Co., Cleveland, O. Semi-indirect, with special spider supporting bowl and lamp sockets.

1,146,485. Electric-Switch Operator. J. F. Dunn, New York, N. Y. For attachment to lamp-socket key to operate same always in one direction by endless cord. (See cut).

1,146,486. Electrical Instrument for Electrically Transmitting Indications. M. Dürr, assignor to Siemens & Halske A. G., Berlin, Germany. Resistance device wherein indicator is electromagnetically depressed at intervals to contact with resistance arranged in ring about pivot and thus close circuit of a measuring device.

1,146,498. Arc Light. G. Humber, Denver, Colo. Holders for downwardly converging carbons in separate brackets and electromagnetic means for swinging the brackets toward or away from each other according to current flow.

1,146,518. Electric-Resistance Element. J. R. Quain, London, England. Heating element; resistance kept from air by inclosing in annular, integral chamber of silica.

1,146,535. Sound-Transmitting Member. L. Steinberger, New York, N. Y. Hand-gripped part of telephone-receiver casing a sonorous body with external ribs.

1,146,563. Laying-Frame for Plate Glass. W. J. Golightly, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. Mounting of motor that swings frame.

1,146,574. Controller for Automatic Musical Instruments. A. Jameson, assignor to F. R. Henshaw, Indianapolis, Ind. A hand-piece manipulator having contacts for electrical control.

1,146,577. Hydraulic Brake. S. H. Keefer, assignor to Niles-Rement-Pond Co., Jersey City, N. J. Electromagnetically controlled.

1,146,581. Synchronous Telegraphy. E. W. Larsen, Minneapolis, Minn. For maintaining synchronous operation of pair of sunflowers.

1,146,583. Automatic Telephone - Exchange System. F. R. McBerty, assignor to Western Electric Co. Registering and controlling equipment at exchange and means for preventing interference with it by other calling lines when in use by one.

1,146,588. Automobile Signal-Light. J. F. Miller and C. J. Locke, Detroit, Mich. Structure having electromagnetically operated shutter and incandescent lamp.

1,146,592. Resistance. E. F. Northrup, Princeton, N. J. Non-inductive unit comprising superimposed, flat, spirally and oppositely wound coils in parallel.

1,146,616. Safety Device for Electric Signaling Apparatus. A. C. Farrand, assignor to H. W. Johns-Manville Co., New York, N. Y. Operator protected by insulation covering operating member and outside of coating being grounded.

1,146,623. Electrically Heated Apparatus. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Cooking range comprising heat-storage and heat-insulated body with arms extending to cooking points and means for regulating the heat distribution.

1,146,628. Portable Electric Light. I Koretzky, assignor to L. J. Morrison, New York, N. Y. Special structure of push-button preventing loss of plunger.

1,146,637. Thermostat. R. F. Massa, assignor to H. W. Johns-Manville Co. Contact moved by thermostatic member into and out of attractive region of magnet tending to close circuit.

1,146,661. Trolley Pole. C. O. Shaub, Dayton, O. Has guards for preventing wheel jumping wire.

1,146,679. Oil-Vaporizer for Combustion Engines. A. Winton, assignor to Winton Gas Engine & Mfg. Co., Cleveland, O. Electrically heated vaporizer.

1,146,717. Insulator for High-Voltage Electric-Cable Splices. F. Klenk, Mount Vernon, N. Y. A solid core of insulating material has grooves to receive the splices, respectively, and a sleeve covers them.

1,146,730. Block-Leveler. J. G. Osgood. and F. W. Bachman, Cincinnati, O., assignor to J. G. Osgood. Arrangement of driving motor and cutter shaft.

1,146,734. Electromagnetic Circuit-Closing and Circuit-Breaking Device. A. Pick, assignor to Van Dorn Electric Tool Co., Cleveland, O. Details of relay.

1,146,752. Telegraphy. P. B. Delany, assignor to Telepost Co., New York, N. Y. Tape controlled and recording; receiving perforator retransmits into another circuit.

1,146,758. Curling-Iron Heater. W. S. Hadaway, Jr., New Rochelle, N. Y. Heating circuit closed by insertion of iron.

1,146,767. Means for Driving Centrifugal Machines. M. H. Parker and C. A. Adams, assignors to American Tool & Machine Co., Boston, Mass. Motor switch moved to open position when brake is set.

Patents Expired.

The following United States electrical patents expired on July 26, 1915:

607,830. Device for Operating Electric Switches. J. H. Cary, Springfield, Mass.

607,918. Crossover for Trolley Systems. C. E. Davis, Chicago, Ill.

607,919. Electric Tramway. A. Diatto, Turin, Italy.

607,921. Electrical Measuring Instrument G. K. Elphinstone, London, and A. C. Heap, Penn, England.

607,989. Interior Conduit. E. E. Erickson and F. W. Erickson, Boston, Mass.

607,992. Igniter for Gas Engines. R. B. Hain, Grand Rapids, Mich.

607,994. Microphone. T. J. Howell, London, England.

607,997. Electrically Self-Propelling Vehicle. L. Krieger, Paris, France.

608,013. Reversing Rheostat. I. E. Storey, Philadelphia, Pa.

608,015. Secondary Battery. G. Walter, Strasburg, Germany.

608,076. Electric Telephone System for Houses. L. Plaut, New York, N. Y.

608,088. Insulated Rail Joint. G. A. Weber, New York, N. Y.

608,104. Electric Sounding Device for Ships. J. P. Buckley, New Orleans, La.

608,109. Electric Light for Surgical Purposes. W. E. Dow, Braintree, Mass.

608,132. Electrostatic Measuring Instrument. J. F. Kelly, Pittsfield, Mass.

608,133. Means for Preventing Stray Magnetism in Dynamo-Electric Machines. J. F. Kelly.

608,134. Electrical Circuit-Controller. R. Lundell, New York, N. Y.

608,135. Commutator Brush-Holder for Dynamo-Electric Machines. R. Lundell.

608,137. Electric Motor for Electrically Propelled Vehicles. A. Siemens, London, England.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 6. CHICAGO, SATURDAY, AUGUST 7, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich.....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Hood River Rate Case.....219
Electricity in Agriculture.....220
Chemical Reactions in Magnetic Fields.....220
Getting the Most From the Electric Vehicle.....221
The Character of Electrical Service.....221
DEPARTMENTS:
Commercial Practice 227
Electrical Construction 230
National Association of Electrical Inspectors.....232
Among the Supply Men.....234
Public Service Commissions.....235
New Electrical and Mechanical Appliances.....247
Latest Approved Fittings.....254
Current Electrical News.....256
Record of Electrical Patents.....259
Electric Vehicle Section.....261
LEADING ARTICLES:
Electricity in Manufacture of Wood-Pulp Paper.....223
Paying Commissions on Cancelled Orders.—By Elton J. Buckley 234
Test of a Direct-Current Motor.—By H. C. Lightfoot.....240
The Purchase and Care of the Initial Truck.—By G. Drake Smith 261
Electrically Propelled Fire Apparatus.—By A. Jackson Marshall 264
LETTER TO THE EDITOR:
Style Versus Dogma in Lighting.—By A. Glow.....246
MISCELLANEOUS:
Chicago Makes Big Plans for Jovian Convention.....222
Program of Papers for Municipal Electricians.....222
Electrochemical Society Meeting.....222
Courteous Service.—By Edward H. Mulligan.....227
A System of Accounting for Central-Station Companies....228
Don'ts for Meter Readers and Bill Passers.....228
Electricity in Construction of New Portland Bridge.....229
Robert Montgomery 229
The Compensarc for Motion-Picture Projectors.—By C. Walford 230
Static Electricity in a Textile Mill.—By William T. Estlick 231
Idealism in Competition.....235
Engineers Urge Qualifications of Utility Commissioners....238
British Electrical Standardization.....238
Motor Searchlights With the British-French Forces.....239
Chicago Electric Garages Introduce a Parking System for Waiting Cars 264
Plans Developed for the Coming Convention of Electric Vehicle Association in Cleveland.....268

Copyright, 1915, by Electrical Review Publishing Company, Inc.

HOOD RIVER RATE CASE.

The case recently decided by the Railroad Commission of Oregon, fixing rates for the Hood River Gas & Electric Company, and the Hydro Electric Company, involves a number of interesting points, but perhaps none is more worthy of note than the attitude taken by the Commission with respect to early losses incurred through cut-throat competition.

The two companies, now under common control, were involved in fierce competition before coming under the regulative jurisdiction of the state commission. This involved a deficit in revenue through cutting rates, furnishing a certain amount of free service and other discriminatory practices, and also an abnormal expense through the fight to get new business. The Commission refuses to recognize such losses as legitimate expenses of building up the business, but does recognize the principle of capitalization of expenses properly incurred in developing the business.

Such losses as those above mentioned, however, are not regarded as building up the business, or helping to put the utility in a condition to serve the consumers. They are held to contribute nothing toward building up a going concern, and are not to be foisted upon the customers of the utility, but must be borne by the owners of the utility, and it happens in this case that the competing utility which entered the field already occupied is the one chiefly involved. Now that common ownership has been established, however, that is a matter of little concern with respect to the fixing of future rates.

The conditions brought out as existing in Hood River illustrate once again the futility of attempting to solve the problem of utility service by establishing two or more independent competing companies. The results are not satisfactory to the consumers, and bankruptcy to one or possibly two companies ensues. If not driven entirely to the wall, the weaker concern is bought out by the stronger, the service is eventually consolidated; nothing has been gained, but much is usually lost.

In the long run better service will be given by a single utility, and the combination of good service with reasonable rates can be effected through the supervision of a regulatory commission in the cases of those utilities having such undiscerning management as to let conditions reach the point where commission interference becomes necessary.

Digitized by Google

ELECTRICITY IN AGRICULTURE.

Many reports have been given out from time to time indicating an increase in vegetable growths of many kinds due to the stimulation of electric energy in one form or another. Experiments of this nature have been fairly numerous, and while no doubt can be entertained as to the results, there has not always been satisfactory evidence as to the direct cause of the results. Control experiments have not always been carried out in such a way as to satisfy the critical, and doubts have sometimes been expressed as to whether results have been due directly to electric stimulation or to some co-existing condition which has not received proper attention.

The weight of evidence, however, indicates that under the most advantageous conditions electric stimulation has increased crop yields of many kinds. The favorite method of application has been to cause a high-tension discharge to the ground from insulated conductors which have been arranged over the growing plants. It has been observed that a positive discharge gives better results than a negative one, and consequently where alternating current is used it is preferable to either rectify the current or else insert in the circuit an electric valve which will permit discharge only in one direction. Much more experimentation is needed along these lines from a practical and commercial standpoint, for while beneficial results can be secured it is very questionable whether the commercial results are sufficient to justify the necessary expense.

Electric stimulation appears not only to affect vegetation, but to have a similar effect upon living creatures. Experiments carried out in England in connection with chicken raising have indicated that young chicks subjected to an electrified atmosphere for a certain interval each day show not only a greater vitality, so that a lower percentage of mortality is obtained, but also show a much more rapid growth under the same feeding or an equal growth with a more limited diet. Too strong or too frequent application of the electric stimulation was on the other hand found harmful. Such an application of electric stimulation would seem much more susceptible of commercial exploitation than the stimulation of plants.

Certain experimenters have announced somewhat similar increases in the growth of plants from a stimulation by radioactive materials. It has been claimed that the growth of plants and the yield of useful parts, such as seeds or roots, can be remarkably increased in this way. The reliability of such conclusions is, however, somewhat a matter for question in view of the uncertainty of the causes and the unconvincing nature of the control experiments. In a recent issue of *Science*, Messrs. C. G. Hopkins and W. H. Sachs report experiments carried on at the University of Illinois to test this question, and it is notable that in this case no definite beneficial result of the application of radioactive substances to the soil was found. These experiments covered two years and involved a large number of trials. The crops experimented with were corn and soy beans. The amount of radium salt used was varied, applications costing $1, $10 and $100 per acre being used, the idea being to make the experiments a real commercial trial.

While these results were entirely negative, it is to be noted that certain other experimenters have found that the stimulation varies greatly with different plants and that those selected may not have been most susceptible to this form of excitation. While it is well known that radioactive substances continually give off energy, which is usually manifested in the form of heat, no appreciable effect can be expected from any direct temperature elevation. This is easily seen when it is considered that a thousand dollars' worth of radium gives off no more heat in one hundred days than is received from the sun on one square foot of the earth's surface in thirty seconds. The recent announcement that the Bureau of Mines has greatly lessened the cost of production of radium by a new process which has been applied to the carnotite ores of Colorado is not likely to have any effect upon the application of radioactive materials to agriculture. Here again it would seem that even though beneficial results may be obtained under certain circumstances, the cost of applying stimulation is likely to be much larger than the commercial value of any beneficial results which may be obtained.

CHEMICAL REACTIONS IN MAGNETIC FIELDS.

Experiments have been reported from time to time which have indicated that the chemical action taking place in aqueous solutions has been modified by the existence of a magnetic field in the solution. Great difficulty has been experienced, however, in distinguishing between a case of this sort and one in which the action is due to local differences in the concentration of the solution. Departures from the homogeneity of the mass might arise from the differences in the magnetic susceptibility of different substances which might lead to differences in the concentration in the presence of a magnetic field.

Recent experiments indicate, however, that differences in concentration cannot be produced in a mixture by separation of the constituents through magnetic action, but where a new compound is being formed, as at the surface of a solid, the magnetic action may prevent this from diffusing throughout the mass at the same rate which would be observed in the absence of the magnetic field. Consequently, the existence of the field may in some cases produce a change in the chemical result through its effect upon concentration. Thus, if two pieces of iron are immersed in sulphuric acid and one of these pieces is magnetized, a resultant electromotive force may be observed. This has been shown in some work by Rathert to be due to the magnetism of the ferrous sulphate which is formed. Stirring the solution interfered with the results obtained.

It would appear from available experimental data concerning this problem that the only way in which the magnetic field may affect chemical action is

Digitized by Google

through the physical effects which it may exert and that the same chemical phenomenon would take place if the physical conditions could be reproduced in some other way than by the action of the magnetic field.

GETTING THE MOST FROM THE ELECTRIC VEHICLE.

It has been amply demonstrated that the electric vehicle is well adapted to a large variety of work and that it constitutes the most economical means of transportation in cases where it is fitted for the work which is to be done. It is fully realized by those central stations which have acquired battery-charging load that the electric vehicle represents one of the most profitable developments of the future. The problem for every central station should therefore be to develop the use of electric vehicles in its own territory as rapidly and as fully as possible. It has before it the problem of finding users.

It has been frequently pointed out that the first step for the central stations which desire to encourage the use of electric vehicles is to adopt that means of solving its own transportation problems. If the central station does not set this example, any arguments which it may advance to its customers will have little weight, for actions invariably speak louder than words. If the central station does adopt electric wagons, it should, not only for its own satisfaction, but in order for its demonstration to be convincing to others, get the vehicle which is best adapted to its special requirements. The greatest care is necessary in making a selection in order that the vehicle will show up at its best. In the past this has not always been done, as is emphasized by Mr. George Drake Smith in the discussion presented by him at the convention of the Ohio Electric Light Association last month, and which is given in full on other pages of this issue. Mr. Smith presents a serious indictment against certain unnamed central stations which have not given proper care to their electric vehicles after securing them, and against others which have ordered vehicles for one service and later applied them to a more onerous service which they were not designed to withstand successfully. In consequence there have been a number of cases of dissatisfaction and disappointment with the electric.

The electric vehicle has features which make it especially suited to a number of central-station needs, but to satisfactorily fulfill these the type of machine must be well chosen and it must be properly handled in use and not subjected to abuse. In specifying a type of vehicle which shall be purchased for a given use, it is well also to choose a standard model whenever it is feasible to do so, rather than to require a special design. With a proper analysis of requirements, attention to previous experience of others and to numerous operating data which are now available, the central station should have no difficulty in securing a vehicle which would be perfectly satisfactory.

THE CHARACTER OF ELECTRICAL SERVICE.

Among the more conspicuous features of municipal electrical service in England is the influence which the chief engineer and manager of an undertaking frequently has upon the character which his system bears in both the technical and the public estimation. It is prefectly true that cases might be named of engineers whose chief grievance has been that in their advanced views they have not been able to secure the necessary support of their electrical committee, or else of some important opposing section of the municipal council. Of course, there are cases where those armed with superior authority, whether possessing superior knowledge or intellect or not, have been able to clip the wings of the engineer whose inclination is to fly; but generally he soon can discover the uncongenial and unhealthy nature of the atmosphere and he shakes the dust of the city from his feet. When this has happened the most interesting development has been witnessed when his successor has been appointed and has been given practically a free hand! It has been amusing at times to note how the new man has been allowed to carry out extensions costing hundreds of thousands of dollars which the departed chief knew to be necessary, recommended, and saw turned down. As new brooms sweep clean, so sometimes the new man, because he is new, inspires such confidence to the municipal mind that he is allowed to sweep everything before him.

But there are outstanding examples of undertakings where there is nothing akin to fickleness; where councillors have had minds of most gratifying receptivity, and in consequence because the engineer or manager has been of the strongly progressive type the undertaking under his control has been allowed to make for itself a progressive reputation, and the councillors have taken their share of credit as well. Given reasonably favorable conditions, the character of the "chief" and that of his system have been alike.

In the same way the progressive spirit of the chief manifests itself throughout and not merely in one isolated section of his work. Men of enterprise and foresight, when the power load was just beginning to come along, launched out to meet the situation by motor-hiring arrangements and convenient rate schedules; when the cooking question came to the fore, these men saw the possibilities, and while others were suspicious, skeptical, or lagged behind, they acted enterprisingly; and now that the electric vehicle business is beginning to move in England, they are prominent with their efforts to render available all possible facilities for its encouragement.

The chief who wants to move forward, but finds his councillors as a stone wall before him, is a subject for our sympathy; but in the majority of cases the progressive man leaves a very definite progressive mark upon his undertakings

Digitized by Google

Chicago Makes Big Plans for Jovian Convention.

The thirteenth convention of the Jovian Order will be held at Chicago, Ill., Wednesday, Thursday and Friday, October 13, 14 and 15. Headquarters will be established at the Hotel Sherman, Randolph and Clark Streets.

There will be a reception to the Past Jupiters' Association on Tuesday evening, October 12, followed by dancing.

The opening session will be held on Wednesday morning, and Wednesday afternoon the Jovians will be the guests at luncheon of the business interests of Chicago, the affair very likely being tendered under the auspices of the Association of Commerce. The afternoon will be devoted to an outing trip, and in the evening there will be an elaborate entertainment.

On Thursday morning there will be a business session, the afternoon being devoted to the degree team competition. The evening will witness the annual rejuvenation, at which it is expected to have the banner class in the record of Jovianism.

Friday morning there will be a business session, and in the afternoon the closing session and the election of the fourteenth congress. The convention will conclude with a banquet on Friday evening.

A big general committee under the chairmanship of Homer E. Niesz, Thirteenth Jupiter, is planning for an enthusiastic reception to the visitors, and details already arranged indicate that the convention will offer extraordinary attractions both in the matter of addresses from leaders in various branches of the industry and in entertainment. Special provision is being made for the comfort and entertainment of the visiting ladies.

Program of Papers for Municipal Electricians.

The following papers have been announced for the convention of the International Association of Municipal Electricians, to be held at Cincinnati, O., August 24 to 27:

"The Advisability of Using Concentric Wiring in This Country," by R. A. Smith, city electrician, Norfolk, Va.

"Fire-Alarm Systems for Industrial Plants," by Albert J. Cross, of the Gamewell Fire Alarm Company, New York.

"The Scope and Present Status of the National Electrical Safety Code," by W. J. Canada, Bureau of Standards, Washington, D. C.

"Practical Cable-Maintenance Methods," with demonstration, by O. F. Tallman, of W. N. Matthews & Brother, St. Louis.

"Storage Batteries for Fire-Alarm Purposes," by representative of the Electric Storage Battery Company, Philadelphia.

"The Work of the Bureau of Standards, including some account of the Co-operation of the Bureau with Municipalities in securing Electrolysis Mitigation and improving Electrical Service and Meter Accuracy," by E. B. Rosa, Bureau of Standards, Washington, D. C.

"Uniform Electrical Standards," by John Price Jackson, commissioner of labor and industry of Pennsylvania.

"The Importance of the Superintendent of Fire and Police Telegraph to his Municipality," by W. H. Flandreau, city electrician, Mt. Vernon, N. Y.

"Police Patrol and Fire-Alarm Records," by Price I. Patton, Electrical Bureau, Philadelphia, Pa.

"Lightning Protective Apparatus for Fire and Police Telegraph Circuits," by L. S. Brach, Newark, N. J.

"The Fallacy of Placing Fire and Police Alarm Wires in Telephone Cables," by C. E. Convers, city electrician, San Antonio, Tex.

"Standards for Fire-Alarm Installations," by F. A. Raymond, of National Board of Fire Underwriters, New York.

Electrochemical Society Meeting.

The fall meeting of the American Electrochemical Society will be held in San Francisco, from Thursday, September 16, to Saturday, September 18. Special transportation facilities have been arranged for by a committee of which J. M. Muir, 239 West Thirty-ninth Street, New York City, is chairman. The regular society train will leave New York on Saturday, September 11, and the special engineers' train on Thursday, September, 9.

At the time of holding the meetings, the American Institute of Mining Engineers and the American Institute of Electrical Engineers will also be in session, and joint meetings have been arranged with these societies for Friday, September 17. During the following week the International Engineering Congress will hold its meetings.

The following papers have been accepted to date and will be presented at the meeting:

W. D. Bancroft, "The Peptonization of Chromium Oxide."

F. M. Fredericksen, "Electrochemical Synthesis of Phenol Hydroxyl Amine."

A. G. Bettes, "Electrolytic Antimony Refining."

C. W. Bennett, Rose and Tinkler, "Electrodeposition of Nickel."

W. D. Bancroft, "Electromotive Forces." (This is a review of the fundamental formulas of electromotive force and amendment of the fundamental Nernst equation, deriving it also from a more general standpoint.)

Wills and Schuyler, "Heat Losses from an Electric Steel Furnace."

W. R. Mott, "Use of the Flame Arc in Paint and Dye Testing."

R. S. Bosworth, "Collection of Radium Emanation and its Application for Therapeutic Use."

F. T. Snyder, "Electric Steel Costs." (An analysis of the cost of making electric steel from cold raw materials on a small scale for foundry use.)

R. S. Wile, "Melting of Ferro-alloys in the Electric Furnace."

L. Addicks, "The Electrolysis of Copper-Sulphate Liquors Using Carbon Anodes." (An extended account of recent experiments in leaching copper ores in Arizona, and the successful use of carbon anodes in electrolyzing sulphate solutions.)

F. R. Pyne, "Solution Stratification as an Aid to the Purification of Electrolytes."

F. M. Sebast, "Electrical Resistance of Copper-Nickel-Chromium Alloys."

J. W. Beckman, "Electrochemical Possibilities on the Pacific Coast." (A discussion of the location and cost of power supply, of raw materials and possible markets for electrochemical products manufactured on the Pacific Coast.)

Other papers will be presented by members of the American Institute of Mining Engineers.

Special arrangements have been made for members to visit mining, metallurgical, hydroelectric and various other engineering operations in California on September 18.

Further Canadian Hydroelectric Development at Niagara Falls.

Some months ago its was announced that the Ontario Hydroelectric Power Commission had nearly exhausted the 100,000 horsepower obtained from the Ontario Power Company at Niagara Falls at a cost of $9 a horsepower, and that it would soon be necessary for the commission to contract for additional power or build its own generating plants at Niagara Falls and the spillways of the new Welland Ship Canal.

It is now authoritatively announced that the Commission is about to submit to the Ontario Government plans for the development of the remaining 6,600 second-feet of water available at the Falls under the treaty and the additional power obtainable from the spillways of the Welland Canal to the total extent of 250,000 horsepower, of which 100,000 horsepower is to be developed as early as practicable. The entire development proposed would cost some $10,000,000 and require three years for its completion. The work will be financed by the Province of Ontario for the benefit of the municipalities, which will be responsible for the outlay incurred in providing additional hydroelectric power.

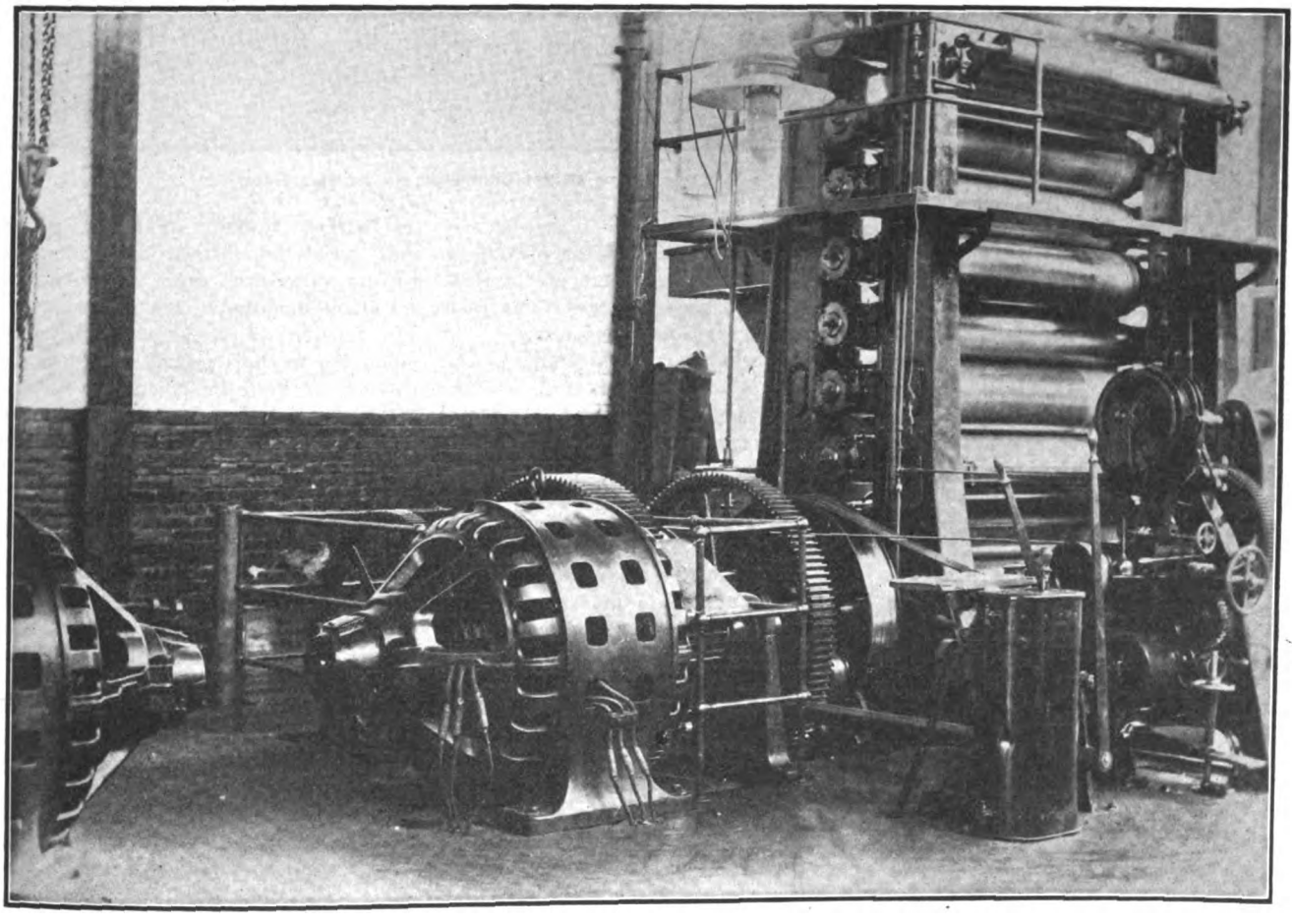
Digitized by Google

Electricity in Manufacture of Wood-Pulp Paper.

This article describes the various processes involved in paper-making, giving recommendations as to the size and type of the motor required. Particular attention is accorded the characteristics and power requirements of super-calenders, used in the manufacture of high-grade paper.

Electric-motor drive has been extensively adopted for the operation of pulp and paper mills in the last decade and it has numerous advantages for this industry aside from the general advantages of safety to employees by the elimination of large belts and shafts, increased production, improving hygienic conditions and general flexibility with ease of control.

Continuity of service and uniform speed are two of the important essentials of the power requirements in the manufacture of paper. When a run of stock is started it must be continuous and any lack of uniformity in speed seriously impairs the product. The starting conditions of pulp and paper machinery are severe and large overloads are frequently encountered. Furthermore certain portions of the paper-making machinery require a variable speed which is admirably met by the variable-speed electric motor without the use of cumbersome mechanical speed-changing devices. The speed of paper machinery must change as the weight and thickness of the product changes and any efficient means of quickly controlling the speed of the machines adds to the rate of production. In some of the departments all of the machines are not used constantly, therefore individual electric motor drive is particularly adapted as the continual losses in long lines of shafting, with numerous belts, is eliminated and any one machine may be operated independently of another.



Motor Driving Calender, West Virginia Pulp and Paper Company.

Roughly the grades of paper and their raw product are divided as follows: Writing and printing papers made from rags, esparto and wood pulp; wrapping papers and paper boards made from wood pulp, hemp, jute, straw and waste paper. The majority of printing paper used in this country is made from wood pulp, of which there are two general divisions, mechanical wood pulp and chemical wood pulp. The former is generally used for the cheaper grades of paper such as used by newspapers. The mechanical pulp undergoes the following processes: First gathering and delivering the logs, then respectively barking, grinding, boiling, screening and pressing. In the chemical process, gathering the logs, chipping, screening, pressing and making the dry pulp liquor are in order.

In general, the manufacture of paper involves a number of successive operations, each of which plays an important part in the production of properties required in any particular paper. The general principles underlying these operations are the same, whatever the nature and quality of the raw material or whatever the nature and quality of the finished paper. The variations in detail in certain stages of manufacture are naturally considerable. The stages of manufacture may be classified as follows: The isolation of the paper-making fiber, cellulose, from the raw material; conversion of the cellulose into pulp, or "half-stuff"; beating of the half-stuff; manufacture of the paper from the beaten pulp, and the processes for finishing the paper.

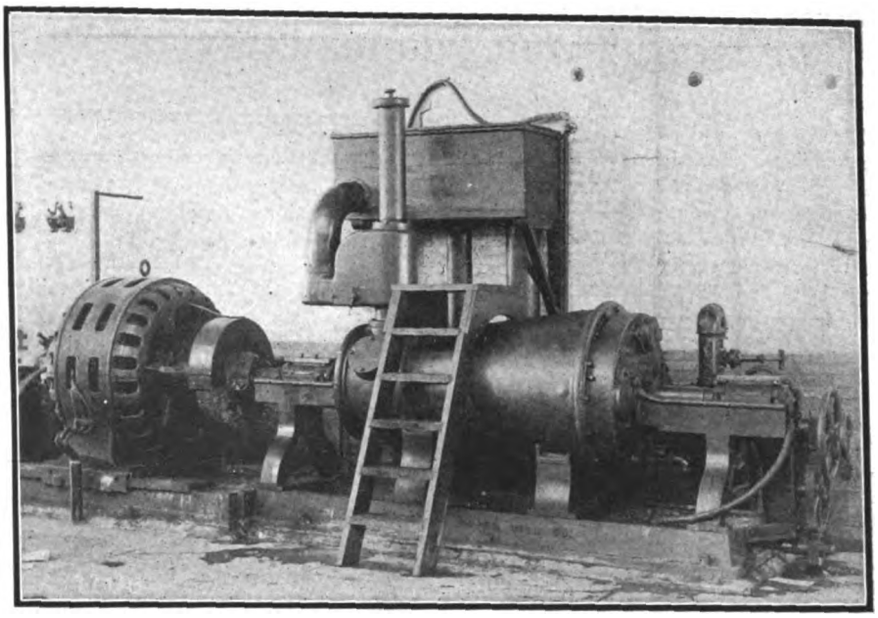
The nature and extent of the process by which the fiber is obtained from the raw material depends partly on the physical and chemical characteristics of the vegetable tissues and partly on the nature of the paper desired. For certain prod-

Digitized by Google

ucts, such as browns, wrappings, millboards, cardboards and the like, the preliminary treatment is so slight that the prepared fiber differs but little from the raw material, while, on the other hand, for better-class papers, such as those required for magazines, fine printings and machine-finished writings, which are mainly prepared from esparto and wood, the treatment is so severe that the fiber obtained has little in common with the raw material either as to physical structure or chemical composition.

Generally speaking, the methods adopted for the isolation of paper-making fiber aim at the production of a more or less pure cellulose by digestion of the raw material with alkali or acid salts at a fairly high temperature. The alkali process is in practice applied to practically every commercial fiber, but the acid process is at present confined to the manufacture of chemical wood pulp. The cellulose freed from the valueless organic compounds with which it is closely associated in the raw plant has then to undergo conversion into what is termed "half-stuff," a convenient term for pulp when partially prepared. The boiled material, which usually retains its shape and general form even after the severe process of digestion, is mechanically disintegrated into single isolated fibers and in this condition the pulp obtained can be readily bleached.

"Beating" the half-stuff is probably the most important stage in the manufacture of paper, and one in which the quality of the finished article may be varied to almost any extent. For ordinary machine-finished papers, the sizing, loading and coloring of the pulp are effected at the same time and in the same appliances as the beating process. The pulp is finally converted into paper by paper-making machines and the process relating to the finishing of the papers comprises calendering, glazing, cutting, sorting and packing. In addition to these operations of general application there are particular methods of producing specialties, such as art, duplex and other papers.



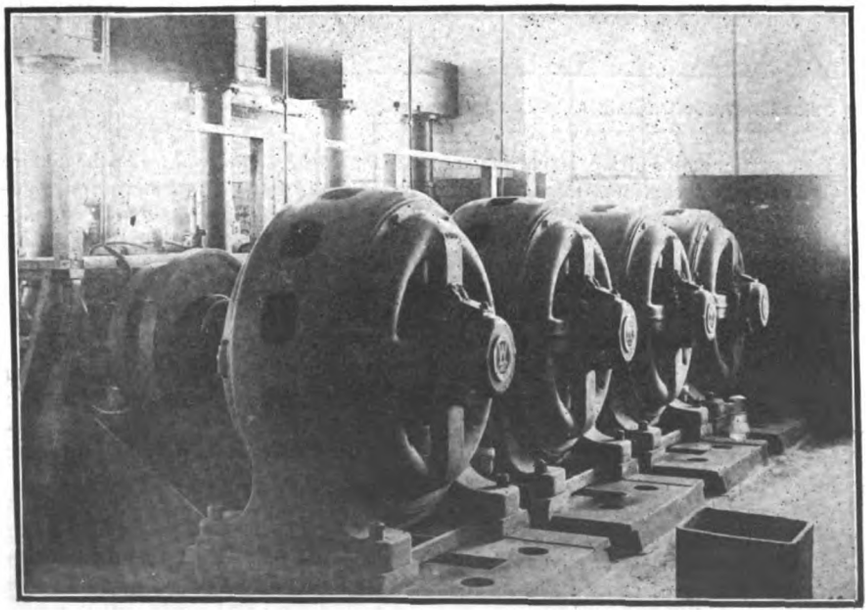
Motor Direct-Connected to Jordan Engine.

Mechanical Wood Pulp.

Paper-making fiber known as mechanical wood pulp is so called because prepared by purely mechanical methods, in contra-distinction to pulp manufactured by chemical processes. Trees are cut down in the winter time by gangs of men, and piled up on the frozen rivers until spring when they gradually find their way to the mill. Other means of transportation of the logs can, of course, be employed. The logs as brought into the pulp mill are usually 12, 14 or 16 feet long. They are cut into short lengths of 2 feet by powerful circular saws and then barked. Two methods of barking are in common use, the "tumbler" system and the "barker" system. In the former, the short pieces are thrown into a large revolving cylindrical drum, together with a suitable quantity of hot or cold water. The friction of the pieces against each other due to the tumbling caused by the rotation of the drum, completely removes the bark, and the logs are withdrawn in a clean condition. In the "barker" system the machine used consists of a heavy iron disk provided with strong steel knives fixed to its surface, and projecting about a half inch from it.

There are several types of grinding machinery used, but they are all based on the plan of forcing the wood by means of hydraulic pressure against the face of a rapidly revolving grindstone continually flooded with water, which carries away the disintegrated pulp as fast as it is produced. The grindstone is a massive heavy stone about 54 inches in diameter and 27 inches thick. It is mounted on a steel shaft and covered with a specially built iron covering. This casing is provided with several projecting chambers or pockets, into which the wood is thrown, in such a manner that the side of the log comes into contact with the face of the stone, against which the wood is forced by hydraulic cylinders attached to the pockets.

The pulp flows from the grinders over a coarse sieve which retains any large splinters or chips and it is then carefully screened. The proportion of water to pulp at this stage of manufacture is so large that it is necessary to pass the mixture through a wet press machine which produces the mechanical wood pulp in a more solid form for marketable purposes. Power requirements of pulp grinders are rather severe, ranging from 250 to 350 horsepower for 27-inch stones.

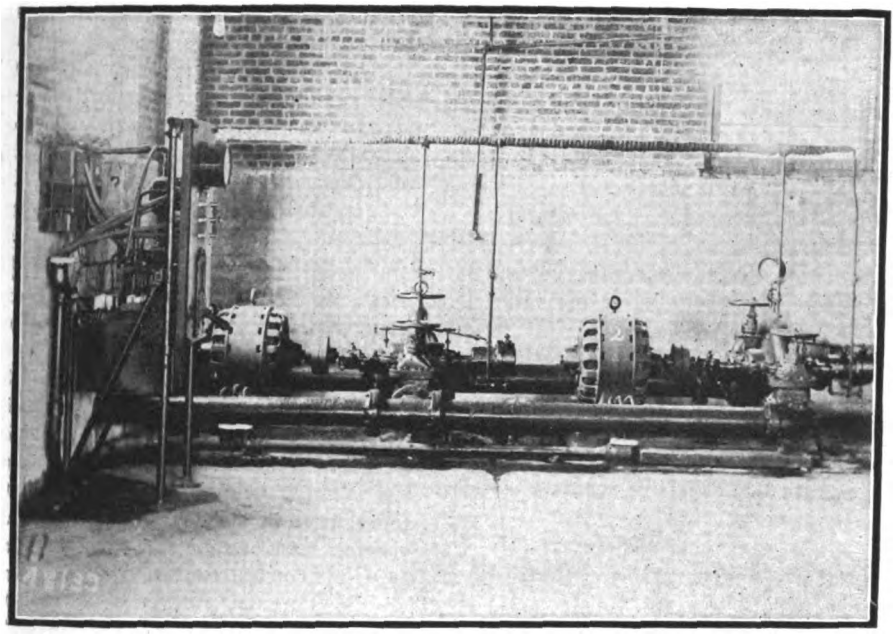


125-Horsepower Motors Driving Jordans.

Chemical Wood Pulp.

In a large eastern paper mill soda pulp is made from poplar, basswood, etc., while

Digitized by Google



Motors Driving Centrifugal Pumps.

the sulphite pulp used is brought from a distant sulphite pulp mill. The wood is received at the mills well seasoned and cut into five-foot lengths. It is then cut lengthwise in several pieces by a powerful motor-driven rip saw. The wood is then ready for the chipper wheels where it is reduced to chips about five-eighths of an inch in length. The chipper wheels make 760 cuts a minute and have a capacity of 100 cords of wood in 24 hours. Each chipper is individually driven by a 100-horsepower 440-volt squirrel-cage induction motor. From tests on the chippers cutting poplar, the highest reading was 158 horsepower and the lowest 19 horsepower, which shows the widely varying nature of the load imposed upon chippers.

The next process is conveying the chips to the digesters where the intercellular matter is dissolved. The wood is cooked for about eight hours under a steam pressure of 120 pounds, when the pulp is discharged into a pulp pit where the liquor is drained off and saved to regain the soda ash. The pulp is then ready for bleaching and refining.

Two pulps, soda pulp and sulphite fiber, are brought together in beaters and mixed with clay sizing and coloring matter. The beaters consist of large tubs shaped similar to a bath tub of enormous size. A partition extends partially across the center of the tub the longest way. On one side of the partition there is a revolving cylinder with knives placed radially in the periphery. These knives are revolved by the cylinder and pass closely over stationary knives in the bottom of the tub. The action of the revolving knives causes the pulp to keep up a continuous circulation about the beater breaking up the pulp into a uniform consistency. The approximate power required for beaters is 30 to 40 horsepower.

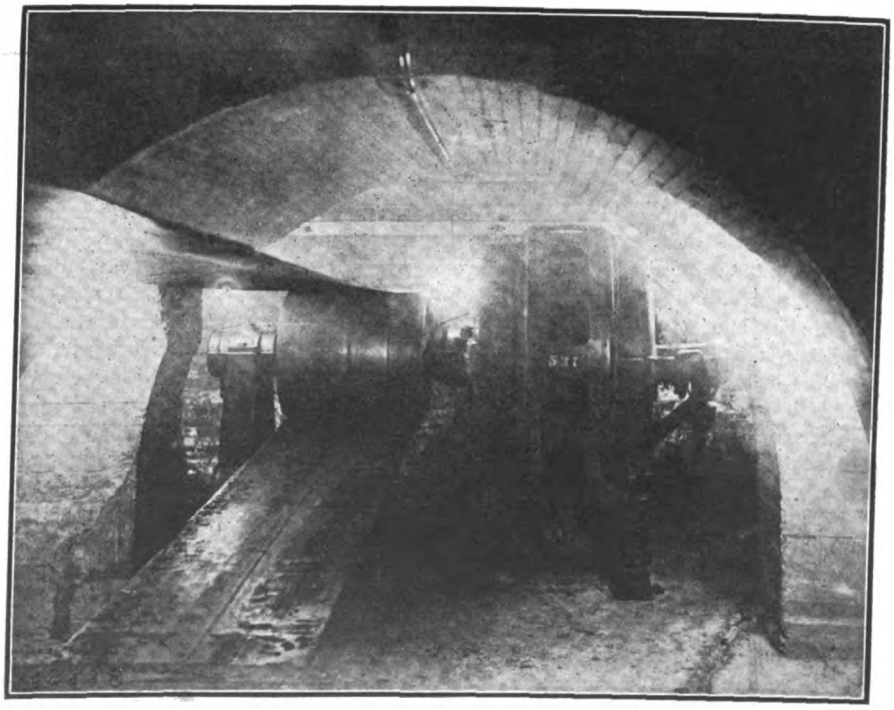
The pulp may be still further refined by the Jordan engine which consists of a conical cylinder in which a concentric cone revolves. Radial projections parallel with the axis of the cylinder run in close proximity to projections in the interior of the conical case. Adjustments are made by an endwise movement of the cone. The Jordans are sometimes directly connected to a squirrel-cage induction motor, the latter having an elongated secondary or rotor which permits adjustment of the Jordan without shutting down. The refining process of both mechanical and chemical pulp is somewhat similar and the next step is the operation of the paper machine proper.

Pumps of many sizes are necessary to handle the wet pulp, water, bleaching and other liquids. These are generally centrifugal and motor driven.

The principles of the "Fourdrinier" or paper machine depends upon the use of a wide, endless band of wire cloth which runs horizontally over suitable rollers. The mixture of pulp and water flows on the wire cloth and is carried forward, the water falling through the meshes of the wire, and the pulp settling on the surface of the wire into the form of a wet sheet. The stock of pulp and water is contained in a stuff chest at the wet end of the machine and is kept in a continual state of agitation by a stirrer. From the stuff chest the pulp flows into a long narrow box from which it is distributed evenly over the wire. The wire passes over couch rolls and returns back to the starting point, passing under the frame of the wet end of the machine.

From the wire the pulp is transferred to a traveling felt which carries it forward to press rolls where it is subjected to considerable pressure. The pulp, now paper, is firm enough to be dried by passing through drying cylinders. After the latter process the paper runs through calender stacks and is trimmed by a paper trimmer. From the foregoing it can be seen that the paper machine is really divided into two parts. The wire, press-rolls, dryers, and calender rolls are driven at variable speeds, and the auxiliary apparatus of the wet end at constant speed. The constant-speed part generally requires from 25 to 30 per cent of the total power necessary to drive the whole paper machine.

In a wood-pulp paper mill in Wisconsin there are two Beloit paper machines. The smaller of the two machines has a capacity of 21 tons daily at the rate of 525

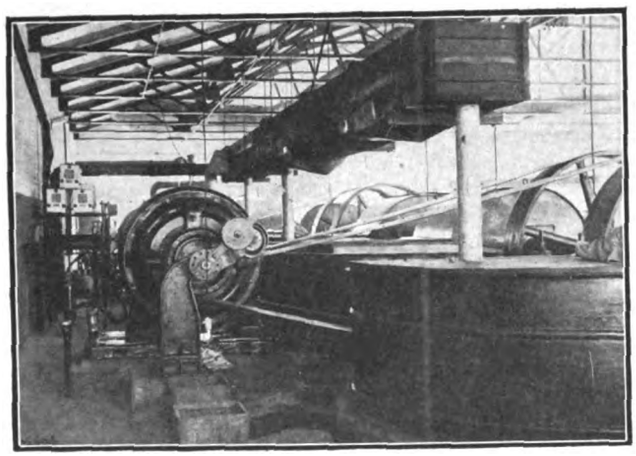


300-Horsepower Motor Driving Beaters.

Digitized by Google

feet a minute. The paper is 84 inches wide before trimming and 78 inches wide after trimming. The machine has 29 dryers and a 70-foot wire; the variable-speed portion is driven by a direct-current shunt-wound variable-speed motor with a speed range of from 470 to 750 revolutions per minute. The constant-speed end of the paper machine is driven by a 50-horsepower direct-current motor of the same make. From actual tests of the paper machine while running under normal conditions it was found that 101 horsepower was used for driving the variable-speed end.

The larger of the two paper machines has a capacity of 26 tons of paper a day at the rate of 475 feet a minute. The paper is 104 inches wide before trimming and 97 inches wide after trimming. There are 25 dryers and a 60-foot wire. The variable-speed end is driven by a 100-horsepower motor of the same characteristics as that for the smaller paper machine and from tests was found to deliver 97 horsepower when the paper machine was operating under normal conditions.



150-Horsepower Motors Driving Two Beaters Each—American Box Board Company.

The constant-speed end is driven by a 50-horsepower motor. The seemingly misleading figures showing that under test the larger paper machine required less power than the smaller, is undoubtedly due to the slower speed of the former machine.

The following data will be useful in connection with super-calenders used for high-class book paper for giving a gloss finish. It is customary to start the calenders at slow speed with a small motor and thread the paper through the rolls. After the paper is in place a large variable-speed motor is started for the operation of the calenders and the small motor is automatically thrown out of gear. In this case the small motors are of the squirrel-cage induction type and the large motors slip-ring variable-speed induction machines.

The following horsepower requirements are recommended for the specified sizes of super-calenders: Super-calenders 86-inch stock; variable-speed motor 75 horsepower, constant-speed starting motor 15 horsepower.

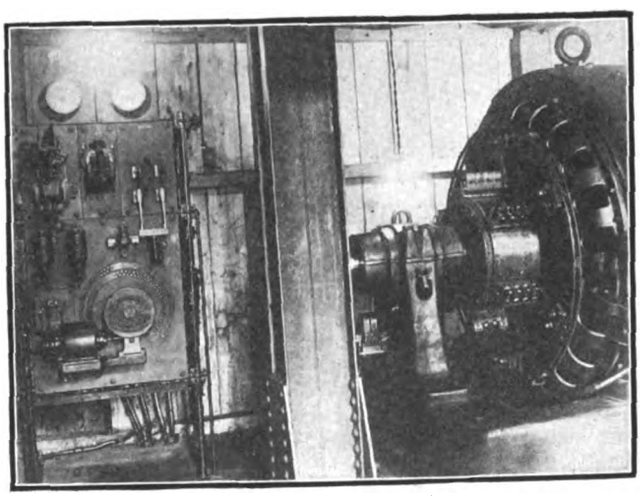
Super-calenders 72-inch stock; variable-speed motor 75 horsepower, constant-speed starting motor 15 horsepower.

Super-calenders 66-inch stock; variable-speed motor 75 horsepower, constant-speed starting motor 15 horsepower.

The dimensions of the calenders refer to the width of the paper. The narrow calenders run at a higher speed than the wider calenders, therefore the power requirements do not vary in a direct ratio with the widths. It is absolutely essential that calenders can be operated at varying speeds, under accurate speed control, in order to slow down and note the extent of defective spots as they appear in the paper.

Electric Operation Begun at World's Largest Copper Deposit.

An American diplomatic officer has forwarded the following interesting report from South America.



Motor and Control Equipment for 165-Inch Paper Machinery.

On May 18 power was turned on in the big electric plant of the Chile Copper Company, at Tocopilla, north of Antofagasta, for the operation of the mill at Chuquicamata, thus inaugurating the exploitation of the mines which officials of the company claim are the largest known deposits of copper in the world. Barros Luco, President of Chile, pressed the button at Santiago that set in motion the machinery at the port and mine. When completed the mill will have a capacity of 20,000 tons of ore daily, the plant being constructed in two units. Only one unit of 10,000 tons has been put in operation.

Although known to mining engineers the world over for many years, the low-grade deposits of Chuquicamata remained almost neglected. The native Chileans worked various parts of this great deposit in a small way, and for a short while an English company also attempted, unsuccessfully, to work a small part of it. In 1910 options for the major part of this deposit were obtained by Albert C. Burrage, of Boston, and shortly afterwards the Messrs. Guggenheim, of New York, became associated with him, the result of this being the Chile Copper Company, of which Daniel Guggenheim is president and Albert C. Burrage vice-president.

The deposit was believed to be extremely large, as the formation tor some 8,000 feet in length and 2,000 feet in width was favorable for the deposition of copper minerals, but its true size was undreamed of. It is interesting to note how the ore "in sight" has steadily grown. In January, 1913, there were in sight 75,000,000 tons, averaging 2.70 per cent copper; in June, 1914, 211,000,000 tons of 2.20 per cent; and in January, 1915, over 300,000,000 tons of 2.10 per cent copper in sight. This makes it the largest known deposit of copper in the world.

The power plant at Tocopilla has 40,000 kilowatts capacity, designed for either coal or oil fuel. A long-time contract has been made for California crude oil at a satisfactory price for the uses of the power plant and for other purposes at the mine and mill. There has been built for the mine and mill a complete equipment for housing the employees of the company; that is, stores, storehouses, hospitals, offices, dwelling houses, etc. Around the mill site there has sprung up, from what a few years ago was a barren desert, a now thriving town of 4,000 inhabitants. An agreement has been entered into with the railroad from Chuquicamata to Tocopilla to carry all the freight for the mine and the copper from the mine for a number of years at a satisfactory rate.

Kentucky broke its record of coal production with an output for 1914 of 20,382,763 short tons.

Digitized by Google

Commercial Practice
Management, Rates, New Business

COURTEOUS SERVICE.[1]

By Edward H. Mulligan.

"Courteous service" combines courtesy and service, two of the absolute essentials in the conduct of a great and successful organization. It is a most pertinent subject, approached from either angle.

Volumes have been written on "Courtesy" in each of its many phases, and yet withal, there has not been one word too much—in fact I even shall have the temerity to add a little more myself. "Service," however, seems to be the root of the subject before us, while "Courtesy," though equally important, is but the qualifying substantive, if I may be allowed the expression. It is then my purpose to try, at least, to emphasize by every means in my power, first the dignity of service itself and then point out the quality of the service that should follow as a natural corollary, viz.: "Courtesy."

In the United States not long ago, there was a movement to change the name "Servant" to something that might not so clearly convey the idea of service to the average mind, in the belief that such a title is degrading. Degrading! Think of it, when no more honorable title exists in the world today nor has existed since the world began.

From the beginning of time down through the ages, mankind has often indeed debased service itself, but never the proud title of "servant." That has always been kingly in its true significance and will remain so until time is no more. Remember the words and teachings of the Savior as our greatest example. His was a life of service—"Servant of ye all," He said, and can we have a more glorious example of the dignity of service than when our Lord served? Kings, princes, potentates have all been servants and have served with honor to themselves. Can any of us in this day and age attempt to place ourselves above those and cavil at a title that honors rather than debases? Have we thought of this side of the question, or if we have, has it been only from its ethical standpoint? True, that is its highest aspect, but have we brought it right down to our every-day life and realized that we too serve and must in honor if we be men. Do we believe service to be debasing in any degree that might affect either our work or our peace of mind? Let us see. Most of us here have in our keeping a badge of service, an insignia showing that we have served one, five, fifteen and even twenty-five years. In proof that we are proud to have this badge, consider it an honor and are jealous of our years of service, ask the auditor about the number of letters he has received in regard to the length of time we have been with the company, when the writers believed too few years had been credited to them and demanded badges, showing longer service.

"Ich Dien" (I serve) has been on the escutcheon of England's heir, the Prince of Wales, since the middle of the fourteenth century—1346. At that time, when sunny France was, as now, torn by war against its present ally, England, Edward the Black Prince lifted from the field of Crecy, the blind King John of Bohemia and appropriated as his very own, the motto found on the shield of his fallen foe. Does it look as though he believed such a motto might be degrading to himself or his house, the head of which was the puissant Edward the First?

With such examples before us must we not perforce believe and should we not by our performance preach the "dignity of service"? Then if we do indeed see the light and substantiate our belief that service is honorable, can we serve but with all courtesy?

On Sunday, October 4, 1914, the day appointed by President Wilson as a general day of prayer for peace, President Arthur Twining Hadley of Yale College took as the subject of his sermon "The Obligation of Courtesy." The Century Company printed the address in full, and speaking of it editorially, used the following words: "Something in its sanity, its breadth of human charity, its call to higher Christian sense of responsibility, its seasonable appeal for peace on earth, good will toward men, demands for it a wider audience—the audience of thinking men and women of our whole land." I too wish we all might read the address.

Knowing full well that no words of mine can have one jot or tittle of the force that so great a master of English as President Hadley gives to his utterances, I am going to quote a little from what he says, which seems pertinent to the subject we are considering:

"To bring about peace on earth, men must develop the Christian virtues of fairness and courtesy. They must try to see things as others see them; to speak and act with a view to the feelings of others, as well as themselves. This appreciation of others' point of view is the essential element both in fairness and in courtesy. They are not really different things; they are different sides of the same thing. Fairness is consideration for others as shown on the intellectual or subjective side. Courtesy is consideration for others as shown on the social and practical side."

There we have the crux, "consideration for others," the cross of our seeming stumbling in the matter of courtesy. To paraphrase President Hadley's diction, "get at the viewpoint of the other fellow in any controversy and differences will vanish, you will be on his side and remember, it takes two to make a fight." He also asks—"Do we accept the Christian obligation of courtesy to all mankind or do we limit our obligation to the narrow circle of our own immediate friends?" Let us ask each other the same question. We wish to be leaders each in his own line, then as President Hadley says in his peroration, "let us recognize the obligation of courtesy to every man and woman. Let us learn so to lead that people will work together, instead of working apart. Let us show this in our conduct toward the town in which we live. Let us show it in our conduct toward our rivals in every line of activity. Let us show it, above all, in our honest, straightforward, whole-hearted pursuit of the truth."

The desire to give one new thought on this great subject of "Courteous Service" for us to ponder on, has been very great with me in writing on this subject, and while I cannot charge myself with any intended plagiarism, it has been my privilege since the turning of the new year to read article after article by writers whose words carry weight on this great subject and I have been influenced, of course. Evidently the scanning of the work of the

1 From *Edison Current Topics.*

Digitized by Google

year 1914 has not been satisfactory in this regard to many of the thinkers in our own line of work and the determination to write, talk and preach courtesy and service for 1915 is evidenced by the articles in question. Our determination to "render unto Caesar the things that be Caesar's" (Caesar, in this case, being our consumers, those we serve, in other words, and in the "things" being "courtesy") has kept us in the front rank heretofore, and that it may help us to stay there and even advance I give you one final quotation that contains thoughts as old as time, yet ever new.

"Courtesy may have been born in the court of a prince; but it can dwell and thrive in the courtyard of a peasant. True courtesy is not an attainment of a knee-crooking courtier, bent in pandering to the freaks and passions of his lord; neither does it belong to the courtezan to whom it is but an item of her stock in trade. True courtesy, by which I mean what the French distinguish as *courtoisie de coeur* (courtesy of the heart) is an exercise of good will, or mutual respect among men of worth. It does not consist in forms, in bows, in dresses or in exchange of polite phrases. It consists in the respect which two or more self-respecting persons pay to one another. It can never deteriorate into the cajolery of a courtier or the captation of the courtezan. Genuine courtesy is a characteristic of strong men. In our medieval warfare, there was something exceedingly charming in the exchange of salutations, when two warriors met to fight in single combat. Even an enemy must have due respect shown him; a man who is not worthy of your respect is not worth fighting with. I like to ponder upon the scene of the meeting between Cromwell and George Fox. No formal politeness could be expected in the first acquaintance of these two rugged giants—the greatest of Puritans and the greatest of Quakers. In that scene, where they stood face to face, one observes and feels a veritable exchange of manly courtesy. How could it be otherwise, when souls are so deeply imbued with reverence for whatever is honest, strong, true and godlike?"

Minneapolis Company Employees Form Glee Club.

Thirty-five employees of the Minneapolis General Electric Company have formed a glee club, the principal object being the entertainment of club members at meetings of the company's Mutual Advancement Club, and other social gatherings. H. L. Panel is president, and A. A. Cavanaugh, secretary of the new organization.

A System of Accounting for Central-Station Companies.

One of the important elements in central-station practice that has been given much attention since the advent of commission regulation of utilities is accounting. In order to determine accurately and quickly the status of any utility the various state commissions have found that a reliable system of accounting, including detailed cost data, must be used by the utilities. Such a system must show a classified analysis of the income and disbursements of the company so that a study of the actual and relative profitableness of its various activities may be made; the system must also permit the ready taking of monthly and annual statements.

To devise a system that fills these and other important requirements peculiar to the central-station industry, F. A. Bowdle, of Cerro Gordo, Ill., an experienced accountant and auditor, made a special study of the subject as the result of which he has developed the Bowdle System of Accounting which is especially adapted to electric light and power companies. This system is so ingeniously arranged that it is suitable to both large and small companies and is yet so simple that a comparatively inexperienced bookkeeper can make all the entries properly. Although concise, the system is flexible enough to permit including all the details and ramifications of the larger utilities.

The Bowdle system provides neatly printed and ruled sheets on the loose-leaf plan that are assembled in binders of either heavy canvas, corduroy or leather. Included in the set are vouchers, cash journal, consumers' ledger, general ledger, collection reports, financial statement for substations or branches, and general statement. The set is relatively inexpensive and includes complete instructions for its use.

All the detailed work of the distribution of disbursements is made on the voucher, from which it is entered into the cash journal in one lump sum. Separate entries are made in this journal for each separate voucher. The vouchers are all recapped each month and the sums total of all the different accounts thereon are thus ascertained; from this a financial statement is made up for each station, as well as one for the entire property which shows up the net results very clearly.

The consumers' ledger is a very compact book taking care of 25 accounts for one year to each page. On each page each account may be proved before being carried forward, to eliminate all mistakes in the consumers' accounts. The cash journal is ruled to accommodate all accounts shown on the vouchers, as well as quite a number of other entries. Posting is very simple, as the main accounts are posted but once a month. The ledger is designed along the lines of the other books and shows debit and credit balances on all accounts.

The Bowdle system has been found to conform to the requirements for uniform systems of accounts promulgated by various state utility commissions and has been highly commended by the accounting officers thereof.

Don'ts for Meter Readers and Bill Passers.

The Dayton Power & Light Company, Dayton, O., lists the following "don'ts" for the guidance of its meter readers:

Don't talk too much.

Don't use skeleton keys.

Don't climb fences.

Don't walk across the grass.

Don't forget to clean your shoes.

Don't enter a premise without permission.

Don't fail to announce your business.

Don't deliver a bill without *reading* the address.

Don't put a bill under the door if there is a mail box.

Don't fail to put the bill under the door of a residence if there is no mail box.

Don't give a bill to *anyone* without telling him what it is.

Don't tell anyone how much his bill will be.

Don't talk with a customer about the size of his bill, but ask him to take the matter up with the cashier's office.

Don't accept requests to disconnect, read or remove meters, change addresses, etc., but politely ask the party making the request to write or telephone the office.

Don't fail to deliver a commercial bill to the office or the person in charge.

Don't make a mistake in reading a meter.

Don't *smoke*.

Don't forget that you are the only person connected with the company that the customer comes in touch with regularly; therefore in the eyes of the customer *you* are the company, so the company's good name is in your hands.

Business Brisk in Minneapolis.

The Minneapolis General Electric Company, Minneapolis, Minn., has experienced a greater increase of business during the first half of 1915 than during the corresponding period of 1914. The number of new contracts was 6,762, an increase of 33 per cent. The connected load was increased by 6,745, a gain of 44 per cent over last year. The output of 55,837,778 kilowatt-hours was an advance of 25 per cent over 1914.

Digitized by Google

Electricity in Construction of New Portland Bridge.

A field woodworking mill operated by power from the Cumberland County Power & Light Company is employed in the making of forms used in the concrete construction of the new bridge being built to connect Portland and South Portland, Me., at a cost of about a million dollars. The machinery is operated by a 15 and a 10-horsepower motor, and consists of a grindstone, American bandsaw, 16-inch planer, swinging cutoff saw, a ripsaw and a boring machine.

Fiber conduit is used in the bridge and its approaches to carry electric light and power wires. There are 16 lines of 3.5-inch Orangeburg fiber conduits embedded in the sidewalk on either side of the main bridge and under one sidewalk of the State Street viaduct. The specifications required a conduit that should not show any separation of layers of fiber when heated to 212 degrees Fahrenheit. In cutting sections of the conduit, the inside was reamed so as to allow no offset at the joints when laid. The requirements included a puncture test of 25,000 volts alternating.

The two leaves of the drawbridge will each be operated by means of a 550-volt series-wound inclosed direct-current motor running 650 revolutions per minute and capable of being turned through an angle of 90 degrees without impairment of efficient operation. The motors will be of at least 20 horsepower. Electric brakes, controllers and resistances, and double-braided rubber-covered wire, with flexible cable for connections between the movable and fixed portions of the bridge, and armored cable to be laid in the river, are called for in the contract for this portion of the structure, which is held by the Phoenix Bridge Company, Phoenixville, Pa.

The bridge is 1,200 feet long, with two viaducts at its western end 400 and 200 feet long respectively. The contracts call for its completion by next spring.

Electrical Cooking Demonstration in Canada.

Beginning July 26, the Public Utilities Commission of the city of Port Arthur, Ontario, gave a daily electrical cooking demonstration for the benefit of local consumers of current. The commission hopes by this means to create sufficient interest in electrical cooking to warrant a special rate for cooking purposes.

A complete installation, showing the cost of each individual cooking operation has been made. Afternoon tea is served to visitors. Demonstrations are given daily.

SUCCESSFUL COMMERCIAL MANAGERS.

Robert Montgomery.

Robert Montgomery, commercial manager of the Louisville Gas & Electric Company, has just turned his thirty-second year with a record of having spent more than half his years in the electrical business. Mr. Montgomery was born on a farm outside the city limits of Jeffersonville, Ind., and as soon as he grew old enough to attend the district school he was old enough to do chores on the farm. Thus he divided his time between the "cows and chickens" and his school books until he reached the mannish age of 14 years.

At this period, Bob, as he was known then, and as his legion of friends still call him, felt the sting of the electric

Robert Montgomery.

bee and he became a helper to one of the electricians of the American Car & Foundry Company in Jeffersonville. After a few months' service, the Jeffersonville Lighting Company needed a meter reader and decided to take him on its meter-reading staff. He became successively a lineman's helper, a lineman, a fireman, an engineer and a construction foreman. As a construction foreman he was in the service of the General Electric Company.

When just entering his twenty-third year, Mr. Montgomery became general manager of the Hopkinsville (Ky.) Gas & Electric Company. Later on he was manager of the Light, Power & Water Company at Lebanon, Tenn., and after this he became contract agent for the Chicago, Lake Shore & South Bend Railway, which sold power along the 75 miles of transmission line between South Bend and Gary, Ind.

Mr. Montgomery's success with the smaller companies attracted the attention of the American Power & Light Company, and when this corporation took over the Fort Worth (Tex.) property, he was called there to take charge of the new-business department. It was while contract agent of this company that he had an opportunity to show his ability as an organizer and a business getter, which resulted in the power business of that concern taking a tremendous forward jump.

In about two and one-half years, the connected load of the lines was nearly double and as a side issue to his other important duties, Mr. Montgomery managed a sales force, which placed 7,000 electric irons in Fort Worth, Tex., homes in one year. Special attention, however, was directed towards substituting electric power for steam in cotton-seed-oil mills, flour mills and other manufacturing industries in the Texas field.

This good work attracted the attention of H. M. Byllesby & Company forces and when the lighting companies of Louisville consolidated into one company under their management, Mr. Montgomery was prevailed upon to take charge of the new-business department. This was in February, 1914. In a year's time he has built up a splendid organization and has effected a co-operation between the service company and the electrical contractors to the extent that all the contractors in the city and the service company are working hand in hand. A house-wiring campaign was inaugurated in the spring of 1914, and since that 2,000 old houses have been wired and connected to the company's line. New houses to the extent of about 1,500 have been wired and added to the company's line. Just before Christmas Mr. Montgomery conceived of a novel idea of disposing of heating devices and putting this idea into effect and co-operating with the contractors and department stores, there were over 6,200 heating appliances sold between December 1, 1914, and January 1, 1915. This is without doubt the largest number of appliances sold in any city of the United States of like size during such a short period of time. During the past year the power business has increased by 2,500 horsepower. In addition to taking care of the electric department, Mr. Montgomery has had charge of disposing of natural gas and has made quite a record in this line. In fact, the first year of work in Louisville, Bob's friends think he has just gotten a fair start. Generally, we find that a man holding a position like Bob has a hobby, and if he has one, it is "work."

North Dakota Coal Production.

The output of lignite in North Dakota—the only mineral-fuel in the State—increased in 1914 from 495,320 short tons, valued at $750,652 in 1913, to 506,685 tons, valued at $771,379.

Digitized by Google

Electrical Construction

THE COMPENSARC FOR MOTION-PICTURE PROJECTORS.

By C. Walford.

The motion-picture show with its high-power arc lamp has given rise to the need of a special motor-generator. The majority of these arc lamps require 35 amperes at 50 volts. With a drop of 170 volts in a steadying resistance when operating on a 220-volt line, the loss is excessive. To meet this condition the motion-picture generator or compensarc has been produced.

When receiving power from an alternating-current source, an alternating-current motor driving a direct-current generator is sometimes used. There is, also, on the market an alternating-current compensarc, employing three choke coils to vary the flow of current; in that case alternating current is used at the lamp. In this article one type of direct-current motor and generator will be discussed.

A very brief explanation of the theory of the direct-current arc may not be out of place, as its behavior is the controlling factor in the design of this machine.

An arc may be maintained by either direct or alternating current. Under ordinary circumstances the two electrodes must be brought together before being separated to establish an arc, otherwise several thousand volts would be required to strike across the air-gap in the first place. As soon as the separation of the terminals commences, the spark, which tends to form at any break in a circuit, vaporizes a portion of the material of the electrodes, thus establishing a bridge of conducting vapor through which the current flow is maintained. The concentration of energy in a small space produces intense heat, which vaporizes the electrodes rapidly, so that a highly refractory terminal must be employed to avoid rapid consumption. Moreover, the intensity of light given out by the arc depends on the temperature to which the electrodes can be heated without being vaporized; therefore, a highly refractory substance like carbon best fulfils the requirements.

It is evident that the amount of carbon vaporized at the positive crater forming the arc stream will vary with the current, therefore the resistance of the arc, which varies inversely with its cross-section, varies inversely with the current. In this respect the arc is totally unlike solid or liquid conductors, whose resistance is independent of the current, other conditions remaining the same. Hence Ohm's law in its general form is inapplicable to the arc stream. But the resistance of an arc, like that of any other conductor, increases with its actual length and changes inversely as its cross-section.

Every constant-potential arc lamp for store lighting and the like has an automatic mechanism contained in the case whose function is to separate the carbons when the current is too high, and bring them together when it is too low. If well made and adjusted, such a regulator may respond to current variations of five per cent either side of the value at which it is set, which might be expected to maintain a practically constant current. Such, however, is not the case. An arc whose carbons are fed by a mechanism of this kind, if connected directly to a constant-potential main, will behave in the most erratic manner, even if it be started by hand regulation, and allowed to warm up before the test. The mechanism adjusted to respond to five-per-cent current variation now utterly fails to keep the current anywhere nearly constant, and the arc is very unsteady. This is true even if the voltage of the mains corresponds to the voltage desired at the arc.

The reason for it lies in the fact that the resistance of an arc decreases as the current increases, which results in a tendency for the current to become almost infinite if constant potential is maintained across its terminals. Similarly, if the current begins to decrease, and so lessen the cross-section of the arc, the resistance rises and further chokes off the current, until the arc goes out. The arc when directly connected to constant-potential mains is therefore in a state of unstable equilibrium, in which the current tends to drop to zero or surge toward infinity. This action, depending as it does only on the instantaneous cross-section of carbon vapor at any moment, is itself instantaneous. The means used to counteract the instability of the arc must operate as fast as the current change can take place, and this is the function of the direct-current compensarc.

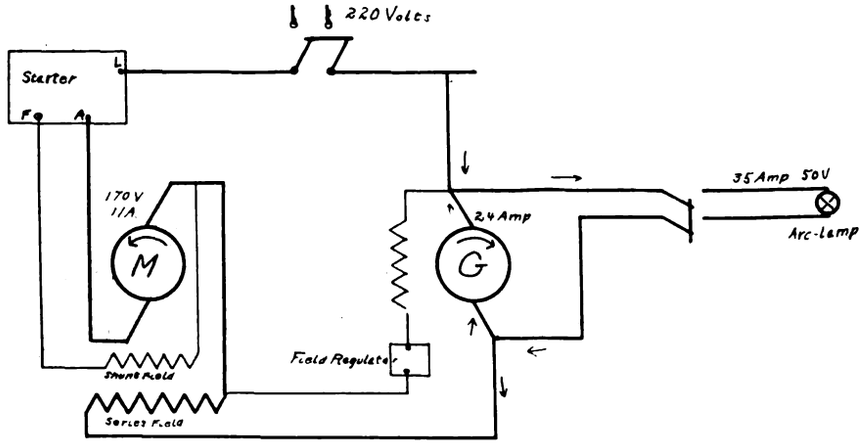


Fig. 1.—Diagram of Connections.

The compensarc manufactured by the Fort Wayne Electric Works consists of a shunt generator driven by an overcompounded motor, having both armatures on the same shaft. The two field-frames are securely bolted together and mounted on a solid bed plate. Attached to the shaft between the two armatures is a ventilating fan which draws the air from the two ends.

From a study of the simplified diagram, Fig. 1, it will be seen that the 11 amperes taken from the line goes through the arc lamp, and that the remainder of the 35 amperes is supplied by the generator at 50 volts. As the voltage on the line is 220, with a

Digitized by Google

50-volt drop in the lamp, the voltage across the motor armature and series windings is 170 volts.

The characteristic curve of an ordinary shunt-armature generator at constant speed is shown at A in Fig. 2. In this case, when the external circuit is open, the voltage of the machine is a maximum, for the field winding is connected directly to the armature and is independent of the external circuit. As the load in the external circuit is increased, the armature reaction and the volts lost in the armature increase, and the terminal volts slowly falls, which causes a smaller current to flow in the field magnets. While the iron is fairly saturated, this slight decrease in the field current makes but little difference, but as the load is further increased and the terminal volts further lowered, the armature reaction becomes of greater importance, and the exciting current becoming feebler, a point is eventually reached where the magnetization is in an unstable condition and the electromotive force drops to zero. Now drive

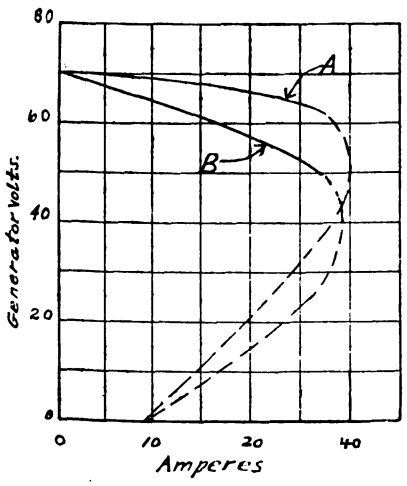


Fig 2.—Characteristic Curves.

this constant-speed shunt generator by an overcompounded motor with a speed change from 1,400 revolutions per minute at no load to 1,250 revolutions per minute at full load and the working curve B, Fig. 2, will be obtained, which is the curve of a compensarc.

From an analysis of curve B and Fig. 1 it will be seen why it is practicable to connect the lamp directly across the generator without a steadying resistance and to short-circuit the generator by bringing the carbons of the arc lamp together when striking the arc.

In the above explanation of the theory of the arc lamp, it was pointed out that as the volume of the vapor increases, the current tends to increase. This increase of current is prevented by a drop in the generator voltage due to a decrease in speed caused by the motor field flux being strengthened by the increase of current in the series coils. A decrease of the current is also prevented by the generator voltage increasing due to an increase of speed. The electromotive force of the generator varies from 70 volts at no load to 50 volts at full load. When the machine is running unloaded, the motor and the generator are in series and in opposition. Therefore, the electromotice force across the motor armature and shunt field is 150 volts when unloaded; and loaded it is 170 volts. This increase in electromotive force at the armature tends to increase the speed, but the field flux is strengthened by both the series and the shunt coils, causing a considerable lowering of the speed.

It is due to the rapid and smooth changes of the generator electromotive force, caused by the speed variations, aided by its own characteristics, that this machine has such perfect control over the current at the arc. After 15 minutes of use, when everything is warm, the generator rheostat is set and it is unnecessary to change it for a full day's run.

Static Electricity in a Textile Mill.

Static electricity is very troublesome in textile mills, especially where the belted group drive is used, unless it is removed. It has been the writer's experience that even if the belt is sufficiently lubricated, the sudden throwing on of a loom causes slippage. There is danger of lubricating the belt too much, because where the belt joint is cemented, the oil attacks the cement and weakens its hold on the leather, with the result that the joint opens up, and there is a shut down until repaired.

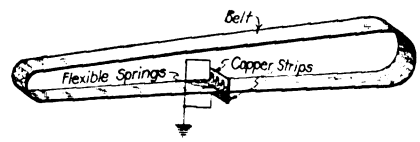
Where cotton looms are running with rubber work, it is very necessary to keep the room perfectly dry, and as it is a well known fact that a belt traveling at a high rate of speed produces a static charge, it can be seen that with a little belt slippage due to the fluctuating load, and the conditions above mentioned, it is impossible to prevent it from being generated.

A belt so charged attracts all the particles of lint which are prevalent in these mills, together with dust and other light material floating in the air, and deposits on the ceiling and on anything near the belt.

If the belt runs between the backs of looms, as the case in our own plant, this dirty and dusty lint is deposited on the back racks of the looms, and it is shaken off on to the warp during the vibration of the loom. This makes the yarn dirty and results in dirty work. Some gets on the shuttles during the weaving operation, which makes them dirty and causes them to stick. The machine therefore has to be shut down and given a general clean up.

About one year ago a 15-horsepower squirrel-cage induction motor burned out. Sparking or rather flashing was noticed between the rotor and stator. Tests were made electrically and mechanically, but everything was found O. K., except at the place of flashing, where the insulation appeared a little charred on the outside. It was not thought serious, however, and after varnishing the windings the motor was allowed to run. The motor burned out again in about one week. After it was rewound and put in operation, the flashing occurred again, and it was thoroughly tested, but no defects could be seen. The motor being thoroughly insulated and quite a distance from any ground connection, I came to the conclusion that the static from the belt would charge the rotor and jumping the air gap to the stator through the insulation, would travel along the power circuit through the ground lamps to the ground. This was a high-resistance ground connection, and the discharge would come in snaps or flashes, which weakened the insulation in time and finally caused the breakdown. I installed the home-made static arrester which I will describe.

The copper strips were placed above and below the center of the belt, as shown in the illustration. On the upper strip some small flexible springs were



Removing Static Charge From Belt.

attached. These were allowed to touch the belt as they were not stiff enough to even scratch the belt. This was grounded and completely eliminated the flashing and saved the motor from a second burnout.

The belt also carries some of the lint and dust on to the pulley end of the motor, and this is carried into the motor, by the air circulation produced by the fans on the rotor, and deposited on the windings. Also some of it gets into the oil well.

When cleaning day comes, a cloud of dust is blown out of the motors, which settles on the work in the weaving room, which has to be removed before cleaning or if not removable it must be covered up, resulting in loss of time. While it is understood that it is impossible to prevent all dust and lint from circulating around with a belt, still a great deal of it can be eliminated by removing the cause of attraction, which is static charge.

The writer has had a deal of experience with it and finds nothing as cheap and better adapted for this work than the home-made arrester described.

William T. Estlick.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The secretary has very little to report this week. President Wynkoop has gone to Lake Champlain with two boon companions and a motor-boat. In a letter to the Secretary he states it is fitted with a new engine which "runs like a watch." Presumably he means that the three take turns winding it up once a day, and the remainder of the time can be wholly devoted to other matters of importance.

He adds: "Our Electrical Code, including a license feature, got by the Board of Aldermen on July 6—vote, 51 to 2—and is now before the mayor for signature. We have his promise and feel safe."

Clarence V. Scholl, Pleasantville, Westchester county, N. Y., and Edward W. Seelig, Beach 113th and Ocean Parkway, Rockaway Park, Long Island, N. Y., have joined the Association.

The Western New England Section held its regular meeting recently, the following being a report, as supplied by the secretary, R. J. Forsyth, of Greenfield, Mass.:

The ninth regular meeting of the Western New England Section was held in the club room of Hose and Ladder Company No. 1, South Manchester, Conn., Wednesday, July 14. L. N. Heebner, chairman of the executive committee, had every minute of the day planned for, which resulted in the most successful gathering the Section has ever had.

Through the courtesy of the South Manchester Light, Power and Tramway Company, automobile transportation was provided from Hartford to South Manchester. This enabled us to call the meeting to order in good season.

The morning session was called to order by Vice-President A. E. Hopkins, of Springfield, the roll call showing twelve members present.

Joseph H. Rohan, wire inspector for the City of Hartford, was admitted to membership. Mr. Rohan is successor to our president, G. W. Perry, who has joined the ranks of wiring contractors.

The question was brought up by the secretary in regard to members in arrears for dues, and after a discussion by the members present it was decided that the secretary be instructed to send out one more notice to members whose dues were not paid at the close of the meeting.

Plans for the fall meeting were discussed, and the Executive Committee voted to hold the meeting on October 13, 1915, at Greenfield, Mass. Plans for this meeting are to be announced later. The January meeting will be given up to a talk by Thomas H. Day on "Concentric Wiring." Mr. Day is getting together valuable information on this method of wiring, and has a complete set of fittings, which he has received from England, where this class of wiring has been in use for some time. It is intended to have this meeting open to those interested in installation of electric wires.

The question arose as to what inspectors were doing with induction-motor installations where the motors were installed in rooms where combustible dust accumulates in the motor. It was decided, after considerable discussion, that the inclosed type of motor should be required where the motor had live, exposed contacts, such as brushes or collector rings, but that a motor without these, such as a squirrel-cage, three-phase induction type, would not require housing or inclosed case.

The question: 'Does Rule 26*p* prevent the use of two conduits for a two-phase, four-wire circuit?" was also taken up. After a short discussion it was pointed out that two conduits could be used, provided the two wires of the same phase were in the same conduit.

The morning session was adjourned at one o'clock for lunch.

The members were the guests of Frank Cheney, Jr., for lunch in the banquet room of Cheney Hall. After lunch Mr. Cheney complimented the organization on its work, and extended to them an invitation to visit the Cheney Brothers silk mill.

Mr. Heebner, assisted by R. J. Dougan and J. O. McCaw, conducted the party through the fire station, which is equipped with several automatic devices designed and installed by Mr. Heebner. The balance of the afternoon was given up to an exceedingly instructive trip through the Cheney Brothers factory, starting with the raw silk and following each operation to the finished product. The power installations in the various buildings were the principal objects of attention.

At the close of the afternoon the Secretary was instructed to extend a vote of thanks to Mr. Cheney for his courtesy to the organization.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Flame-Proof Wires.

Question 306.—Rules 2b and 3e state flame-proofing must be provided for wires brought close together "when required." What is your practice as to this, i. e., how many, how large, and how close must the cables be to warrant flame-proofing?

Digitized by Google

Answer 1(O). The author of the question possibly has not carefully examined the first paragraph of Rule 2*b*, which requires flame-proofing on *all* exposed insulated wires in central stations, even though 2*b*, third paragraph, and 3*e*, call for flame-proofing only "when required."

Answer 2(R)*. This, I regret to say, is a question upon which I have no experience.

Answer 3(U). I should say whenever the spacing is less than required by cleat construction.

Answer 4(M). We require that where wires are brought close together in the rear of a switchboard, for instance, that they be served with a wrap of asbestos tape where the wires are of rubber-covered insulation. Irrespective of size we do not require it where the wires break directly out of a condulet to switch or fuse studs. Nor do we require it on a form of construction which consists of "racking" wires, maintaining an air space between them of about 1½ inches. Where the wires are cleated directly to the rear of the board it is required, as the wires then are usually only about one-half inch or less apart.

Answer 5(P).* We are badly up in the air on this point in our territory and are endeavoring to find a way of establishing a ruling which shall be both fair, uniform and safe.

Answer 6(F and G). We consider the word wires to mean more than one wire. All sizes of wire are held to this rule and flame-proofing required when the conductors are less than 2.5 inches apart.

Answer 7(L). The number of cables or their size does not affect application of rule. Best practice is (1) where they are not in contact with one another and so supported as to render coming in contact an impossibility, to use no flame-proof material; (2) use circular loom tube where there is a possibility of their ever coming together; (3) use asbestos when they are together.

Answer 8(H).* Less than cleat spacing.

Answer 9(T). I believe Rules 2*b* and 3*e* are sufficiently clear on the question of requirements for flame-proofing braid that an inspector would not find any difficulty in properly interpreting these rules, and when they should apply.

Answer 10(N).* Each wire on switchboard must be flame-proofed if less than 2.5 inches apart. The only place where I permit bunching is on the small rubber-covered potential wires on less than 600-volt circuits.

Answer 11(B).* Rules 2*b and* 3*e* refer specifically to conductors and switchboards in central stations, etc. We have no specified distances such as are asked for by question, it being the general practice to use a tight non-combustible outer cover on conductors under conditions such as are referred to.

Two Services to One Meter.

Question 307.—Is it permissible to multiple two three-phase services which are located six feet apart in order to meter the supply with one meter instead of two? Services outside cannot be changed without great cost to power company and full capacity is required. If permissible, what form of construction is best adapted and what about wire and fuse sizes?

Answer 1(O). Rules 23*a* and 24*a* required automatic cutouts and switches on all service wires. Therefore, separate cutouts and switches should be used on both of the services referred to in this question, unless, as is provided by the Code, departure is authorized by special permission in writing. I should judge that the proper course for the inspector to follow would be to require fuses of proper capacity on each of the service wires immediately at the point of entrance to the building and then grant special permission for these wires to be brought together into one service switch in an accessible location.

Answer 2(K)*. Rule 23*a*: "the cutout must cut off the *entire* current from the building." Rule 24*a*: "service cutout and switch (singular number) must be arranged to cut off current from all devices including meters." The proposed installation does not comply with these rules and should not be allowed.

Answer 3(P)*. The Code does not prohibit this. It would be better practice to retain individual service switches and cutouts, although sometimes it is necessary, for local reasons, to couple the two services together solidly and provide one service switch and cutout.

Answer 4(R)*. Multipling such wires at the consumer's premises is poor practice, as in some cases this loop may carry considerable current at the juncture of the wires. If absolutely necessary to so arrange the service, the tie should be made at the point where the line wires attach to same, providing the public service company is satisfied no excessive current can flow. Wires and fuses will have to be governed by load conditions.

Answer 5(F and G). There should be no objection to this. The wires of each service could be of different sizes provided they are all of the same length, as the current flow would be subdivided in inverse proportion to the resistance of the conductor. This is practically the same condition as though a stranded conductor were used with strands of different sizes.

Fuses could properly be placed on each of the individual conductors, or if the wires are connected together a main fuse could be used with a capacity equal to the sum of the capacity of the separate conductors of the same polarity.

Answer 6(T). I should say that it would be permissible under the Code to multiple two three-phase services. I require that each wire be separately protected at point of entrance by fusible cutout of proper rating to protect three-phase wire, the leads then being run to one common service switch of proper size to carry full load of combined services from this switch; two leads of proper capacity could be run to meter loop and then to connected load.

Answer 7(B)*. It is permitted to multiple two services in this city, both services, however, to enter in close proximity to each other, to be properly protected by fuses or other safety devices, and to be tied together on a suitable board constructed for that especial purpose.

Answer 8(M). Yes, wires could be connected to busbar constructed of sufficient size to carry total load and held on insulators or knobs. Wires feeding busbar to be protected by cutouts.

Answer 9(H)*. I think it might be done by using a copper bus double the size of each lead, and fusing to protect it.

Answer 10(J). Yes: tie the circuits together on the street side of the meter. Fuse both of them where they enter the building.

Answer 11(U). This depends on the services. I see no reason why not, if each service had a cutout and switch. The form of construction depends on the location.

Answer 12(N)*. Yes. I should require a separate cutout on *each* wire *immediately* at the point of entrance, and *then* tie to a common bus, with cutout switch, leading to meter.

Digitized by Google

Among the Supply Men

PAYING COMMISSIONS ON CANCELLED ORDERS.[1]

By Elton J. Buckley.

The following letter, received from an Indianapolis, Ind., reader, raises an interesting point regarding the payment of salesmen. Of course the law is the same whether it be a salesman on the road, or a retail salesman who goes among customers to get orders, or a clerk behind the counter who gets a commission on what he sells:

We are having an argument with one of our salesmen which may require us to change our whole method of doing business, but before going to such length we feel like submitting the question to you. We employ several outside men, who are paid by receiving a share of the profits on their orders. There has been more or less friction between us over whether anything was due them on orders which were cancelled, but the matter has never reached a head until the present time. One of the salesmen now demands to receive regular commission on all orders he sends in which we accept, whether they are afterward cancelled or not. He states that he has been told by a lawyer that he can collect them from us. You can see that it would not be good business for us to pay a salesman for obtaining orders which we do not fill, and we could not afford to do that and would not. We are desirous of avoiding all controversy with our salesmen, however, and hope you can throw some light on the matter.

This is another complication arising from the loose and indiscriminate habit of cancelling orders, which obtains more or less all over the United States. I can tell this correspondent how he can solve his difficulty with his salesman, but he will probably not adopt it, because he will not consider it good business to do so. All he needs to do is to refuse to accept cancellations of orders. If he will do that, and will stand by it, all the orders his salesmen get, which are accepted, will be filled, and the salesmen will of course get their pay.

But he will probably not do that, so let us see what his status is under the present method.

As I have explained, all courts would probably read into every ordinary contract of purchase today, the custom allowing cancellation at will. That is, if a seller who had previously allowed indiscriminate cancellation, suddenly refused to accept cancellation of a given order, without warning, the court would say: "Mr. Seller, you can't do that. All your previous relations with your buyer allowed cancellations, and you must therefore change those relations by notice that henceforth you will not allow cancellation. Until you do that you cannot strictly hold him to his orders."

Moreover, the courts would also hold a salesman charged with notice of this custom. A salesman who does business right in the midst of the cancelling custom, who sees his own customers cancelling orders time after time and getting away with it, of course knows that any order he gets may not be filled. My judgment is that he could not collect commissions on cancelled orders, for his employer is entitled to expect—unless the salesman tells him different—that he is going along with the cancelling custom like everybody else, and that he will for himself treat as actual orders, only such as the buyer stands by.

Therefore where employer, salesman and buyer have been going along under the prevailing custom, the employer could not hold his customer to an order without first warning him, nor could the salesman hold his employer for commissions on cancelled orders without first warning him.

Particularly is this the case with a salesman who has never heretofore claimed commissions on cancelled orders, or who if he has claimed them has not enforced his claim.

But if a salesman warned his employer that hereafter he would not be a party to any cancelling of orders, that the orders he obtained were obtained in good faith, that the employer could enforce them if he would, and that if he chose not to do so, the salesman would still expect commissions, then I believe the salesman could collect every cent. The employer could no longer plead custom of the trade, for the salesman had notified him that he would no longer be bound by custom of the trade.

The only thing for an employer to do in such a case would be one of three: 1—take the same attitude with his customers and refuse cancellations; 2—pay commissions whether orders are filled or not; 3—discharge the salesman.

I think I should say that if there were no custom of the trade to change it, a salesman's commissions would be due and payable the minute he had obtained an order and his employer had accepted it. He would not even need to wait until it was filled.

1 Copyright, 1915, by Elton J. Buckley.

A. W. Zahm Organizes New Supply Company.

A. W. Zahm has resigned as president of the Minneapolis Electric Equipment Company, Minneapolis, to organize a corporation to be known as the Midland Electric Company. The new organization has taken a lease on the north half of the Elks Block, on North Main Street, Mason City, Iowa, and began business on July 15. Mr. Zahm says that the company will do a general jobbing and wholesale business, and has secured the exclusive agency for a line of motors, dynamos, glassware, lamps, etc. The new company is incorporated for $50,000, with the following officers: President, A. W. Zahm; vice-president, C. C. Carhart; secretary, Floyd E. Johnson.

Mr. Zahm was for several years superintendent of the Peoples Gas and Electric Company at Mason City, and has a host of friends in every section of that territory. T. J. Hanlon will be in charge of the city sales, and there will be two traveling salesmen covering the northern half of Iowa and the southern half of Minnesota.

Louisville Trade Board Favors Price Maintenance.

Favorable action has been taken by the Louisville Board of Trade on the subject of maintenance by manufacturers of resale prices, by which retailers are required to sell also at prices fixed by the manufacturers. This action was taken on recommendation of a special committee of which James Clark, Jr., head of the James Clark, Jr., Electric Company, was chairman, and at the request of the Chamber of Commerce of the United States for a statement of position in the matter.

Western Electric Boston Plant Abandons Outing.

By unanimous vote of the officials and employees of the Boston branch of the Western Electric Company, the annual outing scheduled for August 14, at Hingham, Mass., has been cancelled, out of

Digitized by Google

respect and sympathy for their fellows who perished in the Chicago disaster. President R. B. Hopkins and the executive committee of the Western Electric Club sent a letter of condolence to the officials of the Hawthorne Club, an orgazination of workers in the Hawthorne, Ill., plant of the company.

Idealism in Competition.

Take competition from out the dark caverns; stand it forth boldly in the searching rays of the noon-tide sun, and in the honest white light of day seek out its virtues. For years competition has been heralded as "the life of trade," yet at its door may be laid more business failures than can ever be estimated. Competition is the antagonism, strife and war of business. It is the life of the winner, but the death of the loser, while the innocent bystander pays high for the entertainment.

The competition of price cutting is not only wrong in theory but as wrong when carried into execution. On a recent public work, where competitive bids were received, the highest was $116,764; the lowest $75,404. Quite a variance, but nothing compared to another piece of work on which the top figure was $633,690 and the lowest $270,290, a difference of nearly $400,000. In neither case could the operation be carried out successfully at the figure submitted by the low bidder.

The lowest price is rarely the best price; it should never be a question of how cheap, but a question of how good. The great variance in the bids mentioned above may be charged off directly to the effort of getting business at any cost; to the hope of making up during the operation the loss that would otherwise be suffered; to the gambler's chance—to the curse of competition.

There is another kind of competition, however. It is that of self-competition, the striving to outdo the best previous performance; to have each piece of work executed stand as the best of its class, anywhere. That is competition of idealism; it stimulates and invigorates and inspires to greater, broader, and better efforts. It is the kind of competition that is now bringing about a better spirit in the world of business and a higher and finer relationship among mankind in general.

The passing order may be summed up in this wise: Business is competition; competition is war; war is hell.

Today with the vision of a glorious future, with sympathetic understanding for the hopes and ambitions of our contemporaries; with a growing desire of helpfulness, we can truly say that business is co-operation; co-operation is sustenance, and sustenance is life.—*The Hoggson Magazine.*

Unfair Competition Prohibited in Germany.

In view of the discussions on unfair competition current in this country, it is interesting to study the law on this matter enforced in Germany. This law contains some unique provisions. For example, it is not generally known in America that in Germany such expressions in advertisements as "best and cheapest place to buy," "sold at factory prices," etc., are inadmissible unless true; that actions have been sustained against merchants who displayed signs of "English spoken here" when the assertion was not in accordance with fact; that it is unlawful to attempt to entice away prospective customers standing in front of a competitor's windows; and that a tailor may be enjoined from describing his establishment as "first-class" when he pays his workers according to the fourth class in the scale of wages of the local tailors' guild.

These and other interesting facts on European commercial law have been compiled in a monograph issued by the Bureau of Foreign and Domestic Commerce as No. 97 in its Special Agents Series. It is entitled "Commercial Laws of England, Scotland, Germany and France" and may be obtained for 15 cents from the Superintendent of Documents, Washington, D. C.

In this publication, which is the work of Commercial Agent Archibald J. Wolfe, in collaboration with Edwin M. Borchard, law librarian of the Library of Congress, special attention has been given to the jurisdiction of the various courts, lawyers and their fees, costs, chattel mortgage, attachment, powers of attorney, bankruptcy laws, and laws relating to unfair competition and trusts.

Public Service Commissions

Conducted by William J. Norton

INDIANA.

Indianapolis Electric Rate Cases. The Commission issued orders, July 30, 1915, fixing rates for lighting and power to be charged by the Indianapolis Light and Heat Company and the Merchants Heat and Light Company. The new rates are to be effective September 1, 1915. Separate decisions were rendered fixing the value of the properties of the two companies. The decision on the valuation of the Indianapolis Company was written by Chairman Thomas Duncan and on the Merchants Heat and Light Company by Commissioner James L. Clark.

The value of the Merchants Heat and Light Company, including going value, supplies and working capital is fixed at $2,000,000.

As evidence to be considered in fixing the present value of the property of the Indianapolis Company, the Commission made a determination of (1) the cost of reproduction less depreciation, (2) the original cost, (3) the value of all outstanding stocks and bonds, and (4) the assessed value of the property.

(1) *Cost of Reproduction New Less Depreciation.* The Commission held that in determining the cost of the property on the basis of reproduction cost new less depreciation "the effort must be to arrive at such an estimate as a reasonably prudent and careful contractor would obtain if he were making an estimate with the view of reproducing the property under the physical conditions existing when the property was first constructed, and under present prices for material and labor. The estimate ought to be made without embarrassing minutiæ of detail."

The firm of Sloan, Huddle, Feustel and Freeman appraised the property for the company. The valuation made by the Commission staff is compared in detail with the evidence submitted by the company's engineers.

Overhead Charges. The staff allowed 12 per cent to cover engineering, superintendence, interest during construction, contingencies, etc. In the company's report 15 per cent is used for these items. In the table of the Commission's final summary of reproduction cost 13 per cent is added for overhead charges.

Working Capital. The Commission estimates the cost of reproduction of materials and supplies at $130,000, which is somewhat higher than the estimates of the company's engineers. The Commission says: "The property of the company under any of the evidence is a very large and a very valuable property. It

Digitized by Google

transacts a large business annually, receiving nearly one and one-half millions of dollars in gross earnings. It has more than 30,000 customers. The greater part of its business consists in commercial lighting and a comparatively small percent of it consists in furnishing electric power and heat. Such a business would require a larger stock of materials and supplies than would be necessarily required if the income of the plant was derived from a much smaller number of consumers. It is compelled to be prepared to furnish repairs necessarily incident to the maintenance of a great number of different services."

The Commission fixes the amount for working capital, exclusive of stores and supplies, at $125,000, and says: "In the end it is far more economical to the people to permit the utility to have reasonable earnings on a reasonable amount of working capital than to obstruct and hamper its activities by loans for temporary and trivial purposes. There is no established rule or formula by which a given per cent of the value of the property of the utility should be held as working capital. The amount should be sufficiently large to enable the utility to defray its current expenses, and to purchase its needed supplies without being driven to the necessity of borrowing or anticipating its revenues."

Summary of Reproduction Cost. The staff estimated the cost of reproduction of the property of the Indianapolis Company to be $4,893,881, and cost less depreciation to be $3,917,889; the valuation submitted for the company places these estimates at $6,004,076 and $4,843,898, respectively. The Commission's conclusions do not conform to either estimate, but upon all the evidence submitted finds these estimates to be $5,864,269 and $4,852,777. In commenting on this summary the Commission says: "This theory of the cost of reproduction less depreciation is but a device of students and courts to aid in determining the fair and reasonable value of the property. The true value may be far above the cost of reproduction less depreciation, and in this instance our conclusion is, that the fair and reasonable value of the property is much greater than the cost of reproduction less depreciation. In other instances the fair and reasonable value of the property for rate-making purposes may be far below the cost of reproduction less depreciation of the property. It is one of the means employed by courts to establish a check,—an item of evidence to be considered with all of the other methods set forth in arriving at just and reasonable value of the property for rate-making purposes."

(2) *Original Cost.* Little evidence was available regarding the investment in the property prior to 1893. The Commission's accountants, assuming that the company's records were correct as of December 31, 1893, undertook to determine the capital account invested in the property each year up to and including 1914. The total of their estimates was $5,015,715.81.

There is a conflict of about three-quarters of a million dollars between the company's and the Commission's accounts, and the Commission finds there is little evidence upon which to determine the correctness of either estimate. The Commission places an estimate of $5,400,000 as the total original cost as of March 1, 1915.

(3) *Present Value of Stocks and Bonds.* The company's total capitalization is $5,395,000 made up of $2,000,000 of common stock and $3,395,000, total bond issue, including bonds of the Indianapolis Light and Power Company. In determining the present value of the stocks and bonds the Commission says the bonds are marketable at par and the common stock is worth more than par. "It is worth, under the evidence practically 150 per cent. That is, if the company was permitted to earn six per cent on the present value of this property, after paying the interest on its indebtedness, operating expenses and taxes, there would be left an earning of seven per cent on the common stock. Stocks that will yield annually a net return of seven per cent on the par value thereof are worth more than par. There is no evidence before the Commission that would warrant a return of less than six per cent. Under this reasoning the stocks and bonds of this company are worth practically $6,000,000. We have no doubt that under existing conditions the stocks can be disposed of in a very short time at more than 150 per cent of the par value thereof."

(4) *Assessed Value.* The assessment in 1914 on the property of the company in Marion County was $2,245,100.

Going Value. Having determined the four items upon which to base the estimate of present value, the Commission says it is necessary to take into consideration the element of going value. The decision says: "The cost of reproduction less depreciation determines the cost of the bare bones of the property. That is, this sum is obtained by breaking the plant into integral parts or units, and fixing the value of each separate unit when constructed into a complete plant. The cost of reproduction less depreciation represents the value of the plant without a single customer, without a live business, with no capacity to earn revenues, but with its business yet to be obtained by its owners. That there is a difference in the value of such a plant so constructed, and that of a splendid property with more than 30,000 customers of its products, and with a revenue of nearly $1,500,000, is perfectly evident to anyone who cares to see a manifest and plain distinction. To discuss 'Going Value' is purely academic. The courts do not agree as to what it is, the engineers are as far apart in their definitions and estimates of 'Going Value' as are the laymen. The term 'Going Value' or 'Going Concern' is a device used by the courts to care for an item of value that is largely indefinable, but actually existing."

The Commission finds that there have been no substantial early losses that have not been amply restored by subsequent profits. The Commission says, however, that there are a line of court decisions which sustain the allowance for "going value" even though no losses have been sustained by the company. The allowance of 30 per cent of the structural value by the New Jersey Commission which was sustained by the Supreme Court of that State, the allowance by the Supreme Court of Oklahoma in the Pioneer Telegraph and Telephone Company case, and the court decisions sustaining the Wisconsin Commission's allowance for going value in every case, are among the examples cited. The Commission allows $400,000 for the item of "going value" of the property.

Final Value. "We have heretofore found in this opinion, that the cost of reproduction less depreciation of this plant is $4,852,777. Consequently our finding is, that the cost of reproduction less depreciation plus 'Going Value' is $5,252,777, but we believe this property is of greater value than this. Its present value is near $5,800,000. This includes improvements and additions made to March 1, 1915."

The value of the property heretofore devoted to municipal lighting is estimated at $171,772. With the municipal lighting contract transferred to the competitor, the Merchants Company, much of the property will cease to be used and useful, and the value of the property is deducted. The final figure allowed by the Commission is $5,625,000.

Reasonable Return. In regard to reasonable return the decision says: "An examination of the records kept by the company and its predecessors disclose that large earnings have been gathered into its treasury. From these earnings there has been invested in this property a large surplus taken from the people. If it enjoyed a monopoly this invested surplus in the property would justly reduce the returns on this property to six per cent. But in its field of operation it has a strong and vigorous competitor, and the rate of return should be larger by reason of this fact. The hazard arising wholly from a competitive situation is very great. Arising out of the municipal lighting of this city this company has lost within the last year at least $172,000. Having in view this competitive situation it is entitled to a return of at least seven per cent on the value of its property as above found.

Digitized by Google

Depreciation. The Commission says that there are few light and power properties where the percentage of depreciation is as small as it is for this property. Deducting $950,000 for real estate, working capital and scrap value, upon which no depreciation is figured, and $670,000 for underground conduits, cable mains, and tools and supplies, which property has the very lowest depreciation, there is but $3,630,000, in value of property where usual depreciation may occur. "In view of all the evidence we find that three per cent of the total present value of the property is a proper and adequate depreciation account."

Allowing $525,000 for operating expenses, $100,000 for taxes, $157,500 for depreciation, and $367,500 for return on the value of the property, the Commission states that the rates must provide such revenues as will yield a total of $1,150,000.

Rates. "In order to maintain this utility in the most economical way it is necessary to give consideration to large users of light and power. The ability of such users to install private plants for the production of electricity for their own use creates a competitive condition that must be reckoned with. The investment in the two plants now operating in Indianapolis is but little above the expenditures that would be necessary if these were removed and one ideal plant established. The necessities of the community require the continuous operation of these two. If the large business houses and factories of the city were to abandon the existing plants and install private ones, the cost to private consumers would be greatly increased. Yet, these private consumers are wholly unable to install separate plants. Such relief is economically imprudent and unwise. A very small margin of profit on each kilowatt of consumption adds much to the revenues of the company. As the plant must be in continuous operation, the testimony shows that the general experience of all operators has been that it is better for small consumers to serve large users at a low rate than not to serve them at all. The same evidence establishes the fact that off-peak users are entitled to some concession in rates. The Sunday user of light and power is in the same class."

The Commission says that the method of computing the cost of energy consumed ought not to be unnecessarily disturbed and that, "the rates should be, as far as possible, free from mystery. To conform to the Public Service Commission Act, the rates should be such that a citizen of average intelligence could understand and correctly apply them to his particular case. Of course, the earnings must be amply sufficient to meet the lawful requirements of the company."

A schedule is prescribed with a maximum rate of seven cents per kilowatt-hour, or 6.5 cents net. This does not include lamp renewals.

MASSACHUSETTS.

The General Laws relating to the manufacture and sale of gas and electricity have been compiled by the Board of Gas and Electric Light Commissioners, and issued in pamphlet form. The state laws, relating to both private and municipal electric and gas utilities have been extended and codified in Chapter 742 of the Acts of the Year 1914. In addition to this Chapter there have been included in this compilation certain provisions of the revised laws and subsequent acts necessary to the proper interpretation and understanding of the chapter named. A page index of the laws is given.

NEW JERSEY.

Public Service Electric Company. The Bell Electric Motor Company entered a complaint against the Public Service Electric Company in which it is stated that the complainant is using 25-horsepower motors supplied with current by the Public Service Electric Company, that the complainant has installed a direct-current generator driven by an alternating-current motor which receives current from the defendant company, that part of the direct current so generated is used in the operation of an electric sign and for lighting service, and that the respondent has notified the complainant that the use of current from the motor-generator set for lighting purposes will have to be discontinued unless arrangements are made to pay for current used by the motor at the regular lighting rates.

The Commission decides that "to allow the Bell Electric Motor Company to obtain illumination service at power rates would be an unjust and undue discrimination against other lighting customers. Service for the electric sign and for the ordinary factory illumination, whether furnished directly from the mains of the Electric Company or through the medium of a motor-generator set, should be charged in accordance with the regular lighting schedule. * * *

"It will be to the advantage of the Bell Electric Motor Company to have the sign and the ordinary office lighting supplied directly from the company's mains, and a separate meter should be installed by the company for this purpose and current supplied through this meter charged for at the regular lighting rates."

The opinion of the Commission enters into a discussion of the reason for maintaining separate rates for lighting and power service which is given, in part, as follows: "It is well understood that the maximum demand or peak load upon the ordinary generating plant is caused by the lighting load, and rates of charge take into account the fixed charge based upon the capacity of the plant.

"In the early days of the electric lighting industry, generating plants operated only from dusk to midnight, or at most from dusk to daylight the next morning. Later, electric current was sold for the operation of motors, and as the fixed charges were ordinarily covered in the rate charged for electric lighting the rates charged for power used in ordinary daylight hours were less by the amount of the fixed charges.

"As the electric power business has grown, the rates for electric lighting have been reduced, due to better operating efficiency and to the sharing of the fixed charges by the power customers, to a greater or less extent.

"In no case, however, does it appear that the peak load upon the plant caused by the power has exceeded the peak caused by the lighting load."

OREGON.

The Oregon Light and Power Company. In a decision rendered July 29, 1914, the Commission fixed rates to be charged by the Oregon Light and Power Company in thirteen towns of eastern Oregon. The complaint was made respecting the rates in La Grande and the Commission broadened the scope of the investigation to cover the rates charged in all the eastern Oregon towns. The value of the company's electric property is found to be $1,020,300 and of the gas property $27,000.

The Commission placed no value on the water rights within the boundaries of the National Forest Reserve from which the company obtains its water power, and stated that it would "not capitalize the bounty of the nation for the benefit of the individual."

The residence lighting rates ordered at La Grande and Baker are: 10 cents per kilowatt-hour for the first 100 kilowatt-hours in one month, 9.5 cents for the next 100 kilowatt-hours; 9 cents for the next 100; 8.5 cents for the next 100 kilowatt-hours; 8 cents for the next 100 kilowatt-hours; 7 cents for the next 100 kilowatt-hours; 6 cents for the next 100 kilowatt-hours; 5 cents for all over 700 kilowatt-hours. The above rates are subject to a 10-per-cent prompt-payment discount, and a minimum charge of $1.00.

Finding that the cost of serving the smaller communities is approximately 25 per cent higher than the cost of service in Baker and La Grande, the Commission ordered the following rates put in effect in all other communities: 12 cents per kilowatt-hour for the first 100 kilowatt-hours, scaled down one cent for each block of 100, to 5 cents for all over 700 kilowatt-hours.

Digitized by Google

Engineers Urge Qualifications of Utility Commissioners.

Experience in connection with public utilities should be made a necessary qualification for public service commissioners, according to a committee of engineers representing national and local engineering societies, which has addressed a strong plea on the subject to the Committee on Public Utilities of the New York Constitutional Convention. In the judgment of the engineers, men familiar with the technical, financial, commercial and legal matters which come before a public service commission are best fitted to render valuable service to the public. The committee feels that there are to be found among those connected with the public-utility companies men with as broad conceptions of public rights and of the duties to be fulfilled to the public as can be found in other walks of life.

The engineers also urge on the Committee on Public Utilities that the point of greatest importance in any plan for an organization of the public-utility commissions of the state is the preservation of the principle of continuity already established in the present public service commissions, whereby the term of office of the members of the commission expire at different times, so that only one member of the commission at a time goes out of office.

Represented on the committee of engineers making these representations are the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Consulting Engineers, the New York Section of the American Institute of Mining Engineers, the Municipal Engineers of the City of New York and the Brooklyn Engineers' Club.

British Electrical Standardization.

The English Engineering Standards Committee will shortly publish the following reports which have been completed by the Sectional Electrical Committee: British standardization rules for electrical machinery; British standard specification for electricity meters; British standard specification for charging plug and socket for vehicles propelled by electric secondary batteries; British standard specification for wall plugs and sockets, five-ampere two-pin, without earthing device.

The subcommittee on electric power cables is considering the revision of the report on copper conductors. The electric lamps subcommittee will, in cooperation with the Tungsten Lamp Association, in the course of a few months consider the drafting of a standard specification for tungsten lamps, and the question of miners' electric lamps will also engage the attention of this subcommittee. The electrical accessories subcommittee will, through one or other of the several panels which are at work, shortly issue recommendations in regard to motor starters, heating and cooking apparatus, and fuses, as well as other electrical fittings. A panel upon which manufacturers are represented will revise the standard specification for ammeters and voltmeters.

The subcommittee on electrical symbols has appointed two panels, one to draw up a British list of graphical symbols for use in installation and power work, and the other to deal with telegraphs and wireless symbols. A special subcommittee will consider the important question of standards for distributing pressures for new systems, which has been brought forward by C. H. Merz. All interests concerned will be represented on this committee and it will be presided over by R. T. Glazebrook, of the National Physical Laboratory.

Louisville Jovians Hear Prosperity Talks.

A prediction that prosperity was not far off was made to the Louisville Jovians at their last luncheon meeting by Donald McDonald, vice-president and general manager of the Louisville Gas and Electric Company. Mr. McDonald referred not merely to comparative prosperity but to extraordinary prosperity, and said that the coming fall ought to see it getting well under way.

Mr. McDonald observed, while speaking on this subject, that he had lived through three panics. They all began, he said, by conservative people getting their money out of enterprises which were of dubious substantiality or out of ventures which were carrying inflated valuations. These same panics ended, he said, when people who had stopped buying wore out their old clothes and exhausted their supplies, when the merchants' stocks became depleted and their shelves bare and when the banks filled up with money which bankers were seeking to put to work.

The recent, or present, depressed condition started in the same way as the panics Mr. McDonald referred to, and the condition which was described as common when those panics terminated exists all over the country today. "All signs are right for virtually an immediate resumption of business," he said.

If the war in Europe continues, this country will find a growing market for food, manufactured and natural products in a large and important volume. If the war should end, Europe would call on this country for huge supplies.

New England Electric Stove Demonstration.

Alexander P. Maynard, Inc., of Boston, New England managers for the Standard Electric Stove Company, have been conducting a three weeks' campaign at Portland, Me., where a demonstrating kitchen with two two-compartment cookers and a standard family electric range were installed in the basement of a large department store on Congress Street.

During the demonstration a fine course dinner was served to 10 office heads of the Cumberland County Power and Light Company, and the processes of electric cooking shown to a large number of visitors. The result of the campaign was the sale of several ranges and about 30 compartment cookers.

The local central station gives advantageous rates to stove users; a service charge of $2.00 a month for four kilowatts demand, plus $1.00 a month for each additional kilowatt or fraction, and a current charge of 1.5 cents per kilowatt-hour for all current used.

A year's contract is required, but it may be discontinued after six months, in which case a charge of $10 is made for placing and removing service and meter connections. It is reckoned that the average cost to a family would be about $3.20 per month.

The Central Maine Power Company, Augusta, has recently begun a campaign to secure heating and cooking business, and has established a rate of about three cents a kilowatt-hour. A similar demonstration will be made in several Connecticut cities.

Report of Chicago Commissioner of Electricity.

The annual report for the year 1914 of the Department of Gas and Electricity of Chicago has been issued by Ray Palmer, the retiring commissioner. This report gives in detail the activities of the department, a considerable portion of it being devoted to electric street lighting. Detailed costs are given for both the old and the new types of lamps. Operating costs per lamp for the flame arc type are $32.96. Fixed charges amount to $26.80, making a total cost per lamp per year of $59.75. Corresponding figures for the 300-watt gas-filled tungsten lamps are $22.54, $17.00 and $39.54. It is shown that the cost to the city per thousand candlepower is only about one-third the cost of same in 1910 and one-tenth the cost in 1898. Performance curves are given for the new gas-filled lamps.

Sections of the report are devoted to the operation and maintenance of the fire alarm and police telegraph systems and to the Department of Electrical Inspection.

Digitized by Google

Motor Searchlights With the British-French Forces.

A searchlight lorry and its equipment manufactured specially for service in connection with the British Royal Navy is shown in Figs. 1 and 2 appearing herewith. It is an Austin standard two to three-ton lorry chassis and contains electric generating plant designed by the Austin Motor Company, Limited, of Birmingham. The dynamo runs at one thousand revolutions per minute and has an output of 120 amperes at 80 volts; it is connected up to a drum carrying the cable, the contact being suitably arranged to avoid the possibility of a fault developing from it whilst the drum is in motion. The lorry carries a two-cylinder, 12-horsepower petrol engine, with a specially designed cooling system and an exhaust silencing chamber. The plant can be used for lighting temporary quarters for officers, field hospitals, and other similar purposes. Ramps and tackle are provided to haul the trolley and projector on to the lorry. The equipment is adequate for a 31-inch projector, though that shown is only a 24-inch. The searchlight trolley runs on four pneumatic-tired wheels. The rear wheels are fitted with brake drums, the brakes being operated by hand lever at the rear of the trolley chassis; they act as a safeguard against the danger when on inclines, of overrunning the men drawing the trolley. The projector is mounted on a swivelling base and also swings in horizontal trunnions. A seat, which revolves with the lamp, is provided for the operator. Both the horizontal and vertical movements are controlled by means of worm gearing; the latter can be thrown out of gear and the light then swung into the desired position and the beam adjusted as required. The cable is attached to the trolley by means of special contact plugs, and it is constructed so that the possibility of damage or "shorting," across the ends, is obviated; provision is also made to prevent accidental breakage of the contact.

In the construction of the trolley, special attention was paid to the possibility of it being drawn over rough ground—possibly for long distances—independently of the main chassis, in the event of capture or destruction of that unit.

Some views of a number of the De Dion motor searchlight plants (supplied by De Dion Bouton) used in the French army are given in Figs. 3 and 4. The searchlights illustrated are of the Breguet type mounted on light independent four-wheel trucks, so arranged that they can either be used directly on the wagons or can be taken to any point demounted, within a range of 100 yards from the wagon, sloping channels or ramps and blocks and tackle being provided for this purpose. From the main engine a dynamo at the rear of the driver's seat is driven to provide current for the searchlights. The cable for conveying current when the equipment is operated at a distance is carried on a reel. The projectors are mounted on turntables for turning in any direction and are also adjustable for throwing a beam at any angle.

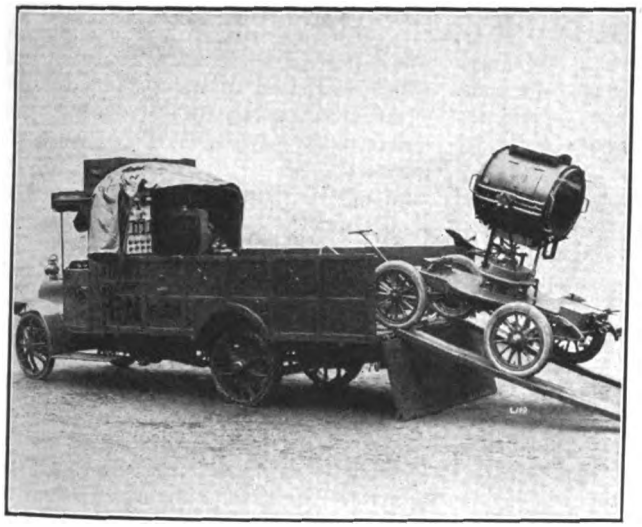


Fig. 1.—Searchlight Truck for British Naval Service.

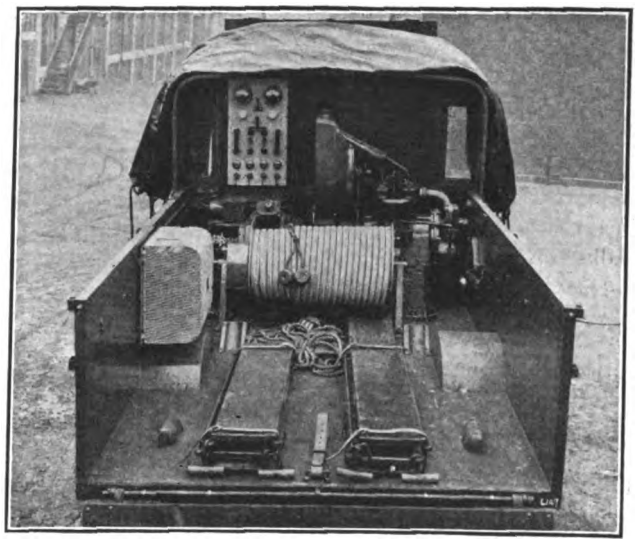


Fig. 2.—Rear View of Searchlight Truck.

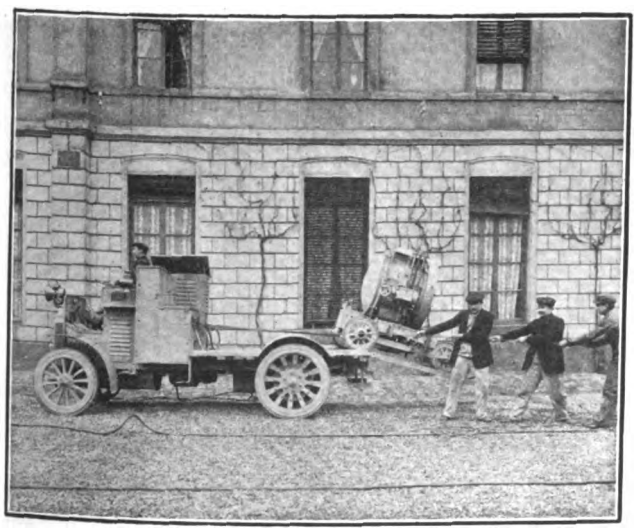


Fig. 3.—Unloading the Searchlight.

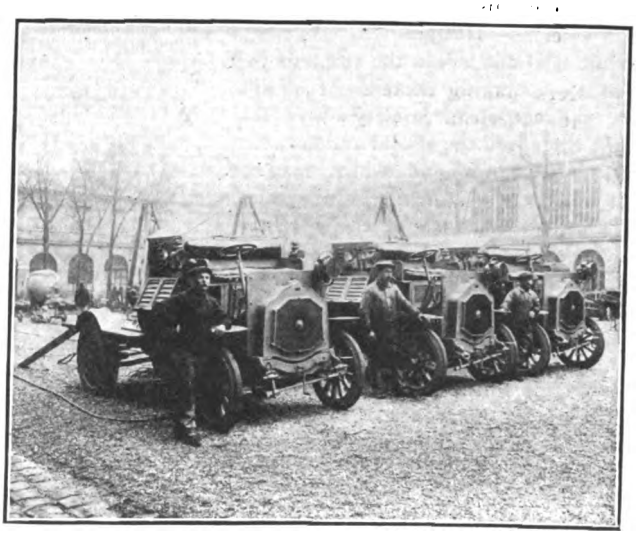


Fig. 4.—Motor Searchlights in French Army.

Digitized by Google

TEST OF A DIRECT-CURRENT MOTOR.

By H. C. Lightfoot.

The increasing use of electric drive in the manufacturing industries requires more than ever before that the men now engaged in the maintenance and installation of motors be acquainted with the standard requirements and the methods employed in making tests.

Having this need in mind it is purposed to show in the following pages what information is necessary, how this information is obtained; to give the standards; the derivation of formulas and to describe the details of an accurate test leading to the general characteristic and efficiency determinations for a motor.

Test Record.

As a considerable amount of data are to be accumulated and must be carefully preserved, it is important that a test record be prepared upon which these data can be quickly entered. A convenient and well arranged form is shown herewith, the figures entered thereon representing an actual test of a direct-current, shunt-wound, multipolar, intermittent-duty, inclosed-type motor.

Space is provided on this record for dates, identification data, service for which the motor is intended, etc., and when properly compiled, represents the complete history of the machine.

Design.

While it is not within the scope of this paper to cover the details of design, there are certain general features that should enter into the considerations when selecting a motor and which may be mentioned here.

The armature must be easily removable from the fields and bearings for repairs. It must be constructed of laminated punchings assembled and secured in an approved manner and be wound, in sizes above five horsepower, with formed coils which can be separately replaced in case of trouble. The air gap between armature and field poles should be uniform.

The field coils must be protected from mechanical injury and readily removable from the poles without damage.

The bearings should be of the self-oiling and self-alining type, the oil rings should revolve freely on the shaft and the base or feet be planed true to prevent vibration. The bearings must not leak and shall be fitted with gauges to indicate height of oil.

The field and brush terminal connections should be easily accessible. The brush leads should be of sufficient length to permit of shifting the brushes and to allow easy access to the commutator and shaft.

Cold Resistance of Armature.

The first step in preparation for a test is to measure the cold resistance of the armature winding. In order that this may be properly done it is necessary to determine the character of the winding.

There are two general methods employed in connecting armature coils, i.e., multiple-connected or lap winding and series-connected or wave winding. These windings may be identified by noting the direction taken by a coil when leaving opposite ends of an armature slot. In a multiple-connected winding the coil will turn in the same direction at the commutator end and at the rear end of the armature slot, while in the series type they will take opposite directions. (See Figs. 1 and 2.)

For multiple-connected armatures (see Fig. 1) diametrically opposite commutator segments must be chosen for the points across which the resistance should be measured.

In the series-connected, or two-circuit type, (see Fig. 2), the resistance must be measured across the segments immeditely under adjacent plus and minus brushes.

A study of the winding arrangments in Figs. 1 and 2 will show that in the multiple-connected armature the paths through the winding will vary with the number of brush groups or studs, while in the series-connected type there are but two paths through the winding regardless of the number of brush groups employed.

Only two brush groups, plus and minus, are necessary for series-connected armatures in multipolar motors, but multiples of this number are frequently employed where the amount of current to be collected is large or beyond the capacity of two sets of brushes.

For the measurement of the very low resistance of large motor armatures, it will be necessary, for accurate results, to use the standard resistance and galvanometer method, but for armatures in which the resistance of the windings is comparatively large, Fig. 3 shows an arrangement of wiring and instruments which may be successfully employed and which was used in determining the resistance of the armature of the 10-horsepower motor covered by the accompanying test sheet.

In applying this test the fields of the motor should be opened and all brushes removed. Copper blocks or brushes, of sufficient size to carry full-load current, should be placed in brush holders, which will cause the blocks to make contact with the commutator segments between which the resistance is to be measured. The resistance of the rheostat R should be so chosen as to permit, with all resistance in circuit, a current through the armature not greater than 20 per cent of

DIRECT-CURRENT-MOTOR TEST RECORD.

Name of Maker—A. B. C. & Co. Order No. 500. Date—2-1-15.
Where Used—X. Y. Z. & Co. For Operating—Wood Lathe. Duty—Intermittent.
Maker's Type—A-1, Inclosed. Maker's Motor No.—12345. Maker's Armature No.—456789. Motor Type—Shunt. Armature Wound—Wave. Horsepower—10. Volts—220. Amperes, Full Load—39.8. R. P. M.—1,250. No. of Poles—4. No. of Brush Studs—4. Brushes per Stud—2. Brushes—Carbon. Size of Brushes—1⅛×⅜×1¼ Inches. Diameter of Armature—11.9 Inches. Amperes per Square Inch of Brush Contact Surface—23.1.

Resistances	Cold at 23° C.	Hot, end of heat run	Insulation resistance in megohms
Armature between segments	.122	.143	.....
Armature between segments, at end of overload run	.....	.....	.....
Shunt field, end full load	239.	282.	10 Armature
Shunt field, end overload	.....	.....	.....
Shunt field, end field heat run	.....	288.	15 Field
Series field	.....	.....	.....
Series field, end overload run	.....	.....	.....
Commutating pole fields	.....	.....	.....
Commutating pole fields, overload	.....	.....	.....

High-potential test, 1,500 volts A. C. for 60 seconds—O. K. Calculated horsepower and full-load efficiency—10 H. P.—85.5%.

Speed Variation.

Full load cold—1,152 R. P. M. Full load hot—1,240 R. P. M. Variation—7.6%. No load hot—1,275 R. P. M. Full load hot—1,240 R. P. M. Variation—2.8%. Design—O. K. Workmanship—O. K. Operation at 125 per cent of no-load speed—O. K. Mechanical strength—O. K. Balance—O. K. Lubrication—O. K. Vibration and noise—O. K. Commutation—O. K. Weight—..... Weight of controller—.....

Heat Run.

Time	Line Volts	Line Amperes	Shunt Field Volts	Shunt Field Amperes	Field Volts	Field Amperes	Speed	Room Temperature C°	Remarks
a. m.									
10:00	220	39.8	220	0.92	....	....	1,152	23	2-hour heat run
11:00	220	39.8	220	0.85	....	....	1,188	23.	Intermittent-duty
12:00	220	39.8	220	0.78	....	....	1,240	24.5	motor
p. m.									
12:03	220	4.5	220	0.78	....	....	1,275	....	No load
12:03	220	12.	220	0.78	....	....	1,270	....	¼ load
12:03	220	20.	220	0.78	....	....	1,265	....	½ load
12:03	220	30.	220	0.78	....	....	1,250	....	¾ load
12:03	220	39.8	220	0.78	....	....	1,240	....	Full load
12:03	220	49.8	220	0.78	....	....	1,235	....	1¼ load
12:45	220	49.8	220	0.78	....	....	1,235	....	25 per cent overload
1:15	220	49.8	220	0.79	....	....	1,250	....	for 30 minutes
1:20	220	59.8	220	0.79	....	....	1,240	....	50 per cent momentary overload

Temperature Rise, Centigrade.
Without Hot Spot Correction. Maker's Ratings.

Motor Part	Full load	Overload	Motor Part	Full load	Overload
Armature core	47.5	49.	Series field	....	....
Armature conductors	47.5	49.	Commutating-pole coils	.....	.....
Commutator	48.5	52.5	Bearings	27.5	30.2
Pole tips	33.5	37.	Frame	25.5	29.2
Shunt field by thermometer (end of field heat run)	49.	....	Average room temperature	24.	24.
Shunt field by resistance	52.	....			

Accepted—Yes. Rejected—.....

.....Engineer.

Digitized by Google

the full-load current, and be capable of varying the current between the limits of 20 per cent and 75 per cent of full load.

Before supplying current to the armature the cold temperature should be taken by placing a thermometer (usually centigrade) on the windings and permitting it to remain about three minutes or until the true temperature is indicated.

The rheostat R should now be moved to the first contact and the terminals *a* and *b* of the voltmeter leads placed on the segments in contact with the copper blocks. Voltage across segments, and the current in the circuit, should be carefully read. Similar readings should be taken for several values of voltage and current in order to obtain a good average. In no case should the current exceed approximately 75 per cent of full-load current, so as to avoid heating the windings and obtaining false readings for the cold resistance. These readings should be taken as quickly as possible for the same reason.

The volts and amperes for each of the

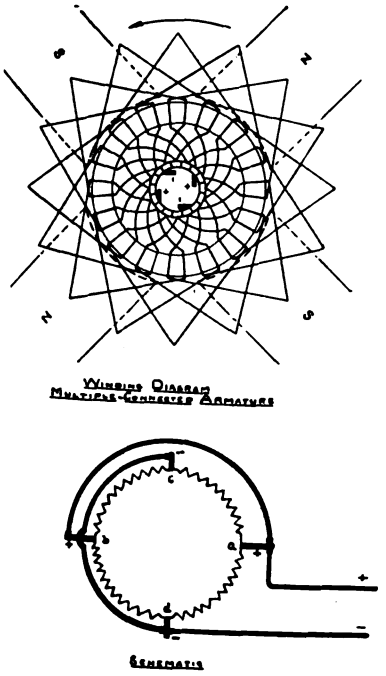


Fig. 1.

readings are used to obtain a value for the resistance, by substituting in Ohm's formula,

$$R=E/I$$

where R is resistance, E voltage and I current.

The results thus obtained differ somewhat on account of the unavoidable errors in reading the low voltage necessary to limit the current, but an average of these values will give a reasonably accurate resistance for the winding across the segments selected.

This is the true resistance offered to the passage of the current in multiple and series-connected armatures of bipolar motors, and series-connected armatures of multipolar motors, but must be modified when applied to multiple-connected armatures of multipolar machines, as the current paths through the windings of this type vary with the number of brush groups.

A diagrammatic arrangement of the relative brush positions and circuits of a multiple-connected armature of a four-pole motor, are shown in Fig. 1.

In Fig. 1, let

r=resistance of armature measured

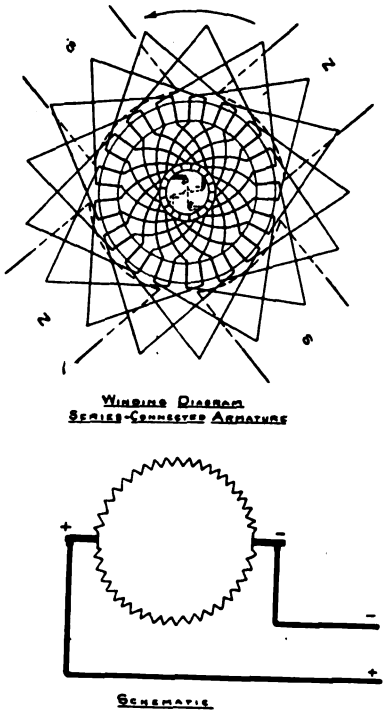


Fig. 2.

between diametrically opposite commutator segments.

$2r$=resistance of one-half the armature winding.

n=one-half the number of brush studs.

$2n$=total number of brush studs.

I=total current in armature.

R=resistance to be used in calculating the I^2R losses in armature winding.

W=watt loss or I^2R in armature winding.

Then;

Resistance of $ac=2r/n$.

Current in $ac=I/2n$.

I^2R in $ac=(2r/n)\ (I/2n)^2$.

Total I^2R in armature=$W=2r/n\ (I/2n)^2 2n$.

Simplifying; $W=I^2r/n^2$.

But; $W=I^2R$.

Then; $I^2r/n^2=I^2R$.

$$R=r/n^2.$$

This is a general formula for obtaining the value of R in multiple-connected armatures of multipolar machines. The formula considers one winding only. In the case of duplex or a greater number of separate windings on the same armature the resistance R should be divided by the total number of windings.

The cold resistance of armature is useful in finding the losses due to heating and in checking the temperature rise by the resistance method.

Cold Resistance of Fields.

The cold resistance of the field is found by substituting in Ohm's formula, as given under "Cold Resistance of Armature," the values of voltage and current in the field when first connected to the line, the figure obtained from a single calculation being sufficiently true for the reason that the higher voltage across the fields is more easily read without error. The readings should be quickly taken to prevent false results caused by heating the wire.

Brush Setting and Method of Starting.

Before an attempt is made to start the motor the brushes should be equally spaced around the commutator and set as near the neutral points as can be determined by observation, that is, in contact with the commutator segments connected with the armature coils outside the influence of the field flux.

Fig. 4 shows the method of wiring through switches and controller to obtain speed reversals, which may be accomplished by changing the direction of current through either the armature or

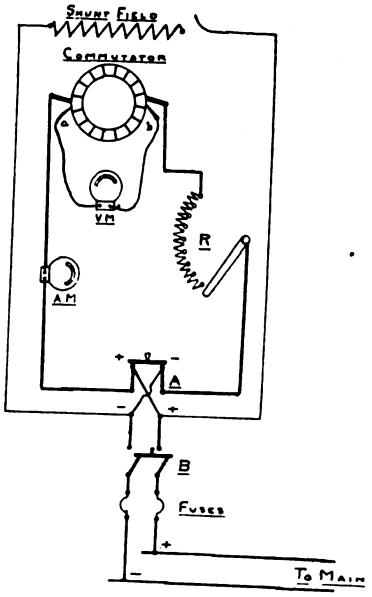


Fig. 3.—Method of Measuring Armature Resistance.

fields. While the meters in the field circuit are not necessary for the brush-setting test, they are provided for the reason that the field volts and current must be read as soon as the motor is started to obtain true figures for use in calculating the cold resistance of the fields.

By closing switch B and with controller C in the "off" position, current is caused to flow in the fields.

Under no circumstances should the armature circuit of shunt or compound-wound motors be closed before first exciting the fields. It is equally important that the fields should never be opened leaving the armature circuit closed, as the counter-electromotive force in the

Digitized by Google

armature, due to the field flux, would be immediately reduced, permitting a large and destructive current through the low-resistance winding. There are further precautions necessary which should be carefully observed to prevent damage to the field windings when closing down a motor. The load should first be reduced to a minimum to prevent heavy arcing at the switch. The switch B should then be opened, disconnecting the motor from the mains, unless a specially constructed controller is provided, and designed to cut a resistance in the field circuit to take the inductive discharge when disconnecting the field from the line. When circuit is wired as shown in Figs. 4 and 5, never stop motor by cutting out rheostat as the armature should always be in multiple with the field when the main-line switch is opened in order to provide a discharge path through the armature for the high self-induced voltage in

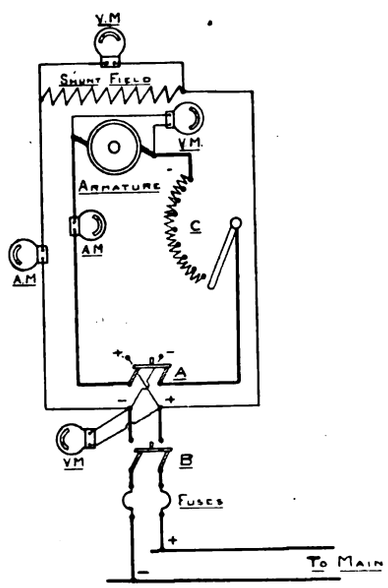


Fig. 4.—Arrangement for Brush Setting.

the fields. Unless this discharge path is provided the induced voltage is likely to puncture the insulation and cause a grounded coil.

With fields excited and without load on motor, close switch A, move controller C to the first point and gradually cut out resistance. This will cause the armature to rotate and increase in revolutions until full rated speed is attained with all rheostat resistance out and motor connected directly across the line voltage. The resistance of the rheostat should be so chosen as to limit the starting current to about 50 per cent of the full-load current.

The brush setting should be checked by taking the no-load speed of the motor in one direction, closing down and causing the armature to rotate in the opposite direction by reversing the double-pole, double-throw switch A.

The reverse speed should be read and if found to differ from that in the original direction, the brushes are shifted to a point which will give a speed representing an average of the two.

The direction of rotation is again reversed and speed noted, the process being continued until the revolutions in each direction are the same; the line voltage being held constant throughout the test.

This determines the brush setting without load. When the load is applied the neutral areas shift somewhat, due to the field distortion by the increased armature flux, and it may be necessary to move the brushes slightly in a direction opposite to rotation in order to preserve the neutral position and maintain sparkless commutation.

A change in brush setting due to load is not usually necessary in motors equipped with commutating poles.

The brushes on most carbon-brush motors are constructed and set at such an angle as to permit a reversal of the armature without damage. If this is not the case, the proper brush position can only be obtained by trial.

When the correct setting is finally determined the rocker arm should be marked to preserve the position.

Heat Run: Continuous-Duty Motor.

In order to accumulate the data necessary for the electrical determinations, a motor is subjected to a prolonged run under conditions similar to those which will be met in practice.

Before starting this run, thermometers, usually centigrade, should be secured, one each to the field coils and on opposite sides of the frame, and two suspended in the room about four feet from the motor and away from drafts to indicate the temperature of the surrounding air. The thermometer bulbs on the motor parts should be covered with small pieces of waste to retard radiation at the point of application and record a true reading.

The load for the motor is obtained by belting it to a generator whose leads are connected through a water rheostat or some other easily controlled load.

The method of wiring and instrument connections for the test run are shown in Fig. 5, the ammeter in the line indicating the sum of the armature and field currents.

Closing the switches and bringing the motor to rated speed, the load is gradually applied to the generator until full current input at normal voltage is reached in the motor.

The time should be noted, and the current and voltage in field and line, the speed, and the room temperature immediately read and recorded on the test sheet.

In order to determine the heating limits of the parts, in motors intended for continuous duty, full load is applied, taking readings at half-hour intervals until the maximum rise in the temperature of the fields is reached. As the temperature rises the resistance of the fields increases and in constant-potential coils this increase is attended with a decrease in current until the final temperature is reached. This ultimate temperature is manifested by a current of the same value through the shunt fields during three consecutive half-hour readings, with constant room temperature, indicating no further increase in resistance due to heat.

In cases where the room temperature, when nearing the end of the run, is changing rapidly enough to affect the field windings over a period of three half-hourly readings, the final heating limit may be determined by noting the difference in the temperature of the field and room. When this difference remains constant for 1.5 hours, the fields may be

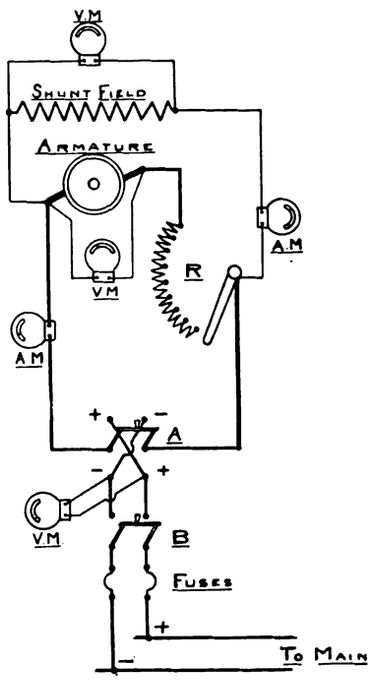


Fig. 5.—Arrangement for Heat Run.

considered to have reached the highest temperature under the conditions of the test.

Upon completing the heat run the load is changed and readings taken quickly at 25, 50, 75, and 125 per cent of full-load current input.

No-load or belt-off reading of the speed, and the volts and amperes in line and field, should also be made and recorded.

There should be no sparking at the brushes from no-load to full-load, and no injurious sparking from full-load to 150-per-cent load.

Glow points and heavy sparking should never be permitted as they soon pit and destroy the smooth surface of the commutator.

The commutator should not be cleaned or the brush setting changed during the test run.

Completing the fractional and no-load readings, which should be made as quickly as possible to prevent the cooling of

Digitized by Google

parts when current is reduced, the motor is closed down and the temperatures of the commutator, armature core, armature windings, pole pieces, frame and bearings are taken and the hot resistance of the armature measured.

Motors are also subjected to overload tests immediately upon completion of the temperature and resistance readings. For continuous-duty motors these loads are usually 125 per cent for two hours and 150 per cent momentarily, and are made to test its ability to withstand such strains without injury.

Intermittent-Duty Motors.

Motors are frequently required for service that is more or less intermittent and for this type it is considered sufficient to close down the heat run after two hours of continuous operation at full load, noting and recording temperature rises, resistance of armature and no-load readings similar to those described for continuous-duty motors.

Fractional-load readings must also be taken and 125 per cent load for thirty minutes and a momentary overload of 50 per cent should be run immediately following the heat test.

Upon completing these tests full current should be continued in the fields, with motor running light, until the maximum field temperature is reached. This is done for the reason that such motors may have a continuously excited field while subjected to load only at varying intervals and it is important to know the ultimate temperature rise for this condition.

Inclosed Motors.

It is sometimes desirable that motors be totally inclosed, and while the general requirements are the same as for the open types, it is recommended that during the heat run the hand-hole covers be not removed for the purpose of reading the field thermometers every half-hour, as it has a cooling effect upon the parts and does not conform to service conditions. The maximum rise can be determined by the field current values, and thermometers read upon closing down.

It is customary to secure thermometers to the fields of motors during the heat run, but the temperatures thus indicated are usually checked by the rise-in-resistance method, as it is difficult to always obtain a true reading due to the protecting covering of the coils. The resistance method will generally show the higher temperature rise and is therefore accepted as correct. The temperature of other parts taken by thermometer are considered satisfactory.

Hot Resistance of Armature.

The hot resistance of the armature should be measured immediately upon closing down the heat run and by the same method and across the same commutator segments employed in taking the cold resistance. This resistance, with the proper correction for the type of winding, is used to determine the I^2R losses in the armature when calculating the motor efficiency.

TABLE I.—PERMISSIBLE TEMPERATURES AND TEMPERATURE RISES FOR INSULATING MATERIALS, IN DEGREES CENTIGRADE.

Class	Description of Material.	Maximum temperature to which the material may be subjected Hottest spot.	Maximum allowable temperature rise Actual reading.	Hot spot correction
A1	Cotton, silk, paper and other similar materials, not so treated as to increase the thermal limit.....	95	40	Temperature measured by Thermometer 15
			45	Resistance 10
A2	Similar to A1, but treated or impregnated, and including enamel wire...	105	50	Thermometer 15
			55	Resistance 10
B	Mica, asbestos or other material capable of resisting high temperatures, in which any class A material or binder, if used, is for structural purposes only, and may be destroyed without impairing the insulating or mechanical qualities.....	125	70	Thermometer 15
			75	Resistance 10

TABLE II.—PERMISSIBLE TEMPERATURES OF ELECTRIC POWER CLUB.

Temperatures in Centigrade Degrees.

Motor Part	Open Type		Inclosed Type	
	Full load	1¼ load for two hours	Full load	1¼ load
Armature winding and core, field windings, bearings, frame and pole tips.....	40	55	55	No
Commutator	45	60	60	Guarantee

Hot Resistance of Fields.

The hot resistance of the field is obtained from the field volt and ampere readings taken at end of heat run, using the same formula referred to under "Cold Resistance of Fields."

Temperature Rise.

Due to the changing temperatures of the seasons, motors are subjected to varying degrees of heat and cold and possibly upon completion of the heat run will indicate abnormally high temperature rises which may or may not be caused by the current in the windings.

The American Institute of Electrical Engineers in the revised Standardization Rules of July 1, 1915, has fixed what is considered to be safe heating limits and temperature rises for motor windings. These temperatures are given in the accompanying table.

These values are based upon a reference room temperature of 40 degrees Centigrade (104 degrees Frahenheit) which is chosen for the reason that it is probably the highest temperatures which will ever be reached by the air surrounding a motor operating under normal conditions.

As it is difficult to detect and measure the temperature of hot spots in the windings, corrections of 15 degrees Centigrade for thermometer readings and 10 degrees for temperatures by resistance, as shown in the table, are recommended as a safeguard to insure protection to the insulation.

The hot-spot temperature rise for class A1 insulation shall therefore not exceed 55 degrees Centigrade above the surrounding room temperature and the thermometer must not indicate a rise greater than 40 degrees. The indicated temperature obtained by resistance shall not exceed a 45 degrees rise.

Insulations under classes A2 and B are to meet requirements given in the table.

Tests conducted in room temperatures less than 40 degrees must conform to the same limits of temperature rise.

It is necessary to specify definite limits which may be met under the most severe conditions of operation, since a motor tested in a room temperature of 25 degrees in winter might easily withstand a hot-spot temperature rise of 60 degrees, while under summer-heat conditions the same motor would probably become overheated.

While the Standardization Rules (July 1, 1915) recognize only one temperature for all types of motors employing certain classes of insulation, the representative American manufacturers have not yet changed their ratings to conform to these requirements, contending that the probability for undetected hot spots in inclosed motors is reduced, due to a more uniform temperature within the motor, permitting a higher rating, and that under occasional overloads of short duration temperature limits may be increased without injury.

Table II gives the readings, without hot-spot corrections, for temperature rises guaranteed for stock motors as manufactured by those companies who subscribe to the recommendations of the Electric Power Club.

There are likely to be modifications which will bring the Standardization Rules and makers' ratings into agreement, but for the present the manufacturers' standards will probably obtain.

Where motors are to be operated under unusual conditions of exposure or in surrounding temperatures exceeding 40 degrees Centigrade, the specifications should so state, that the manufacturers may be informed in order to furnish a suitable machine.

Temperature by Resistance.

The method which is employed in obtaining the temperature rise in such coils as cannot be accurately measured by thermometer is shown by the formula, $r=(R_1/R-1)(238+t)$ derived as follows:

Digitized by Google

Let

r =temperature rise in degrees centigrade above the cold temperature of the coil.

t =cold temperature of coil, degrees centigrade.

R=cold resistance of coil at temperature t.

R_1=hot resistance of coil.

0.0042=temperature coefficient of copper wire at 0 degrees centigrade.

T=final room temperature.

R_0=resistance of coil at 0 degrees centigrade.

Since for each degree centigrade rise in temperature above 0 degrees the resistance of copper wire increase 0.42 per cent of its resistance at 0 degrees;

Then;

$$R=R_0(1+0.0042t)$$

Also;

$$R_1=R_0[1+0.0042(t+r)]$$

Dividing;

$$R/R_1=R_0(1+0.0042t)R_0[1+0.0042(t+r)]$$

Simplifying;

$$r=R_1/R(238+t)-(238+t)$$

$$r=(R_1/R-1)\ (238+t)$$

When the final room temperature (an average of the last four half-hourly readings of the room thermometers) differs from the temperature t of coil taken when cold, the value of r should be corrected to the rise above the room temperature by subtracting the difference between the cold coil and final room temperatures from r if the final room temperature is greater, and adding if it is less.

In previous Standardization Rules of the American Institute of Electrical Engineers, certain temperature corrections with reference to a standard room of 25 degrees centigrade were prescribed to compensate for the variations in the heat of the room and that generated by the current due to the difference in the resistance of the windings. While the principles thus employed are theoretically correct, there are other influences from radiation, atmospheric conditions, etc., which are difficult to determine accurately, and after numerous observations it has been shown that any corrections other than as now recommended are impractical and undesirable.

Speed Regulation.

There are certain variations in the speed of so-called constant-speed motors due to weakened fields caused by the heating of the windings and to the load. The change in speed from no load to full load when motor is hot should not exceed 12 per cent in sizes up to 5 horsepower or 9 per cent in sizes of five horsepower and above. A motor should attain within four per cent of rated speed under full load when hot and must never show more than 10 per cent difference in the full-load speeds, cold and hot. The operation shall be without undue noise or knocking. The end play of the shaft is usually limited to about an eighth inch.

Mechanical Strength.

The mechanical strength of armature to withstand centrifugal force should be tested by causing it to rotate, without load, at 125 per cent of no-load speed for twenty minutes. It is not practicable to specify overspeeds for series motors due to the varying operating conditions to which they are subjected.

Increased speed is obtained by cutting resistance in the field circuit, lowering the current and thereby decreasing the field flux. This results in a lowered counter electromotive force in the armature, permitting increased current flow, and producing a greater turning force and higher speed until the counter electromotive force is again increased to such a value as to limit the armature current and cause an automatic adjustment of the torque to the new field, armature and speed conditions. The reduction of the field current may be continued until the desired speed, within reasonable limits, is reached.

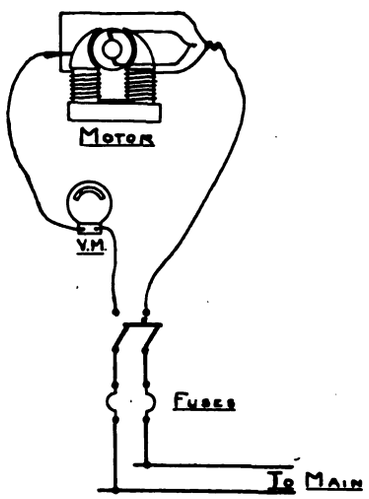


Fig. 6.—Insulation Test Circuit.

Upon completing the high-speed test the armature should be examined for loose coils, high commutator bars and mica.

Dielectric Strength.

To test the dielectric strength of the insulation to withstand the strains due to high induced voltages which would appear in the windings if the current in the coils should be suddenly broken, motors are subjected to an alternating electromotive force of twice the normal voltage of the motor plus 1,000 volts, for a period of one minute. The motor should be disconnected from the mains and the high voltage applied between the frame and the brushes in contact with the commutator, and between the frame and field windings.

The source of alternating-current supply should not be less than five kilowatts and no intervening resistance or reactance shall be used to limit the current in the test circuit should the insulation break down. The test must be made while the windings are hot, and the circuit should be properly protected with fuses.

Insulation Resistance.

The insulation resistance between the windings and frame shall be at least one megohm when hot. This measurement is usually made by the direct deflection method as shown in Fig. 6. In deriving the formula, let

X=the insulation resistance.

R=resistance of voltmeter and insulation in series.

D=deflection of full test voltage on meter.

r=resistance of voltmeter, preferably 100,000 ohms.

d=deflection of voltmeter when in series with test voltage and insulation resistance X.

Since in the series circuit shown in Fig. 6, the current flow, as indicated by the voltmeter deflection, will vary inversely with the resistance;

$$D:d::R:r$$

Simplifying;

$$R=Dr/d$$

Substituting;

$$X=R-r$$

$$X=(Dr/d)-r$$

Five hundred volts is recommended for this test. It is important that the motor be insulated from the ground during test to avoid the possibility of error should one side of the test mains be grounded.

Losses.

The motor having satisfactorily passed the foregoing requirements for heating limits, overloads, speed regulation, mechanical strength, etc., it will now be shown how the losses and efficiency are determined from the data which have been accumulated.

The losses occurring in a motor are:

(a) I^2R in the armature windings.

(b) IE in the field windings.

(c) Brush contact.

(d) Core—hysteresis and eddy current.

(e) Bearing and brush friction.

(f) Windage.

The I^2R loss in the armature is the product of the square of the current and the resistance of the windings measured as previously described.

The I^2R loss in the fields is the product of the current in the fields and the voltage producing it.

Brush-contact loss is the product of the total armature current and the voltage drop across the plus and minus brush-face contacts on the commutator. It has been found by experiment that the average face contact of good-grade carbon brushes on a rotating commutator at the customary pressure of from 1.5 to two pounds per square inch measures approximately 0.167 ohms per square inch of contact surface.

While many conditions, such as poor commutator surface, quality of brushes, dust, excessive heat and humid atmos-

Digitized by Google

phere operate to change this constant (0.167), it is a reasonably accurate figure, under normal conditions, for good-grade carbon brushes where the current-density does not exceed the commonly allowed limit of about 40 amperes per square inch at the faces, and may be used with sufficiently true results in determining the brush-contact losses.

Some manufacturers have constructed curves or collected data showing the losses for the brushes employed in their motors and it is recommended that these figures be used, if available, as the results will prove more accurate.

The total contact resistance for the brushes of a given motor is obtained by dividing the constant 0.167 by the total area of all the plus and minus contact faces. The formula used in finding the voltage drop across the plus and minus brush-face contacts is derived as follows:

Let

R=total contact resistance of all brushes.

A=total area of all brush contact faces.

E=voltage across brush contact faces.

I=current through armature.

Then

$R=0.167/A$.

Substituting the value of R in ohm's formula,

$E=0.167I/A$.

or $E=I/6A$.

This voltage drop across face contacts when multiplied by the current in the armature will give the brush contact losses.

Core, friction and windage losses are determined, in the aggregate, from the no-load test readings by multiplying the armature current by the voltage at the brushes. The figure thus obtained must be multiplied by the fraction derived when dividing the speed at full load hot by the speed at no load hot in order to correct them for the lower speed at full load. This correction is not exact for the reason that the eddy-current losses, which vary as the square of the speed, have been considered to vary directly with the speed, as is the case with hysteresis, friction and windage.

It is also necessary, for very accurate determinations, to subtract the I^2R losses in the armature at no load from the total core, friction and windage losses before the speed correction is made, as the no-load armature current appears in the total armature current at full load. But as this loss is so small compared with the total losses and is probably compensated by the error in the eddy-current figures, the result without this correction is generally considered sufficiently true for commercial requirements.

Should it be found advisable to separate the eddy-current loss, it may be done in the following way:

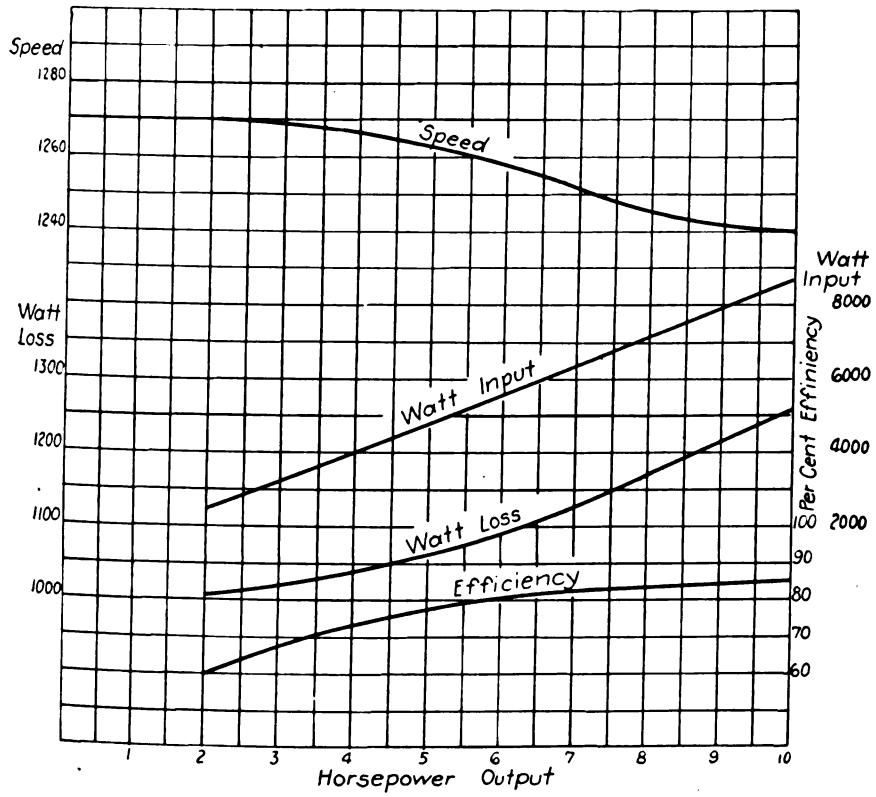


Fig. 7.—Performance Curves for Direct-Current, Shunt-Wound, Intermittent-Duty, Inclosed Motor.

Separately excite the fields from another source and maintain the current in them at the same value as during the test run. Cut a rheostat in series with the armature leads to provide means for controlling the speed. Cause the armature to rotate, running light, at one-half the speed attained at full load and calculate the watts input to armature. The formula given below is to be used in obtaining the eddy-current loss.

Let

W=friction, hysteresis and eddy-current losses at half speed.

F=friction loss at half speed.

H=hysteresis loss at half speed.

D=eddy-current loss at half speed.

K=2, or number of times the full-load speed is greater than the half speed.

W_1=friction, hysteresis and eddy-current losses with motor running light at full-load speed.

D_1=loss due to eddy currents at full load speed.

P=per cent increase in speed (in this case half speed to full speed.)

Then;

$$W=F+H+D.$$
$$KW=KF+KH+KD$$

And;

$$W_1=KF+KH+K^2D$$

Substracting;

$$W_1-KW=K^2D-KD$$
$$D=(W_1-KW)/K(K-1)$$

Substituting the value of K;

$$D=(W_1-2W)/2$$
$$D=W_1/2-W$$

And;

$D_1=D(1+P)^2$ as eddy-current losses increase as the square of the speed. The loss at any speed is therefore obtained by multiplying D by above factor.

Efficiency.

The commercial efficiency of a machine, or its ability to deliver for useful work a certain portion of the energy it consumes, is expressed in the ratio of power output to power input.

To determine the value of the output it is necessary to accumulate all the losses in the motor, add them and subtract the total from the input.

The following example serves to illustrate the method used to determine the efficiency of a motor, the figures employed being taken from the accompanying test record. The conditions under full load and at end of heat run are considered.

Let

I=current in armature at full load.

I_f=current in shunt field.

LOSSES.	WATTS.
Armature, $I^2R=(39.02)\ R=1{,}524\times0.143$	= 218.00
Field, $I_fE_1=0.78\times220$	= 171.60
Brush, $I^2/6A=(39.0)^2/3.38\times6$	= 76.20
Core, friction and windage, $I_aES/S_1=3.72\times220\times1{,}240/1{,}275$	= 796.00
Total loss in watts	1,261.80
Total input in watts at full load, $(I+I_f)E=39.8\times220$	= 8,756.00
Total output in watts	7,494.20
Ratio of output to input=efficiency	= 85.5%
Output divided by 746=horsepower	= 10.0
Full-load speed variation, cold to hot, (1,240—1,152)/1,152	= 7.6%
Speed variation, no load to full load, hot, (1,275—1,240)/1,240	= 2.8%
Ratio, full-load speed to rated speed, 1,240/1,250	= 99.0%

Digitized by Google

I_a=current in armature, motor running light.
E =voltage across brushes (line voltage).
E_1=voltage across shunt field.
R =resistance of armature, hot.
S =speed at full load.
S_1=speed running light.
A =total brush contact surface area in square inches.

In this example the no-load I^2R armature losses have not been deducted and the eddy-current losses have been considered as varying directly with the speed. (See "Losses.") As the armature is series-connected, the resistance across the segments, as shown on test record, is used in obtaining the armature I^2R losses. Had the armature been multiple-connected it would have been necessary to correct the segment-to-segment resistance by the formula $R=r/n^2$, derived under "Cold Resistance of Armature," to obtain the true resistance to be employed in calculating the armature losses.

Table III gives the efficiencies which should be met in well designed motors. For intermediate sizes not given use proportionate values. For larger sizes consult standard handbooks.

TABLE III.—EFFICIENCY PERCENTAGES.

	Continuous Service Rated Speed					Intermittent Service Rated Speed				
Horsepower	300	600	900	1200	1500	300	600	900	1200	1500
2	71	76	80	81	82	69	74	78	79	80
3	74	78	81	83	84	72	76	79	81	82
5	76	80	83	85	85	74	78	81	83	83
7.5	78	82	84	86	86	76	80	82	84	84
10	79	83	85	86	86	77	81	83	84	84
15	80	84	86	87	87	78	83	84	85	85
25	82	86	87	88	88	80	84	85	86	86
35	84	88	88	89	89	82	86	86	87	87
50 to 75	85	89	89	90	90	83	87	87	88	88

The Standardization Rules recommend that efficiency calculations be referred to a standard of 75 degrees centigrade; that is, where the winding temperatures, without hot-spot correction, differ from 75 degrees centigrade, the resistance shall be corrected to this temperature before figuring the losses. This is, however, important only when there is a wide difference between the actual and reference temperatures, and where the efficiency closely approaches the specification and it is necessary to determine very accurately whether the conditions are properly met.

It will be noted that the efficiencies for the intermittent-service types are less than for continuous-service motors of the same size. This is due to the usual practice of specifying smaller-size continuous-duty motors rated at an increased horsepower when employed for intermittent service, as they are not subjected to full-load current for long periods and can be operated at somewhat lowered efficiency and at overloads for a short time without undue heating.

Fig. 7 shows curves plotted from the fractional and full-load readings given on the accompanying test sheet. These curves are useful in studying the general performance of the motor and in finding the horsepower at any load between one-quarter and full load.

While the tests described have referred only to shunt-wound motors, the series, compound-wound and commutating-pole types are subject to the same general requirements, the additional field windings being considered when calculating the horsepower and efficiency ratings.

Bakelite Patents Declared Valid and Infringed.

The decision rendered by Judge Thomas I. Chatfield on June 12, 1915, substantiates the claim made by the General Bakelite Company that three of its Bakelite patents were being infringed by George J. Nikolas, of Chicago, trading as George J. Nikolas & Company.

The United States patents declared valid and infringed are: No. 954,666 of April 12, 1910; No. 1,018,385 of February 20, 1912; No. 1,037,719 of September 3, 1912.

The trial of the infringement suit was begun December 9, 1913, and conducted in the United States District Court, Eastern District of New York, with Judge Thomas I. Chatfield presiding. A decree was rendered June 29, 1915, and an injunction issued July 1, 1915.

The claims of the General Bakelite Company were vigorously contested by the counsel for Mr. Nikolas, who presented in their defense of the case no less than 47 patents, together with many literature references. Each one of the many patents and references cited were alleged by them to contain prior disclosures. The decision of Judge Chatfield, however, rejected all of these allegations and held the three Bakelite patents in suit to be valid and infringed.

It is interesting to note in Judge Chatfield's decision that he shows appreciation of scientific research, stating: "The testimony shows commercially successful accomplishments, as well as scientific investigation by the patentee in this country, and his appearance and testimony upon the witness stand have plainly shown mental capacity, scientific knowledge and deductive ability which would accord with and be expected as the necessary foundation for such investigations and experimental operations as those involved in practicing or advancing the art and processes set forth in the patents as to which the present litigation has arisen."

LETTER TO THE EDITOR.

Style Versus Dogma in Lighting.

To the Editor:

Glare from light sources is one of the things which the Illuminating Engineering Society has fought valiantly to overcome and the results judging by present day practice are better than the most enthusiastic of the Society's supporters in its early days could have reasonably expected. Five or six years ago, which was before the days of semi-indirect and indirect lighting, the proceedings contained specific recommendations from such men as Bell, Sharp and Marks to keep the intrinsic brilliancy down to .5 candlepower per square inch. During this same period others were advocating efficiency at any price.

The consumer settled the controversy by accepting the more hygienic method, but for reasons far removed from those of eye protection.

Women wore short skirts and low shoes last winter and furs are in evidence this summer, so that we men of brains must realize that style settles many problems and style settled the lighting problem of diffused versus direct lighting.

Style decrees that direct lighting and higher intrinsic brilliancy are coming back into favor. What are we men of science going to do about it?

New York, August 2. A. GLOW.

J. G. White Companies Urge Men to Join Militia.

Three large engineering corporations in the United States have taken definite action in the encouragement of employees to join the National Guard. These are the J. G. White Engineering Corporation, J. G. White & Company, Incorporated, and the J. G. White Management Corporation. Gano Dunn, president of the J. G. White Engineering Corporation, said:

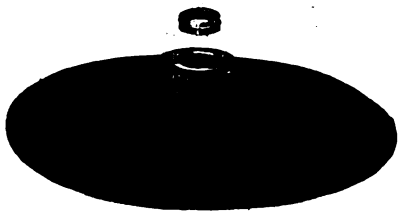
"Arrangements to release men for military service is more difficult for corporations like the White companies because of the highly specialized nature of the engineering and associated work that they carry out, which requires the personal attention of individuals in a way that does not readily permit of the substitution of others to fill their places during absence. Also as a class the men are high salaried men who have particular responsibilities and are scattered over a large territory. It is felt, however, that the sacrifices involved in encouraging these men to enter the National Guard and assuring them of their positions with pay during absence for service in militia in addition to their regular vacations are small in relation to the great importance of fostering the spirit of readiness for patriotic defense."

Digitized by Google

New Electrical and Mechanical Appliances

Flaring Porcelain-Enameled-Steel Reflector.

A new type of enameled-steel reflector for use in commercial and industrial establishments has recently been placed on the market for use primarily with the 60-watt short-base tungsten lamps. The reflector diameter is 14 inches and the shape is such as to give a very good distribution of the light upon the working surfaces. The reflector is equipped with a standard Hubbell contractile collar which permits it to be attached directly to the sockets and eliminates the need for a separate shade-holder. The reflector is finished with a high grade of porcelain enamel which protects it thoroughly from corrosion. Ample ventilation is provided by means of four vents in the top of the neck of the reflector.



New Enameled-Steel Reflector.

These reflectors are manufactured by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn.

Adapti Connectors for Armored Cable and Flexible Metallic Conduit.

In order to be able to connect steel-armored cable or flexible metallic conduit to switch boxes and outlet boxes various types of connectors have been placed on the market that meet the requirements more or less satisfactorily. A new type of this class of device with unique features has recently made its appearance. This is made in two forms, of which Fig. 1 shows the connector for loom switch boxes. This type of connector is made of sheet steel of sufficiently heavy gauge to withstand any strains to which it may be subjected. This stamped sheet steel is bent into the form shown. The neck of the device is made to fit into the knockout of all standard loom switch boxes. It has a smaller diameter than the rest of the device so as to form a shoulder on the inside of the box for the conduit or cable. The inner edge of this neck is rounded off to form a smooth entrance bushing for the wire.

The open side of the connector is doubly split so as to form two pairs of ears. The inner set of ears provides a means of expanding the neck of the collar so that it fits firmly in the knockout of the box; this is done by tightening the screw against the unperforated ear. The other pair of ears at the outer edge provides a means for clamping the armored cable or flexible conduit by being drawn tightly about the same by means of clamping screw.

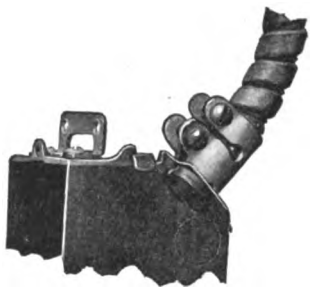


Fig. 1.—Connector for Switch Box.

The connector shown in Fig. 2 is adapted for securing armored cable or flexible steel conduit to standard outlet boxes. The general principle of this connector is the same as that shown in Fig. 1, but in this case it is made of malleable iron heavily galvanized. It fits all one-half-inch conduit knockouts. A shoulder is provided for fitting against the edge of the box.

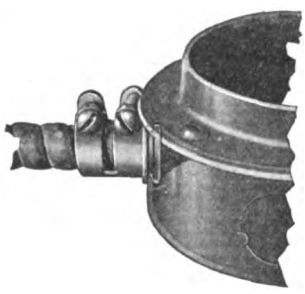


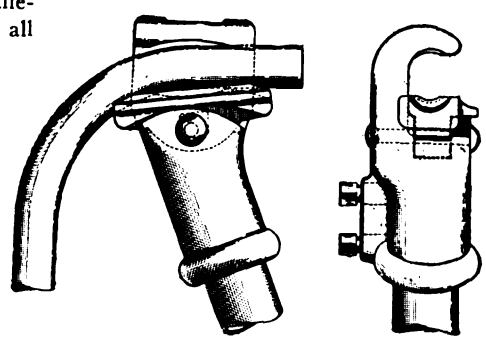
Fig. 2.—Connector for Outlet Box.

Both types of these connectors are unique in being one-piece devices and in eliminating special locknuts and bushings. They are very quickly applied and provide a secure connection to the box. These connectors are made by the Adapti Manufacturing Company, 919-925 West Street, Cleveland, O.

New Hickey for Conduit Installations.

The fact that many cities have already passed ordinances making compulsory the placing of all wiring in buildings in steel conduits tends to show that this practice is soon destined to become general. New systems and new methods require new tools. Many contractors today use an iron pipe tee, a size larger than the pipe to be bent, placing a piece of pipe in the tee for a handle, this giving a sort of wrench with the handle at 90 degrees to the conduit, which is effective, but very inconvenient in many situations. One advantage, however, is that when the tee is new it will not slip on the conduit, and when it becomes worn smooth it can be cheaply replaced with a new one.

Others use a sort of solid wrench with two fixed jaws with an opening or slot on one side between them to permit placing on the conduit without having to slip it over the end. The jaws are curved to fit the circumference of the conduit and belled at one end to an easy curve to prevent flattening or kinking. The bearing faces of the jaws are serrated or roughened to prevent slipping. This tool is open to the same objections as the tee in that as soon as it becomes worn smooth it will slip on the conduit, making it very difficult to make satisfactory bends. This causes continuous losses of time and sometimes produces bad falls and strains to the men, usually resulting in a return to the use of the tee as up to date no better tools have been offered.



Front and Side Views of Hickey.

The Fey Specialty Company, 71 Brainard Street, Detroit, Mich., has just brought out a new tool to meet

Digitized by Google

all the above requirements as well as many others which in regular practice are continually arising. This tool is known as the Fey hickey. It is provided with one solid and one movable jaw, the latter of which, operating by all the pressure required to bend the conduit, automatically clamps it while the bend is being made. This makes slipping impossible, and the jaws are smooth when new, roughening being unnecessary. A glance at the illustration on the preceding page will show clearly how it operates.

The jaws are made alike at each end, so that bends may be made by moving the handle in either direction. In one case the handle at the commencement of the bend will have an agle to the conduit or about 55 degrees, and in the other the angle is about 100 degrees. This variation in operating position provides a tool adapted for use in all kinds of close, cramped positions and meets all the conditions of service. The jaws are also so curved that the tool may be put on or removed from a conduit already bent, without turning it sidewise or slipping along to the end or onto a straight portion of the conduit.

Another improvement lies in the method of attaching the pipe handle, which is slipped into a socket slightly tapered at the inner end, but not threaded. It is driven in tight and retained by two set screws. The maker claims that handles screwed in often break off at the threads. The tool is well made of malleable iron and fully guaranteed by the manufacturers.

Meter for Demonstrating Lamp Economy.

In order to impress on prospective purchasers the economy of the new high-efficiency lamps the declarations of a lamp salesman are not nearly as effective as an actual demonstration of this point while it is being discussed. Lamp efficiency in watts per candle does not mean much to a prospect compared to a visual proof of relative efficiency of modern and old-style lamps.

With these ideas in mind the engineers of the Eldredge Electric Manufacturing Company, Springfield, Mass., have developed a convenient portable meter, known as the "duplex lamp tester." The accompanying illustration shows that it consists of a direct-reading wattmeter, two handy special lamp sockets, with a push-button switch for each, and a connecting cord with attaching plug, all being contained in a compact carrying case.

Duplex Lamp-Testing Meter.

The instrument can be used on direct-current or alternating-current circuits of standard voltage (110 volts) or thereabouts. The watt scale reads to 130 watts in the standard meter, making it especially useful for salesmen demonstrating high-efficiency lamps for households, small stores and the like. For convenience in inserting or withdrawing the test lamps, spring sockets are used in place of the regular screw-shell type. By pressing the buttons in succession the two lamps are lighted in turn and their wattage consumption indicated at the same time. This shows forcibly the difference in power consumption of the lamps compared, also their difference in brightness in case two lamps not equal in candlepower are used.

The connecting cord is four feet long and provided with a swivelled plug, making it easy to connect to the nearest outlet. The leatherette carrying case is only 5.5 by 4 by 2 inches. Despite the utility of this instrument, its cost is not very high.

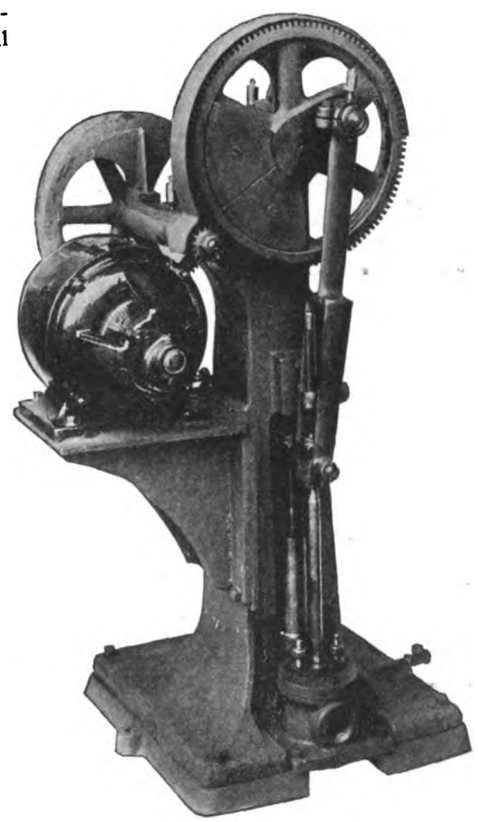
Motor-Driven Deep-Well Pumping Head.

Every person situated out of reach of city water mains realizes the need of an abundant supply of good water. The owners of dairy and truck farms, country estates, and practically every water consumer dependent on some local source of water supply and situated in a locality where water does not lie near the surface, should be interested in the new Hill deep-well pumping head shown in the accompanying illustration.

When operating two-inch, two-and-one-half-inch or three-inch single-acting cylinders it will raise water to a total height of 180, 125 and 90 feet, respectively. It can be used with any of the common forms of well cylinders.

The machine is wholly self-contained and is very compact. All parts are sturdily constructed of the best materials and the mechanical construction and design insure long life with a minimum of repairs. All gears are machine cut and, as the illustration shows, are well shielded.

This head can be used in connection with open or elevated-tank systems or with closed-tank pneumatic-pressure systems. When used with the pneumatic-pressure system, an air pump furnishes air to the tank through the water discharge. Water is raised on the upstroke, while air is forced in on the downstroke, thus equalizing the pressure.



Electrically Driven Deep-Well Pumping Head.

The motors used on these heads are three-fourths-horsepower Westinghouse single-phase type AR. The motor is mounted rigidly on an extension of the pump support and is capable of starting the pump under full load.

The whole outfit is very compact, quiet in operation and extremely economical. It can be operated 24 hours every day and requires practically no attention after being started.

Digitized by Google

Automatic Electric Cooker for Steam Cooking on Improved "Fireless" Principle.

The use of the so-called "fireless" cookers, in which previously prepared and heated food is placed into a closed, heat-insulated cooking chamber, has been steadily increasing because this has been found an economical method of preparing many savory dishes that otherwise would require prolonged cooking and frequent attention at the stove. This method as ordinarily followed has some disadvantages, however. The food must be preheated and transferred to the cooker. If a number of dishes are in the cooker at the same time, one is likely to take up the odor and flavor of the other. Since no additional heat is supplied to the ordinary cooker after it is once charged, the food slowly cools and is therefore apt to be insufficiently cooked, besides requiring to be reheated before serving. These disadvantages have been entirely dispensed with for this purpose.

The construction of the cooker proper, which is the main part of the outfit, is made clear by Fig. 2, a sectional view of the interior chambers. In this *AA* is a double-walled steam jacket about the cooking chamber that holds the various cooking vessels, *a*, *b*, *c*, *d*. At the bottom of the steam jacket is an annular space *W* containing a limited amount of water. Below this is the heating element *H*, shown detached at the lower right corner. In the middle of the bottom is a phosphor-bronze spring diaphragm *D*, whose operation is subject to the steam pressure in the jacket *AA*. Since this jacket is hermetically sealed, the steam generated by the boiling of the water at the bottom is confined and the steam pressure therefore gradually increases. When it reaches about 15 pounds per square inch it is sufficient to buckle the diaphragm *D*, forcing it down so that it pushes a pin *P* downward and this suddenly opens the switch contacts *CC*. This automatic quick break of the circuit takes place when the temperature reaches about 250 degrees Fahrenheit, the boiling point of water being higher than 212 degrees under pressure. When the cooking chamber has absorbed enough heat to bring the steam temperature down to about 220 degrees, there is insufficient steam pressure to hold down the diaphragm; consequently it buckles back and the contacts *CC* are quickly closed by gravity and a lead weight. This restores the heating circuit and generation of steam is resumed. This cycle automatically repeats itself, keeping the cooking vessels constantly at a temperature between 220 and 250 degrees, in other words well above the boiling point of the cooking food, as long as the main circuit switch is closed.

The main switch may be non-automatic or automatic, as shown in Fig. 1. The clock shown is an automatic time switch, which closes the circuit and starts the heating at any time set. Thus the food is prepared, put into the aluminum cooking vessels and the time switch adjusted. The housewife may then go about other duties or pleasures, leaving the cooker to start cooking automatically at the proper time and continue keeping the dishes thoroughly hot until it is desired to serve the meal, everything being then completely cooked and instantly ready. It is this decided time and labor saving, together with the wholesome and deliciously appetizing results of this method of cooking, that has appropriately suggested the name "Good Housekeeping Cooker" to this automatic electric device.

In operation the cooker has been found quite economical. Between the steam jacket and the outer shell, not shown in Fig. 2, there is a two-inch space filled with packed cork and mineral wool as heat insulation. The cork has been ground and roasted to remove volatile and odor-producing constituents. This thermal insulation has been found to hold 80 per cent of the electric heat generated for 14 hours. Current is used only intermittently; when the temperature has reached 250 degrees, the circuit is open eight to ten minutes; when the temperature has

Fig. 1.—"Good Housekeeping" Automatic Electric Cooker with Two Auxiliary Disk Plates for Quick Cooking.

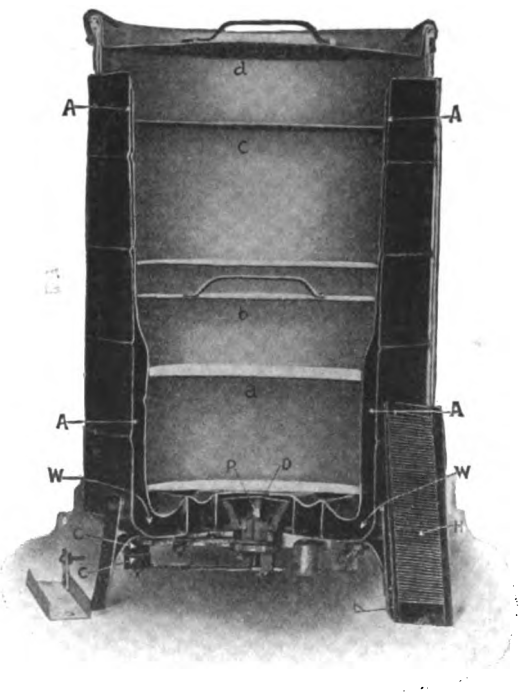


Fig. 2.—Sectional View of Interior Construction.

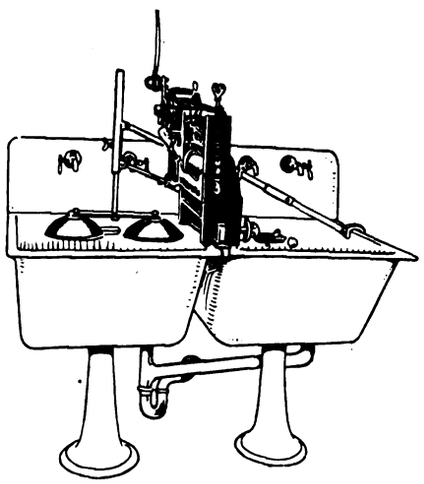
Digitized by Google

dropped to 220 degrees, the circuit is closed for two to three minutes, depending on the amount of food being cooked. The maximum consumption of the cooker proper is 550 watts.

Every part of the equipment is well constructed and the entire outfit is guaranteed for three years. The outside shell is of Wellsville polished steel with heavily nickel-plated trimmings. The double-walled steam jacket is made of copper electrically welded at all seams. The automatic-switch contacts are of carbon. Electrical parts are insulated with porcelain, mica and glass. Each cooker is tested at 1,000 volts for insulation. The complete outfit is neatly proportioned and finished, presenting an attractive appearance. Considering its many distinctive merits this cooker should find a place in every progressive household.

Electric Washer for Use in Stationary Tubs.

An electric washing machine, known as the Kelman or the stationary-tub electric washer and embodying many new and radically unique features, has been developed by the Kelman Electric & Manufacturing Company, Los Angeles, Cal., and is now being placed on the market. This machine washes, wrings, rinses, and blues in any stationary tub and eliminates all handling of water by the operator, since the regular plumbing fixture fills and empties the tub for her. Being mounted on the stationary tub, the machine is entirely out of the way, yet it is always ready for use, and avoids all getting ready and putting away of the equipment.



Electric Washer and Wringer for Stationary Tubs.

The well known vacuum principle of washing is utilized; the smooth vacuum cups wash clean clear through the fabric without injury thereto. It is said that anything from the most delicate and sheerest laces to rag-rugs, heavy bedding, or blankets can be washed without tearing or injuring the goods in any way.

The operation is extremely simple; one operating handle, by a slight movement one way or the other, governs the action of the wringer or washer. To reverse the wringer, the motor is reversed by means of an ingenious four-point attachment plug. This reversing it electrically instead of mechanically eliminates the complicated gearing otherwise required.

Safety of operation is provided for by inclosing the mechanism; by a safety pressure release on the wringer, whereby pressure can be instantly removed from the rolls; also by the four-point attachment plug, which may be quickly detached, stopping the washer or wringer immediately.

Long life and freedom from repair is insured by the simple and substantial construction. Worm and gear mechanism, running in ball bearings with ample provision for lubrication, reduces friction and wear to a minimum.

By loosening a thumb-screw, the motor may be removed for other purposes. Simple accessories facilitate its use as a sewing-machine motor, or to operate small grinding or buffing wheels, and save the cost of the additional motor usually required with such apparatus.

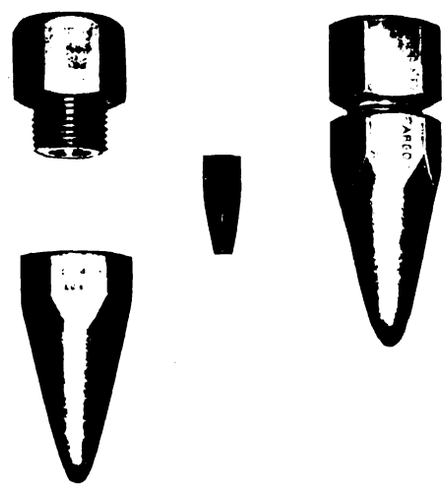


Fig. 1.—Fargo Ground Point, Type A, Unassembled and Complete.

Fargo Ground Points.

The great importance nowadays placed on grounding of transformer secondaries, neutrals, etc., is calling for more reliable means of connecting the ground wire to the grounding device. This matter has been given attention by the Fargo Manufacturing Company, Poughkeepsie, N. Y., which has brought out two types of ground points. Fig. 1 shows the three parts of this device unassembled and at the right the device complete. A cross-sectional view is shown in Fig. 2, which gives a good idea of the compression principle used in clamping the wire very securely.

This device, known as the type A, is made for different ground wires from No. 9 to No. 0 B. & S. gauge. The conical split wedging sleeve shown at the middle in Fig. 1 is placed inverted about the lower end of the ground wire

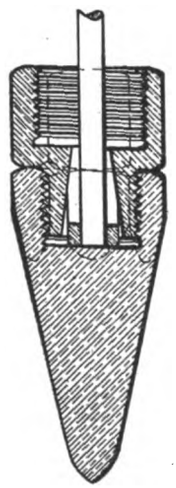


Fig. 2.—Section of Type A Ground Point.

and the latter then inserted into the socket of the ground point proper. The clamping nut shown in the upper left corner of Fig. 1 has its lower end conically tapering inside. When this is screwed over the split conical sleeve a powerful gripping connection is effected between the wire and ground point. The upper end of the nut is internally threaded for pipe to protect the ground wire. Pipes ranging from one-half to one inch are used for the different sizes of ground points. The entire device is made of tough metal and provides a durable, low-resistance ground connection.

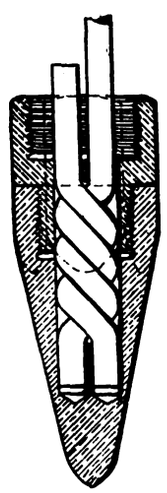


Fig. 3.—Section of Type B Ground Point.

Another form of the Fargo ground point, known as the type B, employs a different principle for making an effective connection. In external appearance it resembles the type A de-

Digitized by Google

vice shown complete at the right in Fig. 1. The internal arrangement is shown in the cross-sectional view, Fig. 3. In this case two wire ends are placed side by side and tightly twisted together. The twisted part is then put into the ground point with the two wire ends fitting into the two pockets provided for this purpose. On screwing down the nut a tight clamping connection is obtained. In other respects this ground point is like that illustrated in Figs. 1 and 2.

Electrostatic Potential and Synchronism Indicators.

Electrostatic vacuum glowers are now being used to indicate the presence of potential on high-voltage alternating-current circuits, and to determine when such circuits are in synchronism and may be thrown together.

For indicating potential, the two appliances shown in Figs. 1 and 2 have been developed by the General Electric Company. The first consists of an electrostatic glower, a metallic condenser hood, a switch for cutting the glower in and out of circuit, and a hook for suspending the indicator from the line and leading current to the glower. One terminal of the glower is connected to a spark gap and then to the lower end of the suspension hook; the other terminal is connected to the condenser hood. The loop in the suspension hook enables the indicator to be hung over the line by means of the ordinary type of switch hook used for operating disconnecting knife switches.

The indicator switch when closed provides a low-resistance path between the line and the hood, and cuts the glower out of circuit. When the switch is open, the glower is connected between the line and hood through the spark gap, and will light up if there is potential on the line at least equal to the tension between the line and ground on a three-phase system carrying 15,000 volts. This indicator is used for indoor and outdoor service and, as a rule, hangs on the line continually, but, of course, can be moved about as desired. Usually a grounded wire is connected to the switch string sufficiently close to the hood to be out of reach of the operator.

The second form of indicator, shown in Fig. 2, is essentially the same as just described, except that no switch is provided and the hood is attached to a long wood rod equipped with a ground cone for connecting a wire between the rod and ground. The upper terminus of the lead running down to the spark gap inside the hood is connected to another lead going to the top of the pole to a metal pin, which is held against the line to determine whether the line is alive. This indicator is, because of its easy portability, most suitable when the indication of potential may be desired on a number of lines.

In using an electrostatic indicator, one should always bear in mind the fact that, although the lighting of the glower gives a positive assurance of voltage on the line, the lack of glow does not by any means prove the line to be dead, because the bulb may be broken, the leads disengaged, the potential too low, etc.

The usual method of indicating when alternating-current lines or machines may be thrown together is by the use of a synchronism indicator and synchronizing lamps, or by either the indicator or lamps separately, employing also as a rule the potential transformers that are used in conjunction with the meters or instruments. This arrangement is entirely satisfactory; but when it is desired to connect systems together where transformers are not needed for indicating or measuring purposes, the equipment is comparatively expensive. The higher the voltage, the more does this apply.

The electrostatic synchronizer, made by the General Electric Company, and shown in Fig. 3, requires for operation only the charging current of the line. It consists of a few simple and inexpensive parts, and can be used to considerable advantage in main stations where current is metered on the low side, in switching stations, line-junction stations and some substations.

Three electrostatic glowers, mounted in a case, which resembles that used for a round-pattern switchboard instrument, are used for each synchronizer. The glowers are connected to the line through condensers consisting of suspension insulators, the insulating value of which is at least equal to that used for insulating the line.

To use the synchronizer, the terminals of one of the glowers are connected through the insulators to the leads of the same phase of running and incoming lines. The other glowers are each connected across dissimilar

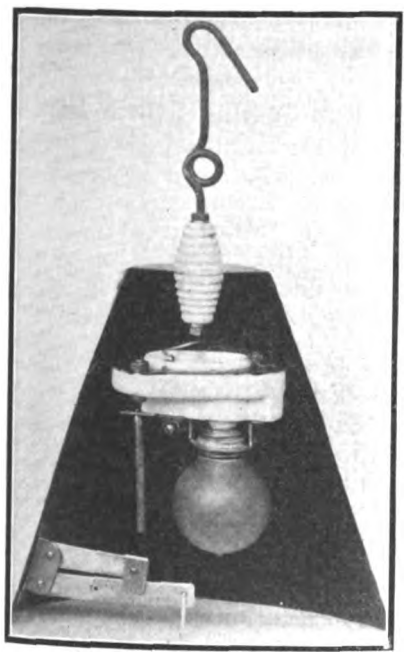


Fig. 1.—Electrostatic Potential Indicator.

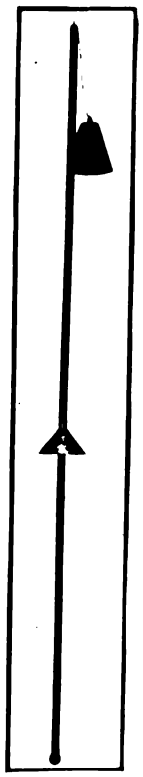


Fig. 2.

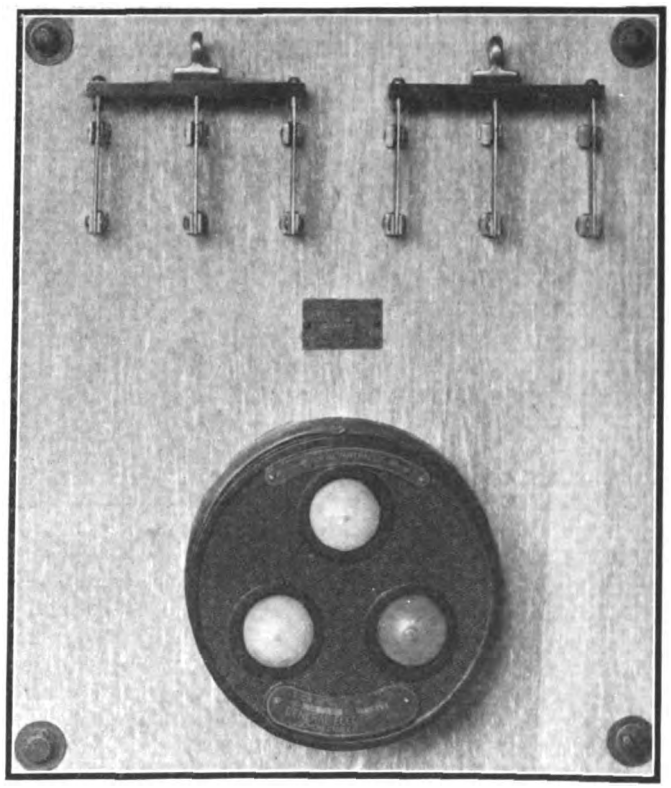


Fig. 3.—Electrostatic Synchronism Indicator.

Digitized by Google

phases of the remaining leads of the running and incoming lines.

When the lines are not in synchronism, the glowers will indicate the relative frequency of the lines in the same manner as the usual synchronizing lamps. When in synchronism, the rotating effect will disappear, the glower connected to the corresponding lines will be dark and the other two will show about one-half brilliancy. The minimum voltage for operation is 13,200, and the maximum depends only on the use of the proper number of insulators.

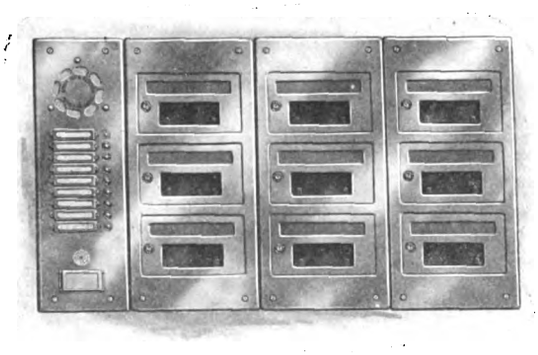
The synchronism indicator can be used as a ground detector by connecting one terminal of each glower to ground and the other terminals to the line. A lighted glower will indicate that the line is at potential above ground, that is, not grounded.

Cordless Vestibule Telephone Outfit for Apartment Buildings.

The Connecticut Telephone & Electric Company, Meriden, Conn., has just placed on the market a new vestibule telephone outfit. This is known as the cordless type. As will be noted from the accompanying illustration, this telephone has a concealed transmitter and receiver mounted behind perforated sound openings in the face plate.

To operate it, it is simply necessary to push the button and talk facing the vestibule telephone just as if in conversation with any party standing directly in front. The person talking from the suite can be heard for a long distance from the vestibule telephone, due to a specially constructed loud-talking receiver. There is nothing on the face plate except the card holders and buttons. Therefore there are no cords or receivers to be stolen, nor hooks to be broken. The perforated sound openings on the front of the plate are protected by a bugproof brass screen.

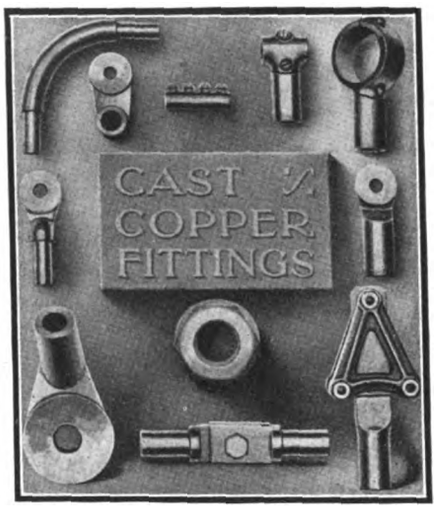
It is the opinion of the makers and of others who have seen it, that this outfit will revolutionize vestibule telephone sets. It is entirely new and nothing of its kind has been heretofore placed on the market. The outfit is compact and neat in appearance. The absence of the cord and hanging receiver eliminates trouble. Use of the new set, while very novel, is found less confusing and much more convenient than the use of most vestibule telephone sets. These outfits are made up for practically any size of apartment building and afford means for communicating with the janitor, as well as any suite.



Cordless Vestibule Telephone with Mail Boxes.

Copper Fittings for Heavy Cable Connections.

In wiring power houses, substations, power and lighting switchboards, heavy electrical machinery and all circuits, in fact, where large currents are carried by heavy cables or other conductors, great care is necessary in making connections between these conductors and the busbars or other terminals on the switchboards and machinery in order to insure abundant carrying capacity and the avoidance of losses at the connections. This is not only to insure efficiency in the wiring, but more important still, to secure reliability of contact. Improper connections mean high resistance and decided heating, which may result in melting of soldered cable lugs and opening of the circuit, if not more serious troubles.



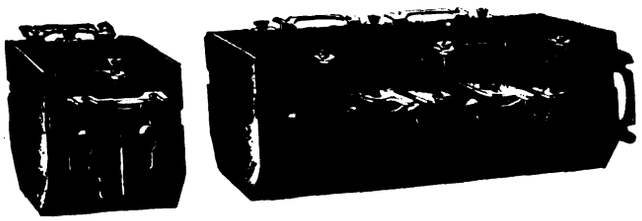
New Copper Fittings.

To insure proper connections requires a variety of high-grade copper fittings designed with regard to the varied requirements of busbar, cable and special-conductor connections under different conditions. This matter has been given careful consideration by the Electrical Engineers' Equipment Company, which has put on the market a complete line of high-conductivity cast-copper fittings, including a variety of plain and angle-type cable lugs, clamp-type terminals, laminated leaf and split-tee connectors, connecting sleeves, screw connectors, switch lugs, "shrink-fit" fittings, etc. All the fittings are designed to meet as far as possible standard requirements as to size and shape. Special fittings are made up quickly according to specifications.

The Electrical Engineers' Equipment Company, 711-15 Meridian Street, Chicago, Ill., has just issued bulletin No. 105, wherein these fittings are fully described. This bulletin is handsomely printed and the illustration herewith is a reproduction of the cover, which is printed in colors.

Wurdack Spacing Switch Boxes.

During the last few years much ingenuity has been shown by the manufacturers in developing switch boxes to meet the varied requirements of electrical construction. One of the most unique types of switch boxes, incorporating in its design several valuable ideas, has recently been placed on the market by the William Wurdack Electric Manufacturing Company, St. Louis, Mo. These boxes are made for loom construction and have the uniform depth of 2.25 inches. The distinctive feature about them is that each box is readily adaptable for a variety of purposes and can be easily assembled with other boxes into a gang of any number of units. The illustrations show the principal features. In order to adapt the single box for assembly into a gang, such as shown on the right, either or both sides of each box can be readily removed. In order to remove the side or sides, the box is held upside down and the bottom end of the side to be removed is struck at the point indicated on all boxes by the stamp "To Open—Hit Here." The units in the middle of the gang of three or more boxes have both sides removed and when placed side by side they are easily connected together.

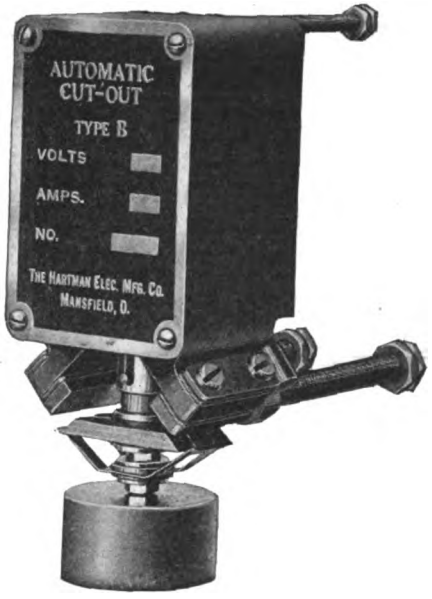


Single and Three-Gang Spacing Switch Boxes.

Digitized by Google

The ears are practically universal in adaptability and as shown in the illustrations can be used for four or more different conditions. For example, in the view of the single box the ear on the back of the box is shown raised, as would be necessary in old work. The ear on the front of the box is shown lowered as a short ear for new work. Likewise, in the view of the three-gang box the ears on the back are shown raised for old work. In this view the two middle ears at the front of the back are shown with their short sides used as bridging ears to gang the units together; this allows the long ears to project from the boxes for new work. At the right end of this cut one ear is shown turned at right angles as a side ear for end support.

The illustration of the gang box shows that by the removal of the intervening sides a continuous box with maximum room for alining of switches or wall receptacles is produced. No spacers are needed in ganging the boxes. To change the ears from one position to another requires but a moment's time. The use of these boxes eliminates the need of carrying a large stock of varied types of boxes on hand, since each box in stock can be readily adjusted to any other type as the condition may require. The boxes may be taken to the job without being previously specially ordered for particular conditions.



Automatic Lighting Switch.

Automatic Switch for Lighting Plants.

The Hartman Electrical Manufacturing Company, Mansfield, O., has brought out a new automatic switch for isolated lighting-plant switchboards, suitable for the largest systems now in use. The switch has a capacity of 100 amperes and is made for 32, 65 and 110-volt systems. This automatic switch, or cut-in and cut-out switch, as it is often called, renders unnecessary all hand manipulation of the switch on small plant boards. It automatically cuts in or connects the generator with line whenever the voltage is high enough to charge the battery and in the same way it automatically cuts out on reversal of current. In the construction of the contacts, a laminated brush is used for the main contact and this is protected by an auxiliary or arcing contact. These contacts are mounted directly on the moving core or armature and as long as the generator voltage exceeds the battery voltage they are held firmly in contact with the stationary blocks.

Adjustment for the exact cut-in and cut-out voltage is made by means of a weight attached to the lower end of the solenoid core, and this weight also serves to open the contacts with a quick break when the reverse flow takes place. The contact blocks are integral with the studs and the latter serve the double purpose of carrying the current and affording means of mounting the switch on the panel.

Large-Capacity Outdoor Substations for Industrial Service.

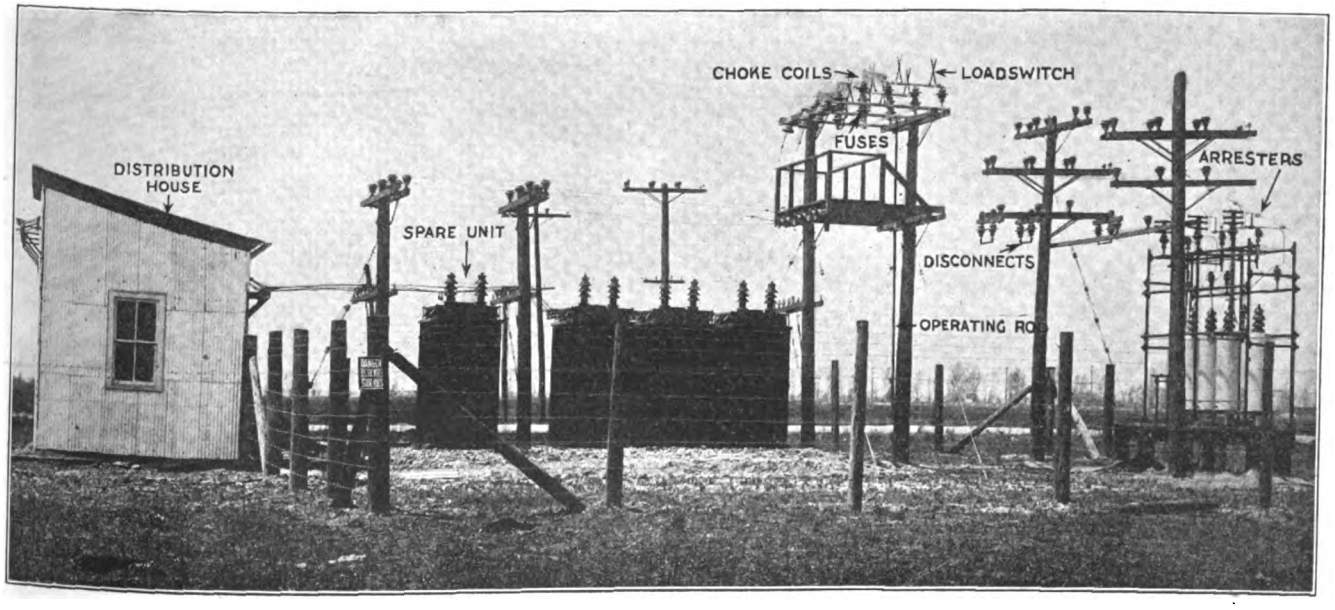
The increasing use of high-capacity outdoor-substation equipment is well illustrated by the installation shown herewith, which supplies industrial loads from a transmission feeder.

The transformers are of 500-kilovolt-ampere capacity each, stepping down from 33,000 to 2,300 volts, the secondary lines being run in the usual manner to various consumers. A spare transformer forms part of the installation and can be quickly connected.

High-tension control equipment consists of a standard three-pole air-break switch, three choke coils and three 15-ampere chemical fuses. The lightning-arrester installation is equipped with three single-pole underhung disconnects, by means of which the arresters can be cut out of service.

The secondary circuits are controlled by oil switches, mounted in the distribution house, from which the industrial lines are carried. By means of a permanently grounded operating handle the 33,000-volt air-break switch can be controlled, the fuses being easily reached from the platform, after the main switch is opened.

The air-break switch, choke coils, fuses and disconnects are of the standard form manufactured by the Delta-Star Electric Company, Chicago, Ill., the electrolytic arresters being of General Electric manufacture and the transformers of Westinghouse make.



Outdoor Substation, 33,000 Volts, 1,500 Kilovolt-Amperes, 60 Cycles.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—Columbia Metal Box Company, 226 East 144th Street, New York, N. Y.

Sheet metal cabinets for meters and meter protective devices.

Listed July 13, 1915.

CONDUIT OUTLET BUSHINGS.—The Sterling Foundry & Machine Company, 55 Hartford Street, Newark, N. J.

"Sterling" armored cable connector for use with standard outlet boxes with knockouts for one-half-inch conduit and consisting of a cast-iron sleeve with a thread and locknut for attaching to the box, and a clamping screw for securing the cable.

Listed July 6, 1915.

CONDUIT OUTLET PLATES.—The Sterling Foundry & Machine Company, 55 Hartford Street, Newark, N. J.

Cast-iron outlet plates for combination gas and electric and straight electric outlets.

Sterling "Bi-Plex" plates with clamps for armored cable.

Listed July 7, 1915.

FITTINGS FOR CONDUIT BOXES—COVERS.—Steel City Electric Company, 1207 Columbus Avenue, Pittsburgh, Pa.

Stamped steel conduit boxes with single metal-bushed hole for pendant of reinforced flexible cord.

Catalog Nos. AD, AF, BD, BF, CD, CF.

Listed May 24, 1915.

FIXTURES.—Harvey Deschere & Company, 1507 Garden Street, Hoboken, N. J.

Argus miniature electric sign. One or more sections, each comprising a base or tray and a number of interchangeable letters with miniature lamps and shunt resistances. An attachment plug, and either portable or armored cord are provided for connection to the lighting circuit. 125 volts.

Standard for indoor use only.

Listed July 10, 1915.

FUSELESS ATTACHMENT PLUGS.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Non-separable attachment plugs.

Arrow E.

660 watts, 250 volts, catalog No. 1948.

660 watts, 600 volts, catalog No. 345.

Listed July 10, 1915.

FUSES, Cartridge Inclosed.—Electric Fuseguard Company, Incorporated, 391 Mulberry Street, Newark, N. J.

"Fuseguard" cartridge inclosed fuses.

0-200 amperes, 250 volts; 0-100 amperes, 600 volts.

Listed July 10, 1915.

RECEPTACLES, Candelabra and Miniature.—The Arrow Electric Company, Hartford, Conn.

Arrow E, 75 watts, 125 volts.

Candelabra.

Sign, catalog No. 390.

Cleat, catalog No. 367.

Miniature, for decorative lighting systems, Christmas-tree lighting outfits and similar purposes. For indoor use only.

Sign, catalog No. 389.

Cleat, catalog No. 366.

Listed July 10, 1915.

RECEPTACLES, Standard.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Metal-shell receptacles, Arrow E.

Key, 250 watts, 250 volts, catalog Nos. 8058, 50717-18, 60430.

Key, 660 watts, 250 volts, catalog Nos. 8058W, 60430W.

Keyless, 660 watts, 250 volts, catalog Nos. 8059, 60431.

Pull, 250 watts, 250 volts, catalog Nos. 156, 8514-20-21. For use on metal ceilings, catalog No. 108.

Also all of above types with shadeholders attached, key types with composition or insulated metal key, pull types with extension attachment, medium types with "Arrolock" attachment.

Listed July 10, 1915.

RECEPTACLES, Standard.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Benjamin, keyless, porcelain-shell.

660 watts, 250 volts.

Conduit box, catalog Nos. 1402-03, 1405-06, 1410-11.

Listed July 6, 1915.

RECEPTACLES, Weatherproof.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E.

660 watts, 600 volts, for use with incandescent lamps in series on 600-volt circuits, catalog Nos. 4003, 9301-6, inclusive, 9407-08-11, 44912, 61577-8.

Listed July 12, 1915.

ROSETTES, Fuseless. — Harvey Hubbell, Incorporated, Bridgeport, Conn.

Hubbell, 3 amperes, 125 volts, 1 ampere, 250 volts.

Ceiling pull-switch rosettes.

Concealed, catalog No. 6018.

Molding, catalog No. 6017.

Conduit box, catalog Nos. 6019 and 6035.

Listed July 7, 1915.

SIGNS, Electric.—P. J. Martin, Incorporated, 302 West Fifty-third Street, New York, N. Y.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed July 2, 1915.

SOCKETS, Candelabra and Miniature.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E, 75 watts, 125 volts.

Candelabra.

Keyless, brass-shell, catalog No. 321. Porcelain, catalog No. 323.

Pull, brass-shell, catalog No. 386.

Miniature.

Keyless, brass-shell, catalog No. 320. Porcelain, catalog No. 322. For candle fixtures, catalog Nos. 327, 346.

Pull, brass-shell, catalog No. 385.

Listed July 12, 1915.

SOCKETS, Standard.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E brass-shell electrolier sockets.

Key, 250 watts, 250 volts, catalog No. 7076.

Keyless, 660 watts, 250 volts, catalog Nos. 7077, 7078.

Pull, 250 watts, 250 volts, catalog No. 7079.

Also all of above types with shadeholders attached, key types with composition or insulated metal key, pull types with extension attachment, medium types with "Arrolock" attachment.

Standard for fixture use only.

Listed July 12, 1915.

SOCKETS, Standard.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Benjamin brass-shell.

Pull, 660 watts, 250 volts, catalog Nos. 4207-08.

Listed July 9, 1915.

SOCKETS, Standard.—W. R. Ostrander & Company, 22 Dey Street, New York, N. Y.

Metal-shell, Ostrander.

Key, 250 watts, 250 volts, catalog Nos. 9000-9004, inclusive.

Also above types with shadeholders attached.

Listed July 6, 1915.

SOCKETS, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. brass-shell sockets.

Key, 250 watts, 250 volts, catalog Nos. 474, 543, 546, 549, 550, 572, 800-804 inclusive, 824-827 inclusive, 7503.

Key, 660 watts, 250 volts, catalog Nos. 600, 606, 612, 614, 616, 624, 626, 628, 650-653 inclusive.

Keyless, 660 watts, 250 volts, catalog Nos. 544, 547, 551, 552 and 574.

Pull, 250 watts, 250 volts, catalog Nos. 507, 545, 548, 553 and 554.

Digitized by Google

Also above types with shadeholders attached; key types with composition or insulated metal key, pull sockets with extension chain guide or insulating link in chain. Also above types with Shurlok attachment.

P. & S. brass-shell electrolier sockets.

Key, 250 watts, 250 volts, catalog Nos. 446, 494, 495, 496, 508, 512, 555, 560, 564 and 568.

Keyless, 660 watts, 250 volts, catalog Nos. 491, 492, 498, 500, 509, 513, 514, 556, 557, 561, 562, 565, 566, 569, 570, and 575.

Pull, 250 watts, 250 volts, catalog Nos. 499, 510, 515, 559, 563, 567, and 571.

Listed July 8, 1915.

SOCKETS, Weatherproof.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Bracket sockets, including improved type, with two-piece metal shell and two-piece porcelain base. Benco, 660 watts, 600 volts, catalog Nos. 4204, 4205.

Also above types with lamp grip.

Standard for use with incandescent lamps in series on 600-volt circuits.

Listed July 9, 1915.

SWITCHES, Automatic.—E. Rebischung, 79 Wyona Street, Brooklyn, N. Y.

An automatic switch for the control of motors used for tolling large bells. Consisting of an inclosed double-pole carbon-break switch, opened and closed by cams on bell shaft after bell has been set in motion by closing of a main switch in motor circuit; rating 5 amperes, 250 volts.

Standard only when installed as part of special equipment for electrically tolling bells as furnished by this manufacturer.

Listed July 7, 1915.

SWITCHES, Automatic. — Venner Time Switches, Limited, 6 Old Queen Street, Westminster, London, S. W., England.

Mercury-contact switches for control of lighting circuits. Clock mechanisms and special switchgears inclosed in cast-iron cases.

25 amperes, 250 volts. Types C, C-4, C-6, CB, CB-4, CBDC, CDC, C4DC, D6DC.

50 amperes, 250 volts. Type C-50-A.

15 and 5 amperes, 250 volts. Types D, E, DB, DE (two circuits "arc" and "glow").

Listed July 2, 1915.

SWITCHES, Automatic.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Remote-control switches, relays and contactors, 1-1250 amperes, 100-600 volts.

Type C, series, shunt and combined series and shunt switches.

Relays, types KC, KA, KF, KS, KT.

Standard for use as parts of control panels, assembled by the manufacturer.

Listed July 7, 1915.

SWITCHES, Automatic. — Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Master switches for industrial control.

Drum type, cam type, mill type, pressure-gauge type, hatchway limit type, geared limit type, motor-operated type, push-button type.

Listed July 8, 1915.

SWITCHES, Push-Button Flush.—The Bryant Electric Company, Bridgeport, Conn.

Byrant or Perkins.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2625, 2626, 2628-2630, inclusive.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog No. 2627.

Two-speed fan-motor switch, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog No. 2631.

Three-speed fan-motor switch, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog No. 2632.

Listed July 2, 1915.

SWITCHES, Push-Button Flush.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Remote-control switch, catalog No. 2883, 10 amperes, 125 volts, 5 amperes, 250 volts.

Listed July 2, 1915.

SWITCHES, Surface Snap.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts. Type O for suction sweeper mounting.

Listed June 22, 1915.

SWITCHES, Surface Snap.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Three-way, 1 ampere, 250 volts, 3 amperes, 125 volts, catalog Nos. 2152, 2153.

3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2089-2090, 2298-2299, 2545, 2633, 2634.

5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 23, 123, 2209-2210, 2359, 2360.

20 amperes, 250 volts, catalog Nos. 3007, 3008.

1 ampere, 250 volts, catalog Nos. 23½, 123½.

5 amperes, 600 volts, catalog Nos. 53½, 153½, 2425, 2426.

10 amperes, 600 volts, catalog Nos. 2172, 2173, 2515, 2516, 2517-20 inclusive.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 24, 124, 2234, 2235.

5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2959, 2960.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 29, 129, 229, 329, 429, 529, 629, 729, 2236-39 inclusive, 2246-49 inclusive, 2062-05 inclusive, 2607-10 inclusive, 2611-14 inclusive, 2661-64 inclusive, 2673-76 inclusive, 2721-24 inclusive, 2731-38 inclusive, 2739-42 inclusive, 2743-46 inclusive, 3071, 3072, 3077, 3078, 3101, 3102.

5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2505-08 inclusive, 2591, 2594-97 inclusive, 2598-2600 inclusive, 2669-72 inclusive.

10 amperes, 250 volts, 15 amperes, 125 volts, catalog Nos. 2482-85 inclusive, 2486-89 inclusive, 2496-99 inclusive.

10 amperes, 250 volts, catalog Nos. 2621-24 inclusive, 3025-28 inclusive.

20 amperes, 250 volts, catalog Nos. 3051-3052.

3 amperes, 600 volts, catalog Nos. 27, 127, 227, 327.

5 amperes, 600 volts, catalog Nos. 57, 157, 257, 357, 2427-30 inclusive.

10 amperes, 600 volts, catalog Nos. 2174-77 inclusive, 2521-24 inclusive.

20 amperes, 600 volts, catalog Nos. 47, 147, 247, 347.

Also above types with lock attachment and with metal or porcelain covers.

Listed June 22, 1915.

SWITCHES, Surface Snap.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 25, 125, 225, 325, 2240-43 inclusive, 2615-18 inclusive, 2747-50 inclusive.

2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2501-04 inclusive, 2725-28 inclusive.

Series, multiple and series-multiple.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2578, 2592, 3019, 3020.

2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2305 and 2720.

10 amperes, 250 volts, catalog Nos. 2813, 2814, 2981, 2982.

20 amperes, 250 volts, catalog Nos. 2199, 2200.

10 amperes, 600 volts, catalog Nos. 2193-96 inclusive.

15 amperes, 600 volts, catalog Nos. 799, 800.

35 amperes, 600 volts, catalog No. 162.

Double-pole, 10 amperes, 250 volts, catalog Nos. 2160, 2860, 2861.

20 amperes, 250 volts, catalog Nos. 160, 2761-63 inclusive.

35 amperes, 250 volts, catalog Nos. 2582, 2587, 2764, 2765.

Also above types with lock attachment and with metal or porcelain covers.

Listed June 23, 1915.

SWITCHES, Surface Snap.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Single-pole, catalog Nos. 20, 21, 50½, 120, 121, 150½, 220, 221, 241½, 250½, 320, 321, 341½, 350½, 441½, 541½, 2148, 2161-67 inclusive, 2199-2200, 2205, 2206, 2231, 2232, 2291, 2292, 2305, 2308, 2309, 2351-54 inclusive, 2391, 2392, 2421-24 inclusive, 2511-14 inclusive, 2541, 2542, 2578, 2592, 2625-28 inclusive, 2654, 2684, 2720, 2813, 2814, 2981-86 inclusive, 3019, 3020, 3149, 3150.

Double-pole, catalog Nos. 22, 32, 42, 122, 132, 142, 160, 222, 322, 432, 442, 532, 542, 2074, 2085-88 inclusive, 2160, 2168-71 inclusive, 2207, 2208, 2219, 2244, 2245, 2296, 2297, 2306, 2321, 2355-58 inclusive, 2396, 2397, 2517-20 inclusive, 2543, 2544, 2582, 2587, 2621-24 inclusive, 2629-32 inclusive, 2761-65 inclusive, 2857, 2860, 2861, 2955, 2956, 2958, 3015-18 inclusive, 3025-28 inclusive, 3048, 3064, 3065.

Triple-pole, catalog Nos. 26, 126, 226, 326, 2655-58 inclusive.

Three-way, catalog Nos. 23, 123, 2089, 2090, 2152, 2153, 2209, 2210, 2298, 2299, 2359, 2360, 2398, 2545, 2633, 2634.

Four-way, catalog Nos. 24, 124, 2234, 2235, 2959, 2960.

Two-circuit, catalog Nos. 29, 57, 129, 157, 229, 257, 329, 357, 429, 529, 629, 729, 2236-39 inclusive 2246-49 inclusive, 2427-30 inclusive, 2482-89 inclusive, 2496-99 inclusive, 2505-08 inclusive, 2591, 2594-2600 inclusive, 2602-05 inclusive, 2607-14 inclusive, 2661-64 inclusive, 2669-76 inclusive, 2721-24 inclusive, 2731-46 inclusive, 3071, 3072, 3077, 3078, 3101, 3102.

Three-circuit, catalog Nos. 25, 125, 225, 325, 2240-43 inclusive, 2501-04 inclusive, 2615-18 inclusive, 2725-28 inclusive, 2747-50 inclusive.

Also above types with lock attachment, with or without indicating dials, and with metal or porcelain covers.

Listed June 25, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

WESTFIELD, MASS.—This town has voted to expend $25,000 for improvements on its municipal light plant; $11,500 will be used for overhead cables and extensions and $3,500 for cables for the Elm Street conduit.

FREDONIA, N. Y.—A new system of electric lighting is proposed. Address town clerk.

HORNELL, N. Y.—A proposition will be voted on by the citizens of Canisteo to secure electrical energy from the Hornell Electric Company.

LESTERSHIRE, N. Y.—The power plant operated by Endicott, Johnson & Company will be doubled in capacity by the equipment of a 2,000-kilowatt steam turbine and auxiliary apparatus.

NORTH CENTRAL STATES.

AKRON, O.—The Firestone Tire and Rubber Company will install equipment to furnish its own electric lights and power.

CINCINNATI, O.—An ice plant, with a capacity of 75 tons a day and costing $75,000, is to be built in Price Hill, a suburb, by the City Ice Delivery Company. Plans and specifications are being prepared by Bernard Wisenall, architect, of Cincinnati. Estimates will be called for in a short time. L.

CISSNA PARK, ILL.—Money is being raised to install cluster lights. Address town clerk.

POPLAR GROVE, ILL.—The electric plant and grist mill owned by Warrent M. Webster burned. Loss $10,000.

GRAND RAPIDS, MICH.—The Division Center Improvement Association, which is raising $12,000 toward the cost of boulevard lighting from Wealthy Street to Hall Street, has decided, if the city authorities give consent, to install the solid iron post, one-light system. Address city clerk.

STEPHENSON, MICH.—The sum of $5,000 in bonds has been voted to install a light and power plant. Address town clerk.

ELLENDALE, MINN.—Ways and means are being discussed for an electric light plant. Address town clerk.

FAIRMONT, MINN.—The Water and Light Commission plans to purchase about 100 lamp standards for ornamental lights. Address Alfred Horne, superintendent.

HARDWICK, MINN.—The sum of $5,000 in bonds has been voted for remodeling the village power plant. Address town clerk.

MANKATO, MINN.—The Consumers Power Company is negotiating a contract to furnish light and power to the city of St. James.

COLUMBUS JUNCTION, IOWA.—It has been planned to install an ornamental lighting system of about 20 posts of three and five lights. Address W. H. Jennings.

NORTH ENGLISH, IOWA.—The Iowa Electric Company has been granted a franchise in North English. The transmission line will be extended from Williamsburg to Parnell. The line is to be completed within 90 days from the acceptance of the franchise of the company.

RIVERTON, IOWA.—The electric light franchise proposition was carried. The Hamburg Electric Light Company has started the construction of a transmission line, and it is believed the lights will be in use here by fall.

WHITE EARTH, N. D.—The council is planning ways and means to establish a municipal light plant. Address mayor.

NETAWAKA, KANS.—$10,000 will be expended for municipal lighting. Address city clerk.

SOUTH CENTRAL STATES.

HAZARD, KY.—Plans are now being perfected for a very extensive central electric plant in this city, which will furnish power to all the mines in this district. Address J. A. Roan.

PARIS, KY.—Electric elevators and other equipment will be installed in a big tobacco handling plant which is to be erected by Lexington and Paris business men. A site has been purchased from J. T. Flora, J. H. Stivers and J. W. Bacon.

CHATTANOOGA, TENN.—The Public Light and Power Company is the name chosen by the Adams interests for the merged Tennessee Valley Light and Power Company, the Dayton, Tenn., Light and Power Company and several other similar corporations in lower east and middle Tennessee towns. The properties are operated by J. W. and G. B. Adams and associates, and the various circuits at Bridgeport, South Pittsburgh, Shelbyville, Dayton and Rockwood are supplied by local steam plants, as well as by connections with the hydroelectric plants at Hale's Bar and Ocoee. Headquarters of the Public Light and Power Company are at 809 Georgia Avenue, Chattanooga.

JELLICO, TENN.—The town is considering a project for the construction of a municipal electric plant at a cost of $25,000, for street and commercial lighting, and a white-way system, with 100 standards, to carry from two to four lamps, at an estimated cost of $10,000. F. C. Moore is chairman of the committee which has the plans in hand.

DALLAS, TEX.—The commissioners' court will purchase a 200-kilowatt engine and generator as additional equipment for the county power plant.

HOLLAND, TEX.—The City Council has entered into a contract with the Texas Power and Light Company, of Dallas, for the construction of an electric lighting system here. D.

WESTERN STATES.

ANACONDA, MONT.—Resolutions for creating Improvement Districts No. 66 and 69, for ornamental street lighting systems, costing, respectively, $39,000 and $4,000, have been passed by City Council. O.

BOZEMAN, MONT.—Special Improvement District No. 100, for installation of lighting system on Main Street, between Ida and Fourth Avenues, has passed City Council. O.

DEER LODGE, MONT.—Plans for the division of the city into 11 improvement districts, to install and operate a system of electric lights in the residence portion, are being considered by the City Council. The arrangement will be similar to the one now in use on the business streets of the city. O.

POLSON, MONT.—The installation of a modern electric lighting system is in contemplation by the City Council. At a recent election the voters authorized bonds to cover construction. O.

ROUNDUP, MONT.—Resolution for creating Special Improvement District No. 12, covering a system of ornamental street lighting estimated to cost $13,000, has passed the City Council. P. A. Appleman, city clerk. O.

PROVO, UTAH.—The city engineer has been instructed to prepare plans for the new electric power and light plant for Provo.

MISSION CITY, B. C.—The Board of Trade is negotiating with the Provincial Government looking toward the installation of a municipally owned and operated street lighting system. Recently, a committee consisting of A. M. Vechere, A. A. Lane and A. Stevens was appointed to confer with the Government regarding the installation, and it is thought it will be but a short time before the installation will be made.

REPUBLIC, WASH.—The Ferry County Commissioners, W. V. O'Connell, Auditor, have been petitioned for franchises for furnishing light and power and for constructing power transmission lines in Ferry County. Address both F. R. Clark and George S. Bailey. O.

VASHON, WASH.—The Vashon-Maury Light and Power Company, G. A. Collins, L. C. Smith Building, Seattle, president, recently announced that extensions of transmission lines would be made between Dockton and the west side of the Islands in the immediate future; also that current would be ready for delivery to customers between Glen Acres and Burton about September first. This company, to date, has expended about $30,000 in developing a power plant and extending its lines on Vashon and Maury Islands. O.

ASHLAND, ORE.—Negotiations for the purchase by the city of the plant and distributing system operated in Ashland by the California-Oregon Elec-

Digitized by Google

tric Light and Power Company, have been entered into. The city has operated a municipal plant for several years, which has been extremely successful, but which is not large enough at present to supply the city's needs. The proposed deal contains arrangements for rescinding the company's franchise and terminating the suit.

GRANTS PASS, ORE.—At a recent election a franchise was granted the Rouge River Public Service Corporation for the installation of an electric light and power system within the city, service to be guaranteed within nine months.

MERCED, CAL.—The council is planning municipal ownership of the electric plant. Address City Attorney Henderson.

PASADENA, CAL.—An election will be called this month to pass on a plan of ornamental street lighting to cover about 18 miles of streets.

QUINCY, CAL.—The Board of Supervisors has granted the Great Western Power Company permission to proceed with the construction of a pole line from Big Meadows to the Engels copper mine in Lights Canyon, a distance of 35 miles.

SAN BERNARDINO, CAL.—Property owners on Third Street have petitioned the City Council for the installation of an ornamental lighting system on that street.

PROPOSALS.

EQUIPMENT. — The State Board of Insanity will receive bids for electric work in the construction of a brick dormitory, a wooden building for employees and a farmer's cottage at Wrentham, Mass. Plans on file at Kendall, Taylor & Company, architects, Boston, and bids must be delivered at the office of the Board, State House, Boston, before August 10, 12 o'clock noon.

NAVY ELECTRICAL SUPPLIES.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 16, 1915, for furnishing the following materials. Firms interested therein should make application to the Bureau of Supplies and Accounts, giving the schedule numbers desired: Schedule 8625, interior communication cable, bell wire, double-conductor wire, single-conductor wire, twin-conductor wire. Bids will be opened on September 7, 1915, for the following materials: Schedule 8615, subway-type fuse boxes, one and three-conductor cable, duct fiber, integrating watt-hour meter, subway-type transformer.

LIGHTING FIXTURE.—Sealed bids will be received at the supervising architect's office, Treasury Department, Washington, D. C., until August 18, for furnishing and installing lighting fixtures in the United States postoffice at Berkeley, Cal., and the United States postoffice at Denver, Colo., in accordance with drawings and specifications, copies of which may be had at the office of the supervising architect.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until September 10, for interior lighting fixtures for the United States postoffice at Gouverneur, N. Y. Drawings and specifications may be obtained from the custodian of site at Gouverneur, N. Y., or at the office of the supervising architect.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 17,593. INSULATING MATERIAL.—The Bureau of Foreign and Domestic Commerce is in receipt of a letter from a merchant in Spain stating that he desires to receive offers for rubber sleeves for covering copper wire similar to the sample which may be examined at the Bureau or its branch offices.

NO. 17,646. GLASS BULBS AND BRASS CAPS.—An American consular officer in England writes that an electrical supply dealer in his district is desirous of purchasing glass bulbs for incandescent lamps, complete with chemical filling. A sample of the brass cap, together with designs of the bulbs, may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

NEW INCORPORATIONS.

NEW YORK, N. Y.—Hartwick Seminary Lighting Company. Inc. Electric lighting business. Capital, $2,000. Incorporators: J. G. Travers, Lee Kinne and Henry C. Swartout, Hartwick Seminary, N. Y.

AUSTIN, TEX.—Mission Ice, Light and Water Company, Mission. Capital $20,000. Incorporators J. A. Sadler, J. L. Jones, J. P. McEvoy.

NEW YORK, N. Y.—City Electric Service Company, Inc. Electrical supplies, etc. Capital, $1,000. Incorporators: Charles Hirsch, Lee Goldsmith and Samuel E. Bleyer, New York City.

LOCKHART, TEX.—The Citizens' Water Works, Electric Light and Ice Company has been organized here with a capital stock of $100,000. It will build an electric light and power plant. E. B. Coopwood is interested. D.

NEW YORK, N. Y.—New York Switch and Panel-Board Company, Inc. Electrical goods. Capital, $25,000. Incorporators: J. Walter Smith, Fred'k Weierman, New York City, and J. F. P. Young, Maspeth, L. I.

NEW YORK, N. Y.—Robert E. Denike, Inc. Electrical contractors, etc. Capital, $5,000. Incorporators: Robert E. Denike, Summit, N. J.; Charles A. Francke, Yonkers, N. Y.; Henry R. Herke, Bronx, N. Y.

NEW YORK, N. Y.—United States Cutting Machine Sales Company, Inc. Manufacturer electric cloth-cutting machines, etc. Capital, $10,000. Incorporators: Morris I. Garshelis, Bronx, N. Y.; Samuel Philips, Bronx, N. Y., Nicholas Komow, Brooklyn, N. Y.

FINANCIAL NOTES.

The reorganization plan of the Kansas City Railway & Light Company provides for a new company for the railway system and a new company for the lighting. The old funded securities are to get par in new issues and will, in a great measure, maintain their status. There will be issued $1,000,000 first 5s, due 1944, on the railway, and a similar amount on the lighting company. The money from these issues is to provide for immediate needs. There are other issues provided in Judge Hook's plan, but the details will not be announced at present, but will have to wait approval of New York interests.

Marconi's Wireless Telegraph Company, Limited, made a net profit of $1,163,582 during 1914, an increase of $551,960, but this is without reckoning anything in respect of services rendered to the British government during the war. The government has had the use of the company's high-power stations, but as the basis of remuneration is not yet settled, whatever income may accrue from that source will benefit later balance sheets. Owing to dislocation of affairs and the deferring of business of importance which was at point of fruition, as well as the abandonment of promising negotiations with foreign governments, and the postponing of the direct public telegraph services between England and the United States and Spain, only ten per cent dividend is to be paid on the ordinary shares, and only seven per cent on the preferred shares. These are big decreases compared with the distributions in the previous year, notwithstanding the above increase is net profit. A conservative policy has been adopted, a further $500,000 being put to reserve, bringing it up to $4,837,650, and $347,485 is being carried forward to 1915.

The French Company (Compagnie Française Maritime et Coloniale de Telegraphie sans Fil) has paid ten per cent on its ordinary shares for 1914, and 31.25 francs per share on its founders' shares.

The Russian companv (Société Russe de Télégraphes et Téléphones sans Fil) has made satisfactory progress, paying 15 per cent dividend for 1914, as compared with only six per cent for 1913.

Dividends.

	Term.	Rate.	Payable.
Chicago Rys.	S	4 %	Sept. 1
Mobile Elec. pf.	Q	1.75%	Aug. 15
Nev.-Cal. Elec. pf.	S	2 %	Aug. 10
J. G. White, Inc., pf.	Q	1.5 %	Sept. 1
J. G. White Eng., pf.	Q	1.75%	Sept. 1
J. G. White Mtg., pf.	Q	1.75%	Sept. 1

Reports of Earnings.

COLUMBUS RAILWAY, POWER & LIGHT.

	1915	1914
June gross	$ 244,059	$ 249,684
Net	93,809	79,733
Surplus	54,468	40,786
Twelve months' gross	3,059,929	3,056,760
Net	1,233,286	1,083,451
Surplus	764,917	597,200

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 2.	July 26.
American Tel. and Tel. (New York)	121½	121½
Commonwealth Edison (Chicago)	134½	132½
Edison Electric Illuminating (Boston)	235	234
Electric Storage Battery common (Philadelphia)	53	52
Electric Storage Battery preferred (Philadelphia)	53	52
General Electric (New York)	171¼	175⅛
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	5	5
Massachusetts Electric Preferred (Boston)	34	33
National Carbon common (Chicago)	134	135
National Carbon preferred (Chicago)	120	—
New England Telephone (Boston)	131	131
Philadelphia Electric (Philadelphia)	23¼	23⅝
Postal Telegraph and Cables common (New York)	74	75½
Postal Telegraph and Cables preferred (New York)	65	64
Western Union (New York)	68½	68
Westinghouse common (New York)	101¼	106⅜
Westinghouse preferred (New York)	130	122

Digitized by Google

MONTANA POWER.

The report of the Montana Power Company for the quarter and six months ended June 30, 1915, compares as follows:

Quarter ended June 30:

	1915	1914
Gross earnings	$ 976,432	$ 965,693
Net after taxes	693,148	687,839
Surplus after charges	399,662	405,211

Six months ended June 30:

	1915	1914
Gross earnings	$1,910,207	$1,923,785
Net after taxes	1,345,195	1,365,644
Surplus after charges	789,278	817,364

PERSONAL MENTION.

MR. C. C. CURTIS, Houghton, Mich., has been appointed lighting superintendent of the El Paso Electric Railway Company, El Paso, Tex. He succeeds L. W. Pritchett, who will go to California for the benefit of his health.

MR. WILLIAM LINCOLN SMITH, secretary of the National Association of Electrical Inspectors, is spending the summer at his bungalow on the Penobscot River, Maine. Mr. Smith reports landing a 14-pound salmon upon a recent expedition with rod and fly.

MR. THOMAS L. BARNES, for the past three years eastern sales manager of the insulated wire department of B. F. Goodrich Company, Akron, O., has been made sales manager of the insulated wire department with headquarters in Akron, succeeding Mr. R. K. Sheppard.

DR. A. S. McALLISTER has resigned as editor of the *Electrical World*, of New York. Dr. McAllister received his preliminary education in the public schools of Covington, Va., and received his degrees of B.S. and E.E. from Pennsylvania State College. His early business career was in connection with the Covington Machine Company, the Berwind-White Coal Company and in the factory of the Westinghouse Electric & Manufacturing Company. He received the degree of M.M.E. after a postgraduate course at Cornell University, and later on the degree of Ph.D. During 1901 to 1904 he was assistant and instructor in physics and applied electricity at Cornell, and was acting assistant professor of electrical engineering there in 1904. He became associate editor of the *Electrical World* in 1905, and since 1912 was editor of that publication. Dr. McAllister has contributed many noteworthy articles and treatises to contemporary scientific literature, and has secured patents for a number of electrical inventions. He is the author of "Alternating Current Motors" and of chapters on "Transformers" and "Motors" in the Standard Handbook for Electrical Engineers. He is a member of the American Association for the Advancement of Science, American Electrochemical Society, National Electric Light Association, the New York Electrical Society, a Fellow and Manager of the American Institute of Electrical Engineers, a member of the Society for the Promotion of Engineering Education and is president of the Illuminating Engineering Society, 1914-1915. He is a member of many social and fraternal organizations.

A. S. McAllister.

OBITUARY.

MR. JORDAN LAWRENCE MOTT, president of the J. L. Mott Iron Works, New York, N. Y., died at the age of 85 years, on July 27.

MR. GEORGE RIPLEY STETSON, for many years president of the New Bedford Gas and Edison Light Company, New Bedford, Mass., died at his home in that city July 26, at the age of 78. He was a native of Brooklyn, N. Y., and early learned the machinist's trade. He entered the employ of a rifle manufacturer and was sent to Brazil to set up an arms factory for that government. Coming to New Bedford in 1873 he became superintendent of a machine company, and in 1890 resigned that position to become the head of the lighting corporation. He was president of the New Bedford Co-operative Bank from 1891 until his death, and held various public offices in his city. He was president of the Republican city committee and of the Board of Trade several years. Mr. Stetson was a member of the National Electric Light Association and of several engineering societies, and had traveled in Europe in connection with attendance on conventions. He was a member of the Knights Templars. The widow and four children, one of whom is the wife of Mr. David W. Beaman, of the lighting company, survive.

With the Electrical Manufacturers

The Davis Slate and Manufacturing Company, manufacturers of electrical slate, Chicago, Ill., announces the appointment of R. W. Ten Broeck as manager of its Detroit branch.

The King Foundry Company, St. Joseph, Mo., has prepared an illustrated poster for the trade which advantageously displays its line of new standards for ornamental street lighting.

The Ohio Brass Company, Mansfield, O., has sent out folders calling attention to the peculiar merits of O-B extruded trolley ears. These are made for various conditions.

J. H. Parker, Incorporated, Parkersburg, W. Va., manufacturer of electrical insulations, has opened a Pacific Coast branch office in the Rapp Building, 121 Second Street, San Francisco, Cal. H. S. Perkins is in charge of this branch and will look after the porcelain interests of the firm on the Coast.

Connecticut Telephone & Electric Company, Meriden, Conn., has issued bulletin No. 50. This deals with apartment-house telephone systems, particularly those for use between the building entrance and the various apartments. These are made both common-talking and non-interfering. One of the most unique of these sets is the new cordless outfit.

The Robbins & Myers Company, Springfield, O., has secured the contract for supplying 101 electric fans for the new United States Post Office building at New Orleans, La. Of this batch, 82 fans will be 16-inch oscillating fans and 19 will be ceiling fans; all are to operate at 110 volts direct current. The contract was secured through S. J. Stewart, local agent for the company.

The Electric Cable Company, New York City, has established an office in the Peoples' Gas Building, Chicago, Ill., under the management of James W. White, who for a number of years has been connected with the Union Switch & Signal Company as special representative and assistant to the vice-president in charge of sales. James M. Brown, formerly with the Lorain Steel Company, and Cyrus R. King, formerly with the Pittsburgh Steel Products Company, have also been assigned to the Chicago office.

McFell Signal Company, Halsted and Twenty-ninth Streets, Chicago, Ill., has issued some new publications on its signaling systems. One of these describes two of the McFell fire-alarm systems and the combination fire-alarm and watchman service. Circuit diagrams and parts of the equipment are shown. All these systems are continually under test for circuit trouble. Another pamphlet describes McFell special signal systems. Of these the direct signal call is a code system to summon an executive officer from any department of a large office, factory or institution. The detective call is a system for department stores, etc., to direct a detective to some particular part of the store in an inconspicuous way. The registry call permits an executive to register his progress about an establishment. The registry clock system keeps a record of all calls in hospitals, institutions, etc.

Digitized by Google

DATES AHEAD.

American Institute of Chemical Engineers. Seventh semi-annual meeting, Los Angeles, Cal., August 16-19; San Francisco, Cal., August 25-28. Secretary, J. C. Olsen, Cooper Union, New York, N. Y.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September, 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Record of Electrical Patents

Issued by the United States Patent Office, July 20, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,146,786. Telephone System. B. M. Davis, assignor to Automatic Electric Co., Chicago, Ill. Substation calling mechanism for automatic telephone.

1,146,788. Combustion Engine. G. Fornaca, assignor to F. I. A. T., New York, N. Y. Driving connection of magneto and distributor.

1,146,791. Art of Treating Tubes Interiorly With Liquid Coating Agents. E. T. Greenfield, Kiamesha, N. Y. Manner of spraying and smoothing coating in conduit.

1,146,800. Ignition Device for Internal Combustion Engines. J. S. Kendall, Hamilton, Ont., Canada. Multiple spark plug producing succession of sparks per stroke.

1,146,806. Battery Case. R. H. Manson, assignor to Garford Mfg. Co., Elyria, O. Has contacts for connecting dry cells and prevents wrong connection.

1,146,821. Semi-Automatic Telephone System. M. Schwartz, assignor to Automatic Electric Co. Comprises automatic means for maintaining impulse transmitter connected with idle trunk.

1,146,833, 1,146,834 and 1,146,835. Trolley-Catcher. M. A. Yeakley, assignor to J. E. McLain, Canton, O. First patent, centrifugal dog stops drum and cushioning means relieves impact. Second and third patents, drum-stopping means maintained operative during rebound.

1,146,867. Magnetic Chuck. W. S. Griffith, assignor to Heald Machine Co., Worcester, Mass. Magnetically insulated pole piece in face plate and work holders of magnetic material.

1,146,872. Combination Electrical Switch and Clutch-Actuating Mechanism. E. V. Hartford, Deal, N. J. Clutch and switch automatically opened and common closing means.

1,146,877. Trolley Mechanism. J. Hollis, assignor to J. E. McLain, Canton, O. Trolley-catcher has drum-stopping means maintained operative during rebound.

1,146,879. Automatic Electric-Heating System for Railroad Cars and the Like. L. P. Hynes, assignor to Railway Utility Co., Chicago, Ill. Thermostatic control.

1,146,881. Binding-Post. N. J. Jeffries, Atlantic City, N. J. Bolt extending through wall has slotted head for screw driver, axial bore for wire and cap covering head for clamping wire end.

1,146,883. Burglar-Alarm. J. Jones, Jr., New York, N. Y. Primary circuit closed by alarm device closes secondary circuit for continuous ringing.

1,146,885. Casing for Lamp Sockets. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Cap and shell snap together and are separated by tool.

1,146,889. Telephone-Exchange System. F. A. Lundquist, assignor to Western Electric Co., New York, N. Y. Automatic; separate means for connecting and maintaining connections of line with trunk, connecting means being moved to idle trunk contacts after each connecting operation.

1,146,924. Storage-Battery Regulator. F. Conrad, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Charging regulated by specific gravity of electrolyte.

1,146,925. Electrical Regulator. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Vibratory-contact field regulator controlled by condition of distribution circuit and differential action of exciter current and voltage.

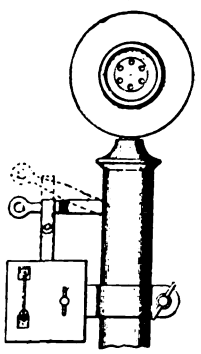
1,146,926. Regulator for Electrical Circuits. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Details of vibratory-contact field regulator.

1,146,927. Electrical Regulator. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Modification of above.

1,146,935. Lighting Fixture. E. F. Guth, St. Louis, Mo. Structure of bowl for semi-indirect lighting.

1,146,938. Attachment-Plug Receptacle. H. Hubbell, Bridgeport, Conn. Covering block has T-shaped slots to receive standard plug contacts whether in parallel or alinement.

1,146,939. Electric-Lighting Device for Vehicles. D. C. Hughes, assignor to Hughes-Wessling Co., Chicago, Ill. Generator frictionally driven from wheel rim.



No. 1,147,014.—Fire Alarm.

1,146,942. Process of Treating Liquids. C. P. Landreth, Philadelphia, Pa. Electrically treated prior to adding agent for precipitating foreign matter to be removed.

1,146,954, 1,146,955 and 1,146,956. Electric Regulator. F. E. Ricketts, Baltimore, Md. Vibratory-contact field regulators; first patent has the contacts adjustable according to circuit conditions; second patent, vibratory contacts control generator connected to field circuit of exciter; third patent, vibratory contacts actuated by differential magnet, auxiliary coil being controlled by relay in field-resistance shunt.

1,146,976. Ignition Apparatus. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Structure of generator collector rings, commutator, etc.

1,146,979. Trouble Lamp. F. A. Walters, W. M. Beckman and A. W. Kohl, Minneapolis, Minn. Cap fitted with battery and lamp.

1,146,985. Printing-Telegraph. C. J. Wiley, Yorktown, N. Y. Plurality of instruments operated by single tape.

1,146,988. Depositing Repair Metal Across an Alternating-Current Arc. M. Arendt, assignor to H. L. J. Siemund, New York, N. Y. Arc brazing; has inductance in series with arc with inductive voltage greater than drop across arc.

1,146,989. Electric Arc Welding. M. Arendt, assignor to H. L. J. Siemund. Current variations by resistance of arc vary circuit voltage in opposite sense.

1,146,993. Block-Signal Apparatus. A. Bevan, Providence, R. I. Step-by-step system for trolley roads.

1,147,005. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Automatic generator regulator for car lighting.

1,147,010. Wireless Telegraphy. R. A. Fessenden, assignor to S. Kinter, Pittsburgh, Pa., and H. A. Barrett, Bloomfield, N. J. Antenna structure.

1,147,014. Automatic Fire-Alarm System. F. Gottschalk, Stirling, N. J. Telephone hook moved to "talking" position on fusing of link. (See cut.)

1,147,016. Electromagnetic Sound-Producer. L. Grubman, assignor to Electric Spark Appliance Co., New York, N. Y. Automobile horn; electromagnetic vibrator beats upon diaphragm.

1,147,020. Accounting System. F. O. Heuser, assignor to W. R. Heath, Buffalo, N. Y. Electromagnetically actuated register.

1,147,021. Means for Protecting Electric Conductors. J. T. Hickey, assignor to Hickey & Schneider, New York, N. Y. Shields conductor from injury at insulator.

1,147,025. Telephony. M. L. Johnson, assignor to Frank B. Cook Co., Chicago, Ill. Automatically selects idle operator set and connection transferable to other operator's set at will; also signals denoting idle link connectors.

1,147,026. Electrode for Vapor Electric Apparatus. C. A. Kraus, Newton Highlands, and R. D. Mailey, Lynn, Mass. A mercury cathode has layer of granular insulating material floating thereon.

1,147,038. Igniter Magneto-Generator. H. C. Mueller, assignor to Evinrude Motor Co., Milwaukee, Wis. Structural details of reversible machine.

1,147,052. Fire and Police-Alarm Box. W. F. Smith, assignor to Western Electric Co. Details of impulse transmitter.

1,147,053. Resetting Signalling Device. C. W. Stancliffe, assignor of one-fourth each to R. J. Leckie and W. H. Leckie, Vancouver, B. C., Canada. Solenoid operates contact-maker.

1,147,065. Insulator Clamp or Bracket. J. Zieg, Lincoln, Neb. Sheet-metal strap embraces crossarm and forms insulator pin.

1,147,071. Polyphase-Current Starter. E. Besag, assignor to Voigt & Haeffner Actiengesellschaft, Frankfort-on-the-Main, Germany. Lever sets rotor starter and tensions springs of stator switch.

1,147,107. Electrical Machine. F. Ljungström, assignor to Aktiebolaget Ljungströms Angturbin, Finspang, Sweden. Armature conductors and core interlocked to prevent circumferential movement.

Digitized by Google

1,147,123. Connection for Continuous-Current Generators. L. Schön, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Arrangement of exciter circuit.

1,147,125. X-Ray Tube. J. E. Seeley, Los Angeles, Cal. Arrangement of cathodes and target.

1,147,127 and 1,147,128. Combined Load-Indicator and Alarm for Motor Trucks. F. J. Troll, Baltimore, Md., assignor of one-half to D. H. Thomas, Jr. First patent, audible indication when maximum load of truck is reached. Second patent, modification.

1,147,150. Method of Obtaining Oxide of Nitrogen From Atmospheric Air. F. I. duPont, Wilmington, Del. Comprises subjection to electric arc.

1,147,165. Electrical Furnace. W. H. Hampton, assignor to Conley Electric Furnace Co., Wilmington, Del. Vertical furnace; reactions with the material facilitated by resistance heating of plates over which it passes.

1,147,168. Electric Motor. R. M. Gilson, assignor to Union Switch & Signal Co., Swissvale, Pa. Split-phase motor, power-factor of one winding increasing with frequency.

1,147,169. Railway - Traffic - Controlling Apparatus. J. S. Holliday, assignor to Union Switch & Signal Co. Single-phase repulsion motor operates track switch and supplies current to indicator motor.

1,147,170. Electric Motor. J. S. Holliday, assignor to Union Switch & Signal Co. Split-phase motor, windings having equal power-factors at one frequency and power-factor of one winding higher than other at higher frequency.

1,147,171. Apparatus for the Control of Electric Motors. J. S. Holliday, assignor to Union Switch & Signal Co. Split-phase motor operates circuit-breaker controlling track-switch motor.

1,147,186. Multicolor Loom. J. Pointu, Roanne, France. Electrical means, controlled by exhaustion of weft, for inserting fresh shuttle.

1,147,205. Portable Electric Lamp. C. Bertram, assignor to Morreau Co., Cleveland, O. Structure of lamp standard, with wiring conduit, etc.

1,147,209. Apparatus for Electric Welding. W. B. Cleveland, assignor to Electric Railway Improvement Co., Cleveland, O. Has high-resistance heating electrodes between which work is clamped.

1,147,223. Lock - Out Party-Line Telephone System. A. F. Erickson, Seattle, Wash., assignor of one-fourth each to J. V. Bock and G. T. Nonnenbacher. Lock-out device consists of two electromagnets with special wiring and structure.

1,147,246. Telephony. M. L. Johnson, assignor to Frank B. Cook Co., Chicago, Ill. Operator-controlled, electromagnetic connecting switches at exchange.

1,147,247. Spark Plug. S. M. Kitchen and N. J. Hoag, Skaneateles, N. Y. Structure of plural-gap plug.

1,147,261. Method of Regenerating Storage Batteries. C. S. Palmer, Newtonville, Mass. Sulphated lead batteries regenerated by charging and discharging with electrolyte of concentrated water solution of acid sulphate of alkali metal.

1,147,265. Production of Ozone. J. R. Quain, London, England. Air passed between tubular insulating envelope and a contained tube exhausted of air and containing electrically vaporized mercury.

1,147,269. Luminous Switch-Key. M. T. Rosenheim, Philadelphia, Pa. Cavity in key has translucent walls and is coated with luminous material.

1,147,277. Electric Cigar-Lighter. M. H. Spielman, New York, N. Y. Structural arrangement of device having high-resistance wire gas igniter.

1,147,282. Stethoscope. K. M. Turner, assignor to General Acoustic Co., Jamaica, N. Y. Telephonic.

1,147,312. Telephone Attachment. D. J. Daniel, Little Rock, Ark. Fresh tape, after each use, may be drawn from roller across mouthpiece.

1,147,323. Recording and Indicating Apparatus. G. A. Hobart, Paterson, N. J. Tally sheet and marker arranged to close signal circuits distinctive according to tally.

1,147,329. Speedometer. W. G. Leathers, assignor to Stewart-Warner Speedometer Corporation, Chicago, Ill. Indicating band moved in opposite directions by drums magnetically and spring-operated, respectively.

1,147,344. Vehicle Lamp. H. A. Spear, assignor of one-half to J. W. Stacy, Springfield, Mass. Construction and arrangement of reflector.

1,147,347. Service - Meter System for Telephone Exchanges. H. S. Turner, San Diego, Cal. Register associated with line operative when line is calling and inoperative when called.

1,147,359. Step-by-Step Electrical Transmitting and Receiving Apparatus. A. Barr, W. Stroud and J. W. French, assignors to Barr & Stroud, Ltd., Anniesland, Glasgow, Scotland. Operated by successive energization of electromagnets and direction of receiver is reversed without reversing direction of transmitter.

1,147,388. Electric Heater. E. E. Gold, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Resistance wire wound on grooved cylinder to promote air circulation.

1,147,389. Automatic Telephone System. C. L. Goodrum, assignor to Western Electric Co., New York, N. Y. Details of switch arrangement.

1,147,390. Switches and Circuits for Automatic Telephone Exchanges. C. L. Goodrum, assignor to Western Electric Co. Has subscribers' circuits arranged in groups and a series of switches less in number than the number of subscribers' lines.

1,147,416. Vaporizing Device. H. P. Macdonald, Montclair, N. J., assignor of one-half to U. Snead. Porous wick soaks up liquid, which is vaporized therefrom by electric heat.

1,147,417. System of Distribution. L. C. Marburg, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Flywheel induction machine acts as power-storing and delivering device on variably loaded circuit.

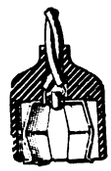
1,147,422. Arc-Light Electrode. W. R. Mott, assignor to National Carbon Co., Cleveland, O. Contains a fluoride and zinc oxide.

1,147,437. Sending Device. J. N. Reynolds, assignor to Western Electric Co. Structure of impulse sender for automatic telephone.

1,147,444. Automatic Train Stop or Signal Device. O. A. Ross, assignor of one-half to C. V. Kasson, Chicago, Ill. Block system in which a section of track in a block may be excluded from circuit.

1,147,448. Fuse Device. E. O. Schweitzer, Chicago, Ill. Makes wide gap in circuit on blowing of fuse; for mounting on pole.

1,147,450. Terminal Clip. W. Shaw, assignor to National Carbon Co. Consists of



No. 1,147,532.—Receptacle and Plug.

flattened tube in which conductor is clamped.

1,147,451. Pigtail Connection. W. Shaw, assignor to National Carbon Co. Manner of connection to carbon brush.

1,147,483. Pyrometer Method and Apparatus. T. W. Clark, assignor to Gibb Instrument Co., Pittsburgh, Pa. Electrically controlled recording mechanism in device for determining temperature of highly heated fluid.

1,147,494. Fuse Cartridge. G. E. Fisher, Cleveland, O. Structure of casing for inclosed fuse.

1,147,498. Divided Insulator. E. H. Freeman, assignor to Trenton Porcelain Co., Trenton, N. J. Reversible, interchangeable cleat.

1,147,501. Automatic Annunciator. J. H. Genter, Newburgh, N. Y. Electromagnetically controlled slide carrier for projecting apparatus.

1,147,516. Machine for Preparing the Conducting Wires of Electric Igniters. J. Krannichfeldt, Cologne-Niehl, Germany. Details of machine for manipulating and cutting conducting wires.

1,147,532. Electric-Lamp Receptacle and Plug. T. A. Morris, Lansford, Pa. Receptacle and lamp plug adapted to snap together. (See cut.)

1,147,545. Bell-Ringing Device. E. Rebischung, New York, N. Y. Electrically operated means for swinging a bell.

1,147,557. Fire-Extinguisher. A. C. Seeger, East St. Louis, Ill. Alarm circuit closed by operation of fusible sprinkler head.

1,147,558. Apparatus for the Sterilization of Milk. A. Shelmerdine, Liverpool, England. Particular structure for passing electric current through milk.

1,147,569 to 1,147,576, inclusive. Electrical Regulator. A. A. Tirrill, assignor to Westinghouse Electric & Mfg. Co. Eight patents on different structures and connections of vibratory-contact field regulators.

1,147,584. Apparatus for Electrically Controlling Planing Machines and the Like Reciprocating Tools. A. P. Wood, Hale, England. Bed plate automatically controlled by controlling field circuit of generator supplying driving motor.

1,147,585. Apparatus for Electrically Operating Planing Machines and the Like Reciprocating Tools. A. P. Wood and R. S. McLeod, Didsbury, near Manchester, England. Details of automatic control of driving motor.

1,147,596. Electromechanical System to Avoid Railway Collisions. A. Beer, Venice, Italy. Counterweight holds signal at "danger" and electric mechanism moves it to "clear."

1,147,598. Distributor for Electric Igniters. C. T. Blake, St. Petersburg, Fla. Particular structure.

1,147,634. Automobile Lock. G. L. Lotz and J. W. Kremer, Seattle, Wash. Starting apparatus including igniter switch locked against unauthorized use.

1,147,636. Telegraph Repeater. J. McKeon, Great Falls, Mont. Structure and arrangement of magnets and contacts comprising heavy-current main-line magnet and light-current local-circuit magnet.

1,147,642. Automobile Door - Opening Mechanism. T. A. J. Porter, Tuckahoe, N. J. Electromagnetically operated lever mechanism for opening spring-closed sliding door.

1,147,666. Apparatus for Electrically Operating and Controlling Planing Machines and the Like Reciprocating Tools. A. P. Wood, Hale, England. A motor for each direction of movement and electric changeover mechanism.

1,147,682. Lifting Magnet. D. C. Jackson, assignor to D. C. Jackson and W. B. Jackson, Madison, Wis. Structure of pole pieces, etc.

1,147,686, 1,147,687 and 1,147,688. Electrical Regulator. O. S. Schairer, assignor to Westinghouse Electric & Mfg. Co. Structures and connections of vibratory-contact voltage regulators.

1,147,692. Electrical System of Distribution. F. G. Beetem, Philadelphia, Pa. For charging storage batteries; dynamo voltage maintained substantially constant by armature field connected through arms of Wheatstone bridge.

1,147,696. System of Electrical Distribution. J. L. Woodbridge, Philadelphia, Pa. Automatic regulation in systems having storage battery floated on line.

Patents Expired.

The following United States electrical patents expired on August 2, 1915:

608,175. Reciprocating Electric Drill. H. Casler, Canastota, N. Y.

608,211. System for Heating by Electricity. J. F. McElroy, Albany, N. Y.

608,228. Galvanic Bath. C. E. Schnee, Carlsbad, Austria-Hungary.

608,234. Insulating Caster and Electric Switch Combined. A. W. Slayton, Tecumseh, Mich.

608,236. Electrical Signaling Apparatus for Transmitting Commands. C. Arldt, Berlin, Germany.

608,249. Alternating-Current Induction Motor. C. S. Bradley, Avon, N. Y.

608,258. Electric Bond for Railway Rails. S. H. Harrington, New York, N. Y.

608,269. Electric Arc Lamp. C. A. Pluger, Chicago, Ill.

608,277. Armature for Dynamo-Electric Machines. E. H. Anderson and D. P. Thomson, Schenectady, N. Y.

608,281. Trolley. F. E. Case, Schenectady, N. Y.

608,300. Electrolytic Apparatus. J. G. Rhodin, Eccles, England.

608,301 and 608,302. System of Train Control. E. W. Rice, Jr., Schenectady, N. Y.

608,307. Electrical Distribution. C. P. Steinmetz, Schenectady, N. Y.

608,308. System of Electrical Distribution. C. P. Steinmetz.

608,309. Regulating Dynamo-Electric Machines. C. P. Steinmetz.

608,319. Electromechanical Lock. H. G. Carleton, New York, N. Y.

608,320. Electric Combination Lock. H. G. Carleton.

608,321. Electric Lock. H. G. Carleton.

608,322. Combination Mechanism for Electric Locks. H. G. Carleton.

608,333. Telegraphic Transmitting and Receiving Apparatus. B. Hoffmann, Paris, France.

608,340. Automatic Switch for Regulating Electric Air Compressors. M. Mosely and P. Funck, Rochester, N. Y.

608,343. Electric Heater. J. F. McElroy, Albany, N. Y.

608,389. Rapid Telegraphic Transmission on Cable Lines. C. L. Davies, London, England.

608,412. Joint for Electric Conductors. H. S. Patten, Montclair, and W. Maver, Jr., Jersey City, N. J.

608,497. Electric Headlight Lamp. H. P. Wellman, Ashland, Ky.

608,504. Telephone-Transmitter Arm and and its Attachment. W. J. Barr, Ashtabula, Ohio.

608,537. Battery Electrode. H. E. Wilkinson, Mount Vernon, Ohio.

Digitized by Google

Electric Vehicle Section

THE PURCHASE AND CARE OF THE INITIAL TRUCK.[1]

By G. Drake Smith.

While the electric has been on the market for nearly fifteen years, the average merchant or plant manager is still likely to be influenced by hearsay or personal bias in buying his first truck. A relative or business friend will brag about such and such a truck and Mr. Jones will order one without considering the question of capacity or adaptability. If he does not do this the chances are he will buy a truck made by the manufacturer of his touring car, forgetting that a truck and a touring car are very different. It is very difficult to get the buyer of the initial truck to take his first investment seriously. A small percentage make a very thorough investigation of different makes, but the majority buy on first price, friendship or snap judgment.

I do not hold the truck manufacturer blameless, especially in years past, because if he had had the patience to make sure that the truck sold was specifically adapted to the needs of the buyer, much dissatisfaction would have been avoided and more sales made. The older manufacturers, however, have for some years sacrificed many immediate sales to a policy of adaptability, and this policy is now bearing fruit.

Mistakes No Longer Necessary.

In many respects the man who is now about to buy his first truck has certain advantages over the man who bought his even three years ago. It is no longer necessary to make mistakes in adaptability, especially if one deals with the reputable, experienced manufacturer. Engineering counsel is supplied in modern motor-truck selling not only to aid the buyer, but to protect the seller. For the latter to make mistakes is to endanger his future sales, not alone to the buyer in question, but to others influenced by the initial sale.

Ten years ago the electric truck manufacturer was greatly handicapped in adapting his product to the needs of the buyer. For the buyer would consider only horse-wagon standards and these we know now were lamentably wanting as a foundation for efficiency. The American Express Company, for example, first bought three-ton trucks, then one-ton, then two-ton, the proper size for the bulk of their work. The Adams Express Company started in with one-ton in 1903; then one and one-half ton; then reached the two-ton size. Many wholesale grocers began with the five-ton size only to drop down to the three and two-ton. Nearly every line of business had to experiment, and with no experience to guide him, the electric truck manufacturer could only consent to build what the buyer ordered.

To-day the large manufacturer knows from long experience just what to recommend for all the lines of trade which approach standard practice in bulk or dead-weight units. A 1,000-pound General Vehicle department-store wagon, for example, has a body whose dimensions are about the same as the old single-horse retailer's wagon, standardized through nearly 70 years' use. It has a speed of 12 miles per hour, and 45 to 50 miles per standard battery charge. The speed conforms to traffic conditions and city ordinances. The mileage is limited not to what the largest battery one can get into the wagon will give; not to what a half-ton wagon at 12 miles can cover in nine or ten hours, but to the average mileage needs of the merchant's delivery service. Why carry about more battery than you need, cutting down load capacity and unnecessarily shortening tire life? Other G. V. models are equally efficient for business needs. The chassis of the two-ton size is adapted to bodies which are standard in eighteen lines of business. The heavy duty, five-ton size is also well proportioned to the body needs of the coal man, the ice man, the brewer, etc.

Providing Exactly What the Work Demands.

But it is in predetermining what capacity of vehicle, what style and size of body, what speed and what size of motor and battery are needed for a given task and then supplying these, that our company has made its greatest progress in "fool-proof selling."

For example, in Pittsburgh, we made little headway with the brewers until we practically placed five-ton motor and battery equipment in three-and-one-half-ton trucks, and carried out this general idea in other capacities. By way of contrast, we have placed three-and-one-half-ton batteries in five-ton ice trucks where the haul was not over 2,500 feet and the smaller batteries were more than ample for a full day's work. The decrease in battery weight allows loads to be correspondingly increased over normal, without straining the frame of the truck. In other cases we have increased the size of the battery to take care of the extra current needed to operate an electric winch on the truck. We use extra large powerful motors to overcome sandy conditions in the South, and hills in Australia. Having frame trouble in Los Angeles, we investigated and found that due to the heavy rainfall the curb stones on the street gutters are from three inches to five inches higher than usual and iron-bound. This means that a truck going into a garage or stable would have to climb a sudden rise of often 36 inches (or a 33 per cent grade), bringing an extra heavy strain upon the frame. We now reinforce the frames of all vehicles sent to Los Angeles. In San Francisco, to negotiate the hills in good shape, batteries specifically adapted to the capacity of vehicle and the local routes are installed, in one instance a special motor and a battery with 64 cells being used.

Particular attention is now paid to the installation of G. V. trucks in the smaller towns where people have no knowledge of storage-battery practice and would naturally get into trouble with charging equipment if not properly coached. We also make a special effort to help our customers in cities where there is a heavy snow fall. We have mill trucks in service where the hauls do not exceed 100 yards and due to speeding up the loading and unloading methods have made these trucks pay.

In many cases it is not the standard trucks which are at fault but methods connected with loading and unloading them. I have in mind two trucks in a Maine mill town which gave dissatisfaction, because while they moved coal, sand, bales of cotton and finished goods they did no more work than the

[1] A paper read before the Ohio Electric Light Association, Cedar Point, Ohio, July 23, 1915.

Digitized by Google

former horse equipment. To load a truck two men would go inside the mill, get a roll of goods and nonchalantly go back for another. After studying the situation, our engineer suggested that as the rolls of cloth came from the loom instead of laying them on the floor to be taken out individually they be dropped into a bin built on a small truck, this to be kept near the loom. Twelve small trucks equipped with ball-bearing castors were built at the mill, of a size to just fit on a one-ton G. V. Boys ran the hand trucks to the door the minute the electric backed up, ran off the empty roll truck and pushed in a full one, the operation consuming about 30 seconds. With one one-ton electric we then did the work which formerly required seven men and four horses, the hauls being about 300 yards.

In another mill this problem of waste time in loading has also been overcome by constructing small floor trucks for work all through the mill. A two-ton electric holds four of these standard units, a three-and-one-half-ton truck, six. The haul of the electrics does not exceed 100 yards and there are 16 stops in a round trip, yet the electrics pay over horses. The scientific loading methods alone make this possible.

Not only are we overcoming the very-short-haul problems but we are making rapid progress in solving long-haul difficulties. A large firm in Boston wanted a five-ton electric which would enable it to haul capacity loads to Waltham, 12 miles, and to Quincy about nine miles, or 42 miles for the two trips. Our standard five-ton truck normally covers but 35 miles per charge, but by boosting for one hour we were able to give him 44 miles per charge. By means of relay batteries, more particularly a spare battery at the out-of-town end of the trip, we have enabled some customers to secure 70 miles per day with three-and-one-half-ton trucks, while 60 miles per charge with one-half and one-ton wagons, with batteries slightly larger than normal, is very common. Where we have the Battery Service System all mileage standards go by the board. A one-ton G. V. in Spokane, Wash., recently covered 7,405 miles in four and one-half months or at the rate of nearly 18,000 miles per year. The cost was 5.05 cents per mile.

Adaptability in the Central-Station Field.

About four per cent of the nearly 5,000 central stations in the United States operate electric trucks, yet the electric truck manufacturer has received more criticism from this field than from any other

The transportation needs of the public utility are many and complex. Vehicles purchased for one class of work are frequently used for another. This would cause some dissatisfaction. Then a great many central-station electrics are not standard. The manufacturer following the specifications insisted upon by the central station produces what is asked for but which is not always satisfactory. Spare parts for special vehicles are of necessity made to order. Should the truck as well as the manufacturer be condemned because there is some delay in supplying these? If your engineering department practically rebuilds a G. V. electric to suit your ideas of what it should be and it does not "make good," are we at fault?

I concede our failure to do many things which might have tended to make our vehicles in some cities do better work, many things which might have given you just what you needed for a specific purpose, but we are correcting these evils as fast as we can. We cannot build a special gas-electric vehicle for one manager, front-wheel drive vehicles for other managers and make any pretense of selling a standard line, to say nothing of selling such vehicles at list prices. Someone has to bear the development expense. I'll guarantee that if we would we could book orders for 75 specials from every 100 central stations.

Against the stated imperfections of electric wagons and the faults of a manufacturer such as I represent, must be weighed the numerous examples of neglect, yes, plain every-day abuse, of hundreds of electrics in central-station service. I have in mind a wagon which I sold myself in this state—a one-ton tower wagon. I tried to make it a two-ton tower wagon but was told the one-ton would be quite sufficient as it would only carry the tower, a few tools and two men. Today (15 months later) that wagon is practically for sale. The engineers complain of poor service and a mileage of 21 per charge. But—that wagon was soon carrying in addition to the tower a *complete set of line repair equipment, and from three to five men.* In 14 months three sets of tires were needed for the rear wheels and two for the front. Our inspector found the weight of the equipment, including driver, to be 8,570 pounds. No wonder the body rides on the axle. I could cite many other cases of, shall I call it, *inadaptability?*

On the other hand our company owes a great deal to the central-station engineers who have co-operated with us in developing vehicles necessary for special work or for service under peculiar operating conditions. It also owes a great debt to the central stations who have not only generously adapted the electric for their own work but influenced the purchase of others by the local merchant and manufacturer. We are trying hard to co-operate fully with such companies and we are also trying very hard to properly sell and install the initial truck purchased by the central station just beginning to motorize.

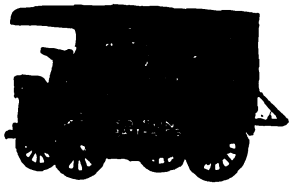
The electric truck is a wonderful vehicle when adapted to the work and properly cared for. In April, 1913, we placed a two-ton, winch-equipped cable truck in the service of the Duquesne Light Company, of Pittsburgh. In 18 months this truck made but 4,175 miles, yet in that time it pulled 200,000 feet of cable at a cost of 1.1 cents, against 2.4 cents for hand-winch pulling. Increased speed and reduction in the number of men required made this possible. In the first seven months of its use this truck saved $2,700 over the old method, these figures being given over the signature of the general contract agent. The cost of a two-ton G. V. chassis is $2,600.

The Duquesne Light Company was good enough to place another one of its two-ton trucks at the disposal of the Pittsburgh Board of Education for a two-day demonstration in competition with a gasoline truck. This truck distributed Christmas trees. The first day it covered 33 miles, using 285 amperes. Loose snow, ice, rough roads and steep hills were encountered.

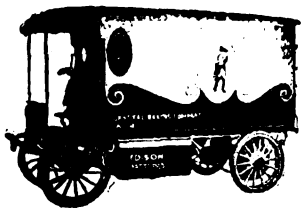
On the second day all schools in the Alleghany district were covered. "With the driver," states the report, "was the driver of a gasoline truck who stated that some places were reached which could not be reached with a gas truck. Mileage 35, amperes consumed 286. No more unfavorable operating conditions could be asked for."

I mention Pittsburgh, because I want to indicate our success under extraordinary conditions, believing that some of you central-station users who are not satisfied with your electrics will be influenced to set your jaws and say, "If they can do it, I can—there must be something wrong with our garage people if they cannot keep an electric going in a level country." I could give you many examples of G. V. performance on the Pacific Coast, not from hearsay but as an eye-witness. A little care and common sense will overcome half the central-station troubles with electrics. Even where a one-ton store-room wagon makes but from 12 to 17 miles a day (against its possible 45 or 50), there is no excuse for an operating cost of from 50 to 90 cents a mile, as some central-station figures show. Either the wagon is not adapted to its work and should be placed in another department, or it is

Digitized by Google



WASHINGTON, D. C.



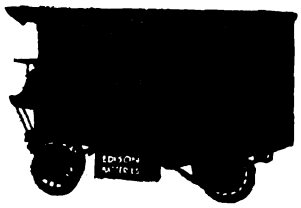
NEW YORK

SAN FRANCISCO

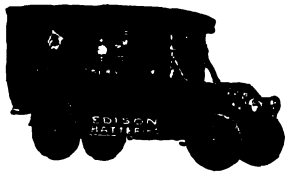
LOS ANGELES

DETROIT

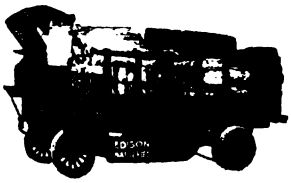
WINNIPEG



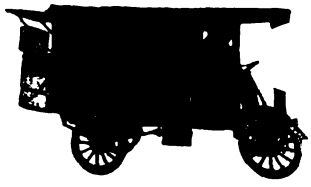
NEW YORK



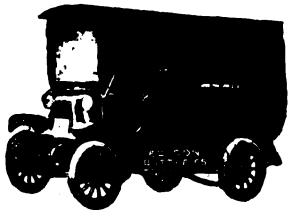
CHICAGO



BOSTON



NEW YORK



CHICAGO

If They Said It To You?

IF **Geo. Stevens,** Superintendent of the Motor Vehicle Department of the Adams Express Co., came to you and said "22 trucks at Indianapolis equipped with Edison Batteries have averaged 660 miles per month for **5 years.** The cost of operating (including **all** battery repairs, new solution, watering, inspection, labor, material **and current**) averaged 2½ cents per mile for the 880,000 miles."

IF **Thos. Breman,** Chief Engineer, R. H. Macy & Co., came to you and said "The eighteen A6 Edison Batteries which we put in service have given from four to four years and six months continuous service in every case. This means every working day at an average mileage of thirty-five miles per day."

IF **Chas. S. Morris,** President Metropolitan Fireproof Storage Warehouse Co., came to you and said "We are highly pleased with the operation of the Edison Battery and the amount of mileage has exceeded in many instances that which was promised to us."

WHAT WOULD YOU DO?

WOULD you not investigate the Electric Truck and the Edison Battery?

WOULD you not be impressed by the fact that more than one-third of all Electric Trucks are Edison Equipped?

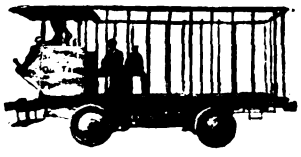
WOULD you not ponder what USERS say? "Longest life." "Costs least to maintain." "Most economical and satisfactory equipment." "Reliable always."

THE USERS KNOW

Edison Storage Battery Company

Main Office and Factory, Orange, N. J.

Distributors in New York, Boston, Chicago, Detroit, Washington, Seattle, San Francisco, Los Angeles, Portland Ore.

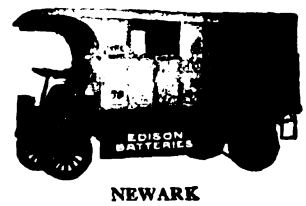


FORT WAYNE

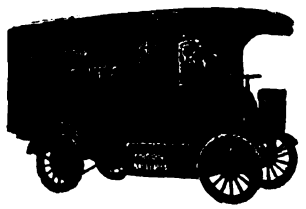
SEATTLE

NEW YORK

NEW YORK

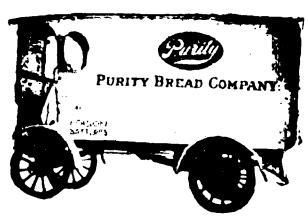


NEWARK



LONG ISLAND CITY

BOSTON



ST. PAUL

Digitized by Google

simply neglected or abused by overloading or both.

Analysis Before Sale.

We believe that far greater efficiency may be secured by analyzing a central station's transportation needs and then recommending just the vehicles necessary to best displace existing horse equipment. In past years we have not had the necessary engineering force to spare to do this but now we are making progress. I have in mind a G. V. report now being considered by a central station operating a traction line as well as lighting.

This company operates 14 single and five double wagons, utilizing 28 horses. There are four single service wagons, four single tower wagons for arc lamp work, one painter's wagon, two single street light maintenance wagons, one single cable wagon, one double pole wagon, one double cable truck, one single conduit maintenance wagon and three extra single wagons for special work and reserves.

Our engineer put recorders on several wagons and went out on them. He noted the running time, the stops and waits, the extra delays, as when foreman could not get on the job for one and one-half hours in some cases, thus tying up the work.

He found that an overhead construction wagon carried nine men whose wages totalled $20 per day. The wagon and two horses represented $3.09 per day. On this work there was a loss of 45 minutes going to work, one hour waiting on hired team, 25 minutes lost on return trip, or two and one-half hours lost in all. At $2 per hour for men, this meant $5 lost on labor alone for this wagon in one day. A hired wagon hauled four tons of cable to the same destination, for which it received $8. A two-ton G. V. truck would have saved the two and one-half hours' delay and hauled the cable as well. This gives an idea of electric truck economy in construction work. The superintendent of a New England central station stated that they could haul more cable from the freight house *after supper* than their hired team did all day.

After all estimates based on technical records and eye witness reports were in, it was found that the work of the 28 horses, 14 single and four double wagons could be done with ten 1,000-pound G. V. wagons and three two-ton trucks, at a saving of $13.53 per day in actual operating costs, besides a much greater saving (perhaps $30 per day) in the time of the men. The electrical equipment, also, would allow the same crews to cover far greater mileages, in fact, provide for a 25 per cent increase in transportation equipment.

From this you will see that the General Vehicle Company does give consideration to the purchase and care of the initial truck. We aim to make certain that, at least from now on, our electrics shall get a fair chance to prove their efficiency. This will be different in some cases because we cannot prevent overloading, nor can we prevent an operator oiling his vehicle only when it squeaks, if he is that neglectful. But we feel that all live central-station men will co-operate with us when they see what we are trying to do, and the right kind of co-operation can move mountains.

Chicago Electric Garages Introduce a Parking System for Waiting Cars.

A long desired service for the users of electric vehicles in Chicago has recently been put into effect through the efforts of the Electric Vehicle Association of America. It is a system of parking waiting electrics in the shopping district of Chicago, and is of an extremely practical and necessary nature, representing a service not extended by any other type of car. As many cities have laws denying the privilege of cars standing stationary for any length of time at the curb in city streets, this is sometimes a considerable hardship if one does not have a chauffeur.

That an electric obviates the necessity of employing a chauffeur is considered one of its greatest advantages. However, women who run their own electrics have for some time realized how difficult it is to use their cars for shopping purposes in the loop. Appreciating this difficulty, several garages have established, under the auspices of the Electric Vehicle Association, a downtown parking service for their customers, enabling them to leave their cars at the Electric Shop of the Commonwealth Edison Company, where a licensed chauffeur drives it to the park and returns it again whenever ordered. There is no charge for this service. The car owner simply understands that by taking advantage of the service he entirely agrees that the driver is acting only in the capacity of the owner's personal agent.

All electric garages who are represented in the Chicago section of the Electric Vehicle Association are participants in this plan, and shortly a notice will be sent to every user of an electric in Chicago and vicinity, telling about the service. In the fall a night service will be arranged for theater patrons.

The parking system is a much needed service which, it is hoped, will be extended to other cities where the electricity supply companies will follow the lead of the Commonwealth Edison Company in its very close and practical co-operation with electric-vehicle interests.

ELECTRICALLY PROPELLED FIRE APPARATUS.

Notes on Their Successful Operation in Various Cities.

By A. Jackson Marshall.[1]

Ever since the first fire department was organized in ancient Rome, for centuries countries have vied with one another in the development of efficient fire-controlling apparatus, endeavoring to make fire the "servant" of man rather than the "scourge" of man. One of the greatest problems has been the propulsion of fire apparatus, and at present the greatest effort is being made to develop motor-propelled appliances. It is interesting to follow the development of fire-fighting from the early period when the "bucket brigade" was the most efficient means of combating the enemy. The hand engine and man-pulled hose carriage were considered marvels of efficiency in their day, but it is with a mixture of curiosity and amusement that we now look upon apparatus relegated to the glass cases and rusty environs of museums. In 1875, shortly after the period of the great fires which devastated some of our cities, a new movement sprang up which heralded the modern building era and modern fire controlling appliances. It was at this time that steam engines came into general use. The inclusion of fire fighting amongst the scientific problems of the day as one worthy of serious consideration dates from modern times, and hence the many improvements which have been introduced into its practice are all of such recent origin that even now they are only just emerging from an embryonic stage.

It is with considerable interest that fire chiefs throughout the country are watching the results and performance of electrically propelled fire trucks and engines in the cities where they have been adopted. The very many obstacles that present themselves in the changing of horse-drawn to motorized apparatus of a large fire department are such that the utmost care must be used to secure that method of propulsion for apparatus that will give speed, reliability, and efficiency together with ease, and economy of operation. In these points the advantage of the electric over other methods of propulsion is fast establishing itself.

The first storage-battery fire engine in this country came into existence in 1912, when Engine 217 of the New York Fire Department was converted into an electrically propelled apparatus.

---

[1] Secretary Electric Vehicle Association of America, 29 West Thirty-ninth Street, New York.

Digitized by Google

An International Distribution

Not only are G. V. Electrics distributed in 43 of the 48 States but they are used in 9 foreign lands as well. General Vehicle prestige has had a great influence on our foreign sales, but the *quality* of the trucks—their efficiency under a wide range of climatic and other operating conditions—has been an even more important factor.

Our policy of "specific adaptability" concerns itself with the hard problem as well as the easy one. We make G. V. trucks pay in the mill yard, where the hauls in some instances are not over 300 feet long, and there are 16 stops in a round trip. Little specially designed bin-like trucks with ball bearing castors are loaded with bolts of cloth, yarn, etc., and run on to the big trucks, thus saving time and reducing labor costs. We overcame the long haul problem by installing larger batteries or placing relay batteries at the out-of-town end of the run.

In Australia, South Africa, Brazil, the Philippines, etc., G. V. Electrics are re-making transportation history. Every problem we solve helps us with *your* problem. Ask us for data on our vehicles in your line of business. Remember we manufacture six models (1,000 to 10,000 pounds) and have been making commercial vehicles exclusively for 14 years.

Write for our catalogue.

General Vehicle Company, Inc.

Long Island City, N.Y.

New York, Chicago, Boston, Philadelphia

Copyright, 1915

2514

Digitized by Google

The *Edison Monthly* gives an interesting account of its history and operation:

"The early history of 217 is well known. The engine, originally a horse-drawn steamer of the largest size, was converted to the motor type by the removal of its forward running gear and the substitution of two Couple-Gear Freight wheels, a storage battery and the necessary steering and controlling devices. This conversion cost $4,000, and it gave to the city an engine that would have cost not less than ten thousand dollars had new apparatus been purchased; in other words, a dependable steam pumping engine was continued in service with added speed and greater radius of operation.

"With the exception of battery renewals and replacement of minor parts, it stands today just as it did when it went in service on April 24, 1912. The bills for repairs and renewals during the two years have come to just $744.29, $486.97 of which was for battery renewals that were made after the machine had been in service a year and a half. The balance includes minor parts, labor and decorating, for the engine has taken part in two street parades. Adding depreciation and the cost of charging, operation of this engine has cost the city just $1,370.03.

"The cost of motive power for this same type of engine, but with horses instead of a storage battery, is $1,469.06 for two years. These figures are based on the records of two companies which ordinarily respond to about the same number of calls as 217. The sum includes depreciation on horses and harness and stable equipment, which at 10 per cent is $105.98 a year. Feed, shoes, and veterinary service for three horses cost $516.86, while the repairs vary. As a rule, better service costs more money. In this case the fire department not only has a better piece of apparatus, but one on which it is saving money. The economy claim is supported by the records of the department—the claim of superiority is based on the actual performance of the engine. In the case of fire fighting this is rated principally by the speed in getting to the blaze. To begin with, the engine saves time in getting out of the house, for there are no horses to harness (incidentally the passing of the horse has done away with the stalls, and the space thus saved is utilized for garaging the car of one of the department chaplains). With no time lost in harnessing and with greater speed through the streets and a wider range of operation, No. 217 is often the first engine at hydrants to which in the days of the horse it was due third."

The experience of Philadelphia with electric fire apparatus has been most successful. Two years ago the first step was taken and Engine No. 20, a first-class steam fire engine weighing 10,500 pounds, horse-drawn, was equipped with an attached two-wheel storage battery tractor. The excellent performance of Engine No. 20 during the tests made in the congested traffic zone induced the Bureau to convert two smaller class steam fire-engines, horse-drawn, to battery tractors, also the two horse-drawn, high pressure hose wagons to storage battery apparatus. In addition to these five pieces of electric apparatus the city of Philadelphia has recently ordered two combination hose and chemical wagons, and one 65-foot aerial truck to be storage-battery driven. This reorder should be especially gratifying to the manufacturer as showing that the electric has proved satisfactory under high speed conditions. In a report on electric fire apparatus given by Chief Mechanician George S. Walker, before the Electric Vehicle Association convention last year, some very interesting tests were described in which the electric excelled all the specifications demanded. In one performance of a fire engine equipped with electric tractor, a distance of four miles was made in 11 minutes, while the same distance consumed 30 minutes with horse-drawn apparatus. Chief Walker says of this performance:

"This test was made to corroborate our belief in the battery tractor, and any person conversant with the territory traversed is well aware that it is no easy going. Along that route there are many hills and one extremely sharp dangerous curve, and the time made on that run, 11 minutes, stands today as record time not excelled by any fire apparatus of any make, weighing very nearly six tons, over the same route * * * The facts presented to me after over a year's experience are so satisfactory and the results so gratifying that I unhesitatingly say that for use in the congested traffic zone and the close adjacent territory thereto, of any large city similarly situated as is Philadelphia, the storage battery tractor is the very best method of propulsion for fire apparatus that is presented by any present-day methods, and I sincerely wish that the Bureau will be able in the near future, to receive the necessary funds, that the present small number of motor apparatus may be so augmented that our city will possess the requisite number of apparatus that modern methods demand of the Department of Public Safety."

No more convincing proof of the superiority of the electric fire apparatus could be obtained than a letter from Chief Engineer W. B. Daggett, of Springfield, Mass., in which he states that the actual use in the service of the department has shown one of the chief advantages of battery-driven apparatus to be absolute positiveness in starting.

"The pieces we have here," he states, "have never failed to start instantly and our experience with them has been such as to inspire a feeling of confidence that they are sure to start when needed, at any time or place.

"We have as good gas-cars as are owned by any city, but there are times when the crank is used more than once to start the engine, and as the larger the engine the more time it takes, also the greater the difficulty to spin. Up to the present time we have not thought of failure in starting with our battery-driven apparatus and no piece has been out of service a minute since they were installed.

"The battery in the aerial truck is two years old. It is my belief that making due allowance for the operation of the batteries under adverse conditions, the cost of maintenance of a piece of apparatus is as follows:

"Renewal of plates (in four years)	$500.00
Renewal of apparatus (in two years), 80 cells at 35c	28.00
Charging batteries (in four years, at $60 per year)	240.00
Broken jars (four years, at $7 per year)	28.00
Total in four years	$796.00
Total in one year	199.00

"In other words I estimate $200 per year as the cost of maintenance of a battery-driven aerial ladder truck of such size and capacity as was formerly drawn to fires by three horses."

When it is considered that the maintenance and upkeep of three horses varies from $500 to $600 per year, it is evident why Chief Daggett is so enthusiastic in his report of the electric apparatus.

In Baltimore, Md., Engine No. 32, of the Fire Department, is equipped with a storage battery tractor, "which," says Fire Chief Enrich, "is the most reliable and economical apparatus in the whole department, and can always be depended upon."

The city of Akron owns a 65-foot aerial truck equipped with electric tractor which, at a demonstration of speed and climbing grades, went up a 13 per cent grade when carrying a full complement of men and equipment and attached to the truck, at the rate of 11 miles per hour, and on level streets the tractor propelled the truck at the rate of 26 miles per hour without any trouble or showing in the least any loss of power.

"In my judgment," said Chief Mertz,

Digitized by Google

Books on Electric Vehicles

"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr. and Frank W. Smith

Fellow Am. Inst. Elec. Engrs., Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America.

President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

362 Pages, Fully Illustrated, Flexible Leather Cover, Pocket Size. Price, $2.00.

CHAPTERS

I.—Electric Vehicle Development. By William P. Kennedy, Consulting Transportation Engineer.
II.—Lead Storage Batteries; Descriptive Lead Batteries; Charge and Discharge Rates; Care of Storage Batteries.
III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
XIII.—Comparative Cost Data.

The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 820 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.

The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carburetor troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 820 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

PRACTICAL AUTOMOBILE DICTIONARY. By S. KRAUSZ

English-French-German; French-English-German; German-French-English. With an introduction by C. J. Glidden. Twelve thousand technical terms and other words employed in connection with motor cars and motoring. For use in office, factory, repair shop and touring in foreign countries. 16mo. Leather. 129 pp. Price $2.00.

SELF-PROPELLED VEHICLES. By JAMES E. HOMANS

A practical treatise on the theory, construction, operation, care, and management of all forms of automobiles. Seventh Edition, revised. 500 illustrations. 6x9. Cloth. 667 pp. Price $2.00.

The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

THE AUTOMOBILE. By P. N. HASLUCK

A practical treatise on the construction of modern motor-cars, steam, petrol, electric and petrol-electric. Three volumes. Special Edition, enlarged. 1,260 illustrations. 8vo. Cloth. 1,300 pp. Price $10.00.

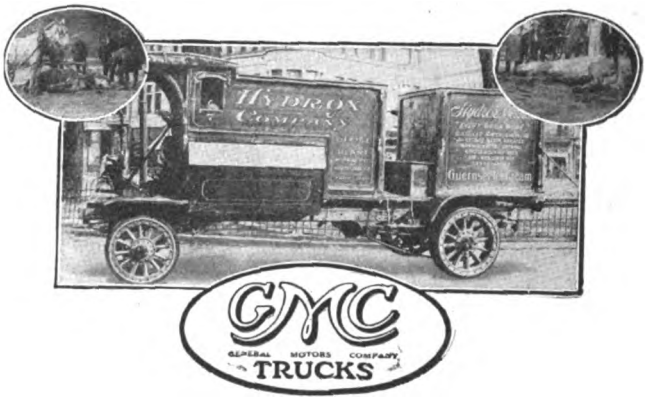
A very handsome set of instructive books brought up to date in the third volume containing many elaborate illustrations of cars now in use.

Electrical Review and Western Electrician

Western Headquarters for Electrical Books

608 S. Dearborn St.
CHICAGO

Motor Trucks Guarantee Hot Weather Deliveries



Neither central stations nor business houses today can give heat as an excuse for late delivery. The modern demand for service will not permit it. The horse must be supplanted by the motor truck if business is to grow.

Compare horse service with GMC motor truck service. Compare the reliability and heat-proof qualities of the gasoline or electric machine against the uncertainties of animal drawn equipment. Your duty to your business is to know motor trucks. Investigate now!

General Motors Truck Company builds top quality trucks to meet the demand of every business that hauls goods. Its line is the most comprehensive on the market. GMC Trucks are made in both gasoline and electric powers and in standard capacities that range from 1000 lbs. to six tons. Gasoline models in both worm and chain drive.

Ask for GMC facts and figures —either for your own use or to assist your power customers in handling their haulage problems.

GENERAL MOTORS TRUCK CO

One of the Units of
General Motors Company

PONTIAC MICHIGAN

Direct Factory Branches: New York, Boston, Chicago, Philadelphia St. Louis, Kansas City

(24)

Digitized by Google

"the storage battery has solved the problem of converting horse-drawn steam fire engines and hook and ladder trucks of any fire department to self-propelled apparatus from a practical standpoint."

As in other departments where the horse is being superseded by self-propelled vehicles, it will not be long before every fire department of any size will be entirely motorized.

It is now a question which will prove the more efficient means of propulsion, petrol or the storage battery. It is an established fact that the electric vehicle is more economical to run than a gasoline car. Without a doubt the gasoline vehicle has its own sphere and as Chief Avery, of Worcester, Mass., states, its use in suburban districts will not be superseded, but for the exacting work in the congested and business

Electrically Propelled Steam Fire Engine Used by New York Fire Department.

centers, "the electric vehicle," he states, "will be the future machine for fire-fighting."

The economy of operating an electric is due largely to its few working parts. As against the gasoline motor and transmission and the large number of working parts, a number of which are reciprocating in their action, the electric is driven by one, two or four motors, as the case may be, and the movement is a revolving one, the least wearing of all movements. In addition, these motors are revolved by electric magnetism and not by destructive explosive forces. The electric car has less than one-half the total parts required with a gasoline car. The life of the storage battery in this class of service is estimated at upwards of five years with one renewal. This estimate is given by Chief Daggett, of Springfield, who has had a considerable experience with electric fire apparatus.

As for reliability, many of the above statements of various fire chiefs bear witness to the absolute dependability of the electric. Its ease of operation and promptness of action arouse utter confidence in it. "The battery tractor has the advantage of the gasoline apparatus," states Chief Walker, "in answering alarms, due to the fact that it is simply necessary for the driver to get on the seat, throw on his controller, and it is under headway in less time than is taken to crank the motor. It eliminates the characteristic ignition and carbureter troubles in starting the motor in cold weather, and the attendant radiator troubles of freezing and leaking."

Another characteristic of the electric fire apparatus, which should commend itself to the heads of fire departments, is its absolute cleanliness. The electric does away with the offensive odors of horses, and the customary litter, dirt and flies, allows more room in the station, eliminates all odors of gasoline and oil, reduces the element of fire, which is characteristic of gasoline equipment. As there is comparatively no grease it is much easier to keep the apparatus clean and of good appearance, all of which adds very greatly to the sanitation of the station.

Although fire apparatus usually has the right of way, there are times when it has to be held up on account of congested traffic, or for other reasons. At such times as these the simplicity of the electric becomes all the more apparent.

Plans Developed for the Coming Convention of Electric Vehicle Association in Cleveland.

Cleveland will be the scene of the Sixth Annual Convention of the Electric Vehicle Association, the convention being held on Monday and Tuesday, October 18 and 19, at the Hotel Statler, and there are excellent reasons for believing that this convention will mark an epoch in the electric-vehicle industry.

The organization meeting of the convention was held in the office of Samuel Scovil, president of the Cleveland Electric Illuminating Company, in Cleveland, on July 19. John F. Gilchrist, president of the Association, addressed the meeting on the general purposes of the coming convention. T. P. Cagwin, of the Chamber of Commerce, accepted the chairmanship of the publicity committee.

After a very extensive discussion, it was decided to limit the convention to two days, namely Monday and Tuesday, October 18 and 19. It is realized that a large number of societies impose heavy demands on concerns and individuals, and that a concentrated program of two days would be greatly appreciated by the large number of delegates who would like to attend the convention. Furthermore, it was decided to make the convention a real business undertaking so that the many companies would feel justified in despatching a large number of delegates. While entertainment will not be entirely dispensed with, yet it will only be employed to supplement the more serious and practical work of the convention, and it is confidently expected that this policy will find the hearty appreciation of the entire industry, and will go far to make the sixth annual convention a bright spot in the Association's history.

The Convention Papers Committee, of which George H. Jones, of the Commonwealth Edison Company, of Chicago, is chairman, held a meeting in the general office of the Association, 29 West 39th Street, New York City, on July 21. As a result of a well attended meeting the committee was enabled to draft a tentative papers program, which includes treatments of subjects of the utmost importance to the industry. In fact, a number of papers scheduled for presentation unquestionably will be the subject of very wide publicity as they will have a marked bearing on the new successful era awaiting the electric-vehicle industry. As soon as the papers tentatively agreed upon are finally approved and acceptances are received from those invited to prepare them, same will be published.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 7. CHICAGO, SATURDAY, AUGUST 14, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.
608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
The Electrical Contractor's Opportunity and Responsibility 269
American Machinery in Foreign Schools.....270
The British Government and Scientific Organization.....270
Rates for Lighting and Power.....271
Cost of Lighting and Power Service.....271
DEPARTMENTS:
Commercial Practice.....276
Electrical Construction.....281
Dollar Wiring Kinks.....286
Public Service Commissions.....287
Questions and Answers.....289
New Electrical and Mechanical Appliances.....299
Current Electrical News.....304
Record of Electrical Patents.....308
LEADING ARTICLES:
Electricity in Cement Manufacture.—By Norman G. Meade..273
Co-Operation of the Central Stations with the Electrical Contractors and Dealers in Electrical Supplies.—By S. V. Walton.....281
Co-Operation Between Electrical Contractors and Jobbers. —By W. L. Goodwin.....282
The Federal Trade Commission Investigates the Foreign Market for American Electrical Goods.—By Waldon Fawcett 292
The First Indication of What the Courts Will Consider Unfair Competition Under Recent Laws.—By Elton J. Buckley 296
BOOK REVIEWS.....298
MISCELLANEOUS:
Plans for Boston Electrical Exposition.....272
Another Perpetual-Motion Primary Battery.....272
Thomson Quarter Century Club Meeting.....272
Joint Meetings at San Francisco.....272
Plans for New York Electrical Exposition of 1915.....272
New Method of Making Service Connections.....275
Unique Advertising Stunt of Dayton Company.....276
Electric Meter Housing for Rural Districts.....277
Expansion of Electric-Vehicle Business in Boston.....277
A Salesman's Window-Display Competition.....278
Mixing 278
Charles B. Yonts.....279
Wiring Contracts in Columbus.....280
Initial Concentric Wiring Installation in Boston.....280
Showing Bracket Fixtures.....285
Among the Contractors.....285
English Electricity Works Conference.....295
Operation of Mazda "C" Street Lamps.—By Carroll H. Shaw 297

Copyright, 1915, by Electrical Review Publishing Company, Inc.

THE ELECTRICAL CONTRACTOR'S OPPORTUNITY AND RESPONSIBILITY.

Upon other pages of this issue we are pleased to publish two interesting papers dealing with the subject of co-operation upon the part of the central station, the electrical supply jobber and the electrical contractor and dealer in electrical merchandise. These papers were presented at the recent meeting of the California Association of Electrical Contractors, one by Mr. S. V. Walton, manager of the commercial department of the Pacific Gas and Electric Company, and the other by Mr. W. L. Goodwin, vice-president and general sales manager of the Pacific States Electric Company.

During a period of tremendous growth, when the demand for electrical equipment then available reached such volume as to give everyone an opportunity to participate in a developing market, there was not much necessity for careful analysis of or attention to the business methods pursued. The prospect of rich returns was alluring; the incentive for great activity was manifest. Consequently the aggressiveness and genius for organization of the American inventor, manufacturer and distributor soon discounted the market for electrical material and then came the battle for supremacy. The inevitable happened, and for several years we have been deploring a lack of a settled policy, a lack of harmonious relations, and a lack of standardization and stability in price.

When all the elements of a community suffer together it is natural that a closer community spirit be engendered. On the Pacific coast, because of one condition or another, the market generally has been disappointing for some time. While the per capita utilization of electrical material is higher than in any other division of the country, the building up of the domestic and industrial utilization of electrical apparatus and supplies has not grown with the ability of the central stations, the manufacturers and the distributors to anticipate the demand. Therefore, we find some very forward movements looking to co-operation upon the part of the various elements of the industry obtaining upon the Pacific coast. The electrical supply jobbers and the electrical contractors and dealers in electrical merchandise have attempted to weld their interests for the common good. The effort is being made even at the point of possible sacrifice upon the part of some of the interests involved to establish a definite relation with regard to the electrical supply jobber in doing business with the contractor and dealer, and the contractor and dealer in doing business with the ultimate consumer.

Digitized by Google

This policy is endorsed and supported by the Pacific Gas and Electric Company, the ramifications of whose network of distribution cover a great territory in the state of California.

The authors of both papers urge that the electrical contractor and dealer realize the opportunity and responsibility which a policy of this kind incurs. Manifestly the central station and the jobber have much to gain if the co-operative policy becomes the successful issue which its propagandists hope for. If the industry be retarded through the failure of such a policy, both of these elements suffer materially. It is the opportunity of the contractor to demonstrate his ability to so effectively work for the creation of new business that the jobber can rest satisfied with the demands made upon him upon the part of the contractor, for the manufacturer to remain satisfied with the demands made upon him upon the part of the jobber, and for the central station to remain satisfied with the development of its load. With the contractor bestirring himself to an active and intelligent endeavor to increase the utilization of electrical material, much of the effort heretofore made by the jobber and the central station to secure added distribution and more adequate demand in spite of the apathy of the contractor, may be directed to working with and for the contractor.

If there is anything at all in the proposition they are working out on the Pacific coast, and we believe that there is everything in it, this is the opportunity to demonstrate it. It will require manly and unremitting labor upon the part of the contractor to live up to his opportunity and it will require patience and support upon the part of the central station and the jobber. If they all work together and do not expect too much of one another the problem will solve itself, and the basis of effort, of patience and of reward lies here the same as it does in the relation of any other parties to an obligation, in absolute faith in one another.

AMERICAN MACHINERY IN FOREIGN SCHOOLS.

A suggestion which is well worth considering, on the part of American electrical manufacturers, was contained in an address by Mr. J. A. Massel, an agent of the Foreign Trade Bureau of the United States Department of Commerce and Labor, before a gathering of machinery manufacturers at the Boston Chamber of Commerce recently. Mr. Massel said that German manufacturers of various kinds of machines have been in the habit of donating samples of their products to engineering and other technical schools in Buenos Aires and other important South American cities. By doing so, the students are given a means of familiarizing themselves with the operation of the various mechanisms, which is of ultimate value to the donors, in that it influences the choice of the familiar machines in practical work after graduation. With the well known superiority of American-made electrical apparatus, it is believed that our motors, generators, regulating and controlling devices, farm and domestic appliances and other products will meet with a ready sale, at higher prices than those at which European-made goods are offered, once the excellence of our manufactures is recognized. And what better method of demonstrating to the youth of a foreign country than by furnishing them our best types of machines to work with during technical training? The gift of a thousand dollars or even a hundred thousand dollars' worth of machinery is not an uncommon thing in connection with the equipment of technical schools in the United States. Why not extend the benefactions to foreign countries, where the field is rapidly expanding to the demand for the best that North American enterprise and skill can offer?

THE BRITISH GOVERNMENT AND SCIENTIFIC ORGANIZATION.

For many years past scientists, engineers and leaders of industry in England have sought by public meetings, by the formation of guilds and societies, and by propaganda, to create a larger sympathy with scientific research and method in the mind of the people, and to secure from the Government a more generous appreciation of the true value of science in relation to industry, and a raising of the status of the scientific worker. English scientists and those who were familiar with the magnitude of the developments in progress in the United States, and in some Continental countries, have not been slow to point out the British weakness and its danger, whenever fitting opportunity has arisen. Yet time and time again they were tempted to relinquish the agitation as being almost a hopeless one. The history of the matter, if ever it be written, will form an astonishing record. The United Kingdom could claim world renown for its men of eminence in all departments of science, but what it lacked was a suitable organization of its forces, a more intimate co-operation between educational, scientific and industrial departments so that the available knowledge could be properly applied in order to profit the nation, and a wider scientific intuition on the part of legislators. So far as the actual heads of the nation were concerned, science and its votaries felt the influence of the cold shoulder.

The events of the past year, and a wider knowledge of the doings of other peoples in consequence thereof, gave greater prominence and timeliness to the agitation in its latest revival. The result is that the Government has through its Education Board set on foot a "scheme for the organization and development of scientific and industrial research." A permanent organization is being established, for any expenditure under which a committee of the Privy Council will be responsible. That committee will have an advisory council to guide it, such council being composed mainly of eminent scientific men and men actually engaged in industries dependent

Digitized by Google

upon scientific research. The first of these, announced at the end of July, are all fellows of the Royal Society, namely: Lord Rayleigh, Mr. G. T. Beilby, Mr. W. Duddell, Prof. Bertram Hopkinson, Prof. J. A. McClelland, Prof. R. Meldola, and Mr. R. Threlfall, with Sir William S. McCormick as administrative chairman.

The Advisory Council will primarily advise on (1) proposals for instituting specific researches; (2) proposals for establishing or developing special institutions or departments of existing institutions for the scientific study of problems affecting particular industries and trades; (3) the establishment and award of research studentships and fellowships. The council will keep in close touch with all government departments concerned with scientific research, and it will have regard to the research work which is done or may be done by the National Physical Laboratory. The Royal Society and the chief scientific and professional associations, societies and institutes, also the universities, technical institutions and other institutions in which research can be efficiently conducted, will all be brought into close co-operation with the council.

It is believed that the scheme which is briefly outlined above will meet the requirements of the case. Perhaps the chief drawback at the moment, and indeed for several years to come, will be the small funds which will be available. For the first year a hundred thousand dollars is to be allowed, but as the establishment gets well to work far larger allocations will be needed. The important thing, however, is that the first step has been taken. It should mean much for British industry.

RATES FOR LIGHTING AND POWER.

Central-station officials frequently meet the question of determining the rate which shall apply upon energy furnished to a motor-generator set which is used at least in part for lighting purposes. The consumer usually contends that a power rate should apply, whereas from the company's standpoint there is no reason why the lighting rate should not be applied to at least so much of the energy as is used for lighting purposes. The fact that energy undergoes some transformation in the motor-generator set does not change the characteristics of this portion of the load.

The question is called to our attention at this time by a case which came up in Scotland and was carried into court for decision. In this particular instance the court decided in favor of the customer, the reason for the decision apparently being that the evidence presented did not bring out clearly the distinction between the uses to which the energy is put and their relations to the rate schedule.

It is well to remember in this connection that the fundamental distinction which properly affects rates is that of the conditions of use rather than the purpose to which the energy is applied. It is convenient to classify customers according to the use of energy, since definite uses usually signify definite conditions with respect to load-factor and other important elements. With the fundamental basis for the distinction of rates in mind, there should be no difficulty in applying the correct solution to any particular case.

COST OF LIGHTING AND POWER SERVICE.

We do not have to go so far afield to find indications of a lack of perception of the elements of cost in furnishing electric service. The Public Service Commission of Indiana, in a decision referred to on other pages of this issue, displays as little acumen in this connection as did the Scottish magistrate. In an opinion in the case of the Merchants Heat & Light Company, the Commission assumes that there are only two reasons for a distinction in rates between lighting and power customers. One of these is the potential competition of isolated plants, which makes the value of the service less per unit of energy in the case of the power customer. The other is the fact that most electric central stations were started for the purpose of supplying electric lighting and the power load has been a more recent development which it is justifiable to take on at an income which does not supply a proportional amount of the overhead charges. In the words of the commission, "It necessarily costs just as much to generate the 200 kilowatt-hours for power as it costs to generate the 200 kilowatt-hours for lighting, and the only reason for making the difference in favor of the power rate is an arbitrary one, because the business will stand the rate in the lighting case and will not stand it in the power case."

This indicates an unfamiliarity with some of the basic elements of the cost of service. If the statement were true it would mean that a power station which supplied energy for motor load alone, such as a street-railway generating plant, could not furnish electric energy any more cheaply than a central station supplying energy for lamps alone. Actual instances abound which disprove this contention. The fallacy lies in the fact that while the cost of generation does not depend upon the use to which the energy is put, it does depend upon the load-factor of the system, and this is invariably much higher for a motor load than for an exclusive lighting load.

As an example of a system which supplies almost entirely a motor load, we might mention the Rand Mines Power Company in South Africa, which has a load-factor of about 75 per cent. This element of load-factor alone would make the investment cost per unit under such a condition only one-seventh of the cost of supply for a lighting system where the load-factor is but ten per cent. Operating costs are also lower in the former case. This does not take into consideration, either, the fact that the cost of distribution is much less where the energy is supplied in bulk to large customers than where it must be distributed to a large number of small customers.

Digitized by Google

Plans for Boston Electrical Exposition.

Preliminary plans for an electrical exposition on a larger scale than has thus far been attempted have been formulated in Boston, Mass., to the extent of deciding to hold such an exhibition in connection with the Pilgrim Tercentennial in 1920, and the appointment of an organization to undertake the work. The exposition will be held under the auspices of the Edison Electric Illuminating Company of Boston, and the following Edison men are in charge: Charles J. Hatch, manager; C. E. Greenwood, assistant manager; L. L. Edger, secretary; W. H. Francis, treasurer; L. D. Gibbs, publicity manager.

There is a project for the erection of a permanent exposition building, with the backing of various public service companies of Boston and New England, which shall be used not only for the great Electric Show, but also for all kinds of expositions and conventions held subsequently. It could also be the home of a permanent electric display and demonstration, in which manufacturing companies would occupy spaces and present a line of their products week by week. It is believed that owing to the fact that many electrical inventions originated in Boston and its neighborhood, there is a peculiar fitness in holding such a public exhibition of electrical progress on the ground first settled by the Pilgrims. A State Commission has been appointed by the Governor to develop plans for the occasion.

Another Perpetual-Motion Primary Battery.

A man named George S. Engle has been indicted in Washington, D. C., for obtaining money under false pretenses in promoting companies to manufacture and sell a "self-generating and recuperative" primary battery. Not only was it promised that the battery could run automobiles and airships, but it was to "furnish light, heat and power at less than half the cost of coal." The following brief and lucid explanation of the action of the battery was given: "We break the molecules of oxygen in a chemical action and reaction, and get a free discharge from the electrons concealed in the oxygen so that the same volume of our current contains more power than the same volume of the old current in primary batteries."

The laws of electrochemistry would have to be re-written. The battery had already attained a zinc efficiency "5.98 times the theoretical figure." A test by the Bureau of Standards, however, failed to show that the established laws of physics and chemistry needed any revision, whereupon disillusioned stockholders laid charges before the district attorney, and the indictment followed, but after a delay of a year and a half.

It is stated that $100,000 had been received from the sale of stock. There were to be several interlocking companies, the principal ones with their capitalizations being: American Elementary Electric Company (parent company), $25,000,000; Auto Company, $50,000,000; Motor boats, $25,000,000; railroad train lights, $25,000,000; State Companies, $210,060,000.

Thomson Quarter Century Club Meeting.

The fifth annual meeting of this organization was held at the "Suntang Inn," Lynnfield, Mass., on July 31, and was attended by about 200. To be eligible for membership a person must have worked continuously at least 25 years for the Thomson-Houston Electric Company and its successor, the General Electric Company. The membership this year is 225.

At the banquet while the speaking was in progress the electric lights suddenly went out. A waiter rushed for a candle, which was lighted and stuck into a cigarette box, and this furnished all the illumination during a part of the program. Prof. Elihu Thomson, after whom the club is named, made the incident the occasion of a forcible reminder of the progress made in lighting.

Walter C. Fish, manager of the Lynn plant of the General Electric Company, made a plea for union and co-operation. Another speaker was Albert L. Rohrer of Schenectady, a former engineer at the Lynn plant.

Each member of the Club was presented with a solid gold button with the words "Thomson Quarter Century" around the edge, and the letters "GE" in the center.

The present committee consists of Frank P. Cox, Daniel B. Gauchet, John Morse, Edw. H. Kelley, and William B. Murray. L. S. Urquhart was chosen secretary.

Joint Meetings at San Francisco.

The Institute of Radio Engineers will hold two joint sessions with the American Institute of Electrical Engineers on September 16 and 17 at San Francisco, Cal. One paper, by Harris J. Ryan and Roland G. Marx, is entitled "Sustained Radio-Frequency High-Voltage Discharge." This paper considers the flame and brush types of discharge obtained from conductors when a powerful arc generator is used to apply voltages up to 50,000 volts at frequencies as high as 200,000 cycles per second.

At the session on Friday, September 17, Robert H. Marriott will read a paper entitled "Radio Development in the United States."

Plans for the New York Electrical Exposition of 1915.

In the relative importance of electrical achievements as chronicled in the annals of past New York Electrical Expositions, the show of 1915 is to record the introduction to the public of a scientific triumph which takes precedence over all recent wonders. Visitors at the Electrical Exposition are to be in hourly telephone communication with the Panama-Pacific International Exposition during the afternoons and evenings by means of the new transcontinental telephone line. A demonstration hall similar to that at the San Francisco Exposition will be constructed in Grand Central Palace and all of the 250 seats will be provided with telephone receivers so that the two audiences, one in New York and the other in San Francisco, may listen to greetings from each other at the same time. In considering the practicability of carrying on the demonstrations it was discovered that the difference in time between New York and San Francisco favored the project. Simultaneously with the first daily demonstration in San Francisco at 11 o'clock in the morning the early afternoon audience will have assembled for a 2 o'clock demonstration at Grand Central Palace. Likewise the hourly demonstrations in San Francisco beginning at 1:30 and ending at 5:30 o'clock in the afternoon will synchronize with those in New York from 4:30 to 8:30 p. m.

The importance of this will be readily appreciated when it is pointed out that to carry on the present demonstrations in one direction only the wire must be reserved for one-half hour on six occasions daily. The commercial toll rate for three minutes is $22, so that the value represented in the use of the wire for the ten days of the Exposition is $13,200.

The Telephone Company will probably transfer its transcontinental station temporarily from Lispenard Street to the Palace. Both in New York and San Francisco a lecturer will explain with the aid of moving pictures the construction and electrical and mechanical wonders of the transcontinental line. While both lectures are in progress the audiences will take up the small individual telephone sets and the talking across a continent will begin.

It is obvious that the Telephone Company will reap an advantage by the adoption of the plan, for instead of demonstrating to one audience there will be two demonstrations going on at the same time on the same connection. In other words the Telephone Company will double the advertising effectiveness of the connection without increasing the cost or the period for which the line is reserved.

Digitized by Google

Electricity in Cement Manufacture.

By Norman G. Meade.

This article deals with the application of electric drive and central-station service to cement manufacturing with a discussion of the processes involved and the characteristics of the motors best suited for the various services.

Owing to severe operating conditions, heavy overloads and the constant presence of grit and dust, cement mills present exceedingly trying conditions from a power standpoint. Electric drive has, however, proven entirely successful in this industry and has many advantages. Induction motors are largely used owing to their practical immunity from damage by dust and to the fact that nearly all cement-making machinery has constant-speed characteristics. When individual drive is used the motor and its coupling to the machine, of whatever type, may be effectually encased if desired.

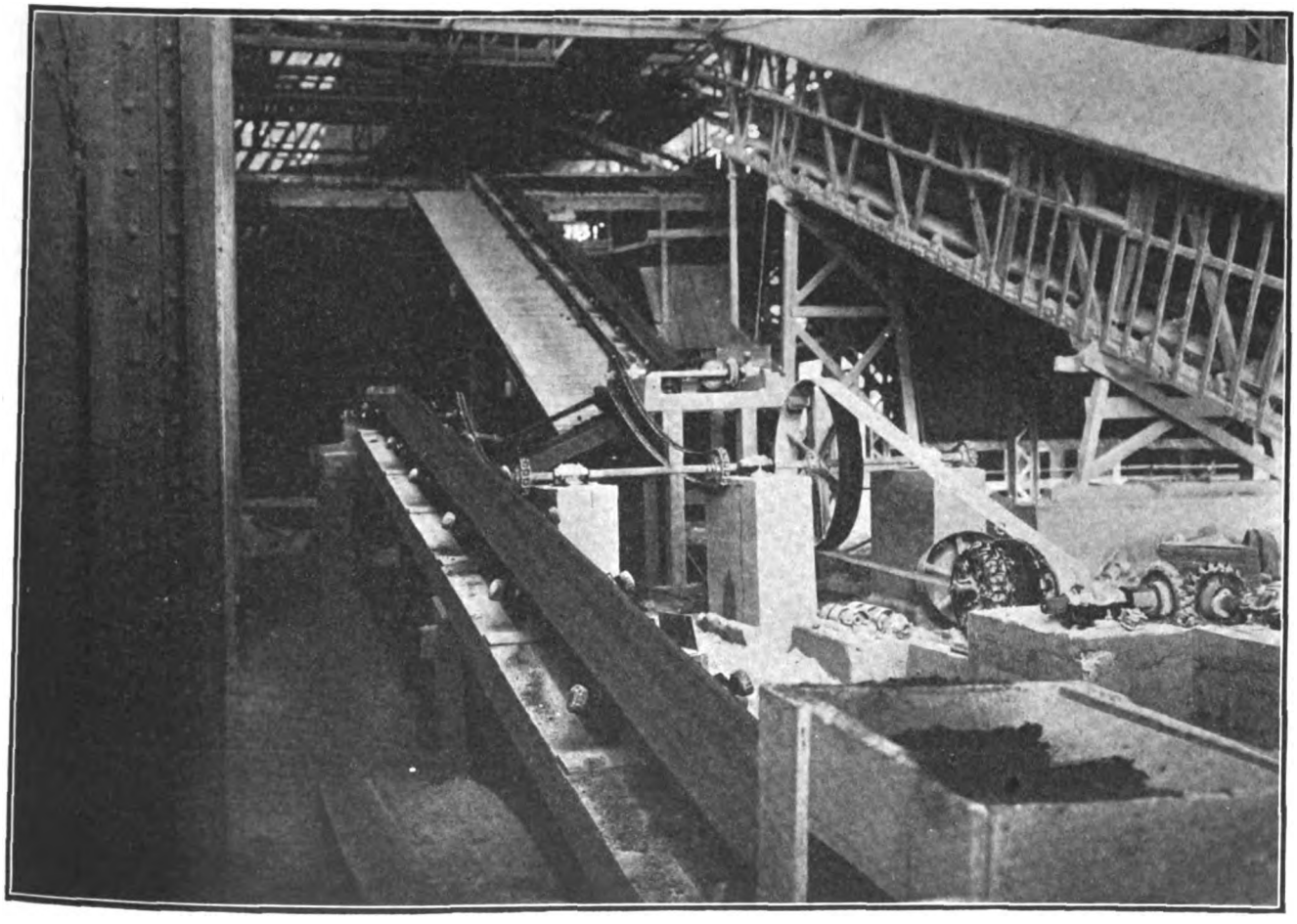
It can be readily realized that with so much grit in the atmosphere of the buildings, the bearings and shafting hangers are subjected to extremely rapid wear, causing excessive expense for renewals, and greatly increased friction losses. Again many of the machines have but intermittent service so that the flexibility of electric drive adds another important advantage, not only from the standpoint of flexibility, but from decreased power costs. The machines may be located in the logical positions for proper sequence of operations which is rarely possible where mechanical drive from a central source of power is used.

Cement-making machinery, especially rock crushers, are subject to excessive overloads and the power requirements fluctuate widely during each revolution. Where belting and shafting are used in connection with a centrally located prime mover, the equipment of shafting, hangers and belts must be abnormally heavy and the building construction must be of superior strength on this account. The matter of flexible control, which is possible with electric drive, is also important as the driving motor is under the immediate control of the operator and can be placed in the most convenient point of advantage. With mechanical drive, starting and stopping is necessarily dependent upon a counter shaft or similar device which must be located with definite relation to the main line shaft.

Increased production is another important feature of electric drive in cement mills. The widely fluctuating loads are met by the motor and gearing, or couplings, without material changes of speed, but where belting and shafting are employed the slippage causes widely varying speeds of machines with a distinct loss in production. Another feature is the necessity for delivering power to scattered locations.

The raw products for the manufacture of cement are quarried and the quarry is frequently some distance from the mills. The buildings themselves are also more or less separated in many instances. Under such conditions, if steam engines are used for power, numerous small units with low efficiency are required and in the case of the quarry a separate boiler plant is frequently necessary. When central-station service is used in connection with motor drive a system of high efficiency and great flexibility is the result.

Small cars are generally used for trans-



Fifteen-Horsepower Squirrel-Cage Motor Driving Conveyor in Storehouse.

Digitized by Google

porting raw material from the quarries to the mills. Where central-station service is available these cars can be equipped with motors and the cumbersome cable haulage, or the slow and unsatisfactory mule drawing, can be dispensed with, insuring greater tonnage per unit of time with reduced number of employees. Furthermore central-station service is admirably adapted to cement mills as there is little use for steam in the manufacturing processes and the buildings are but slightly heated, so that a small low-pressure boiler equipment answers every requirement.

two methods of manufacture, both well adapted to the character of the materials used, and known respectively as the wet process and as the dry process.

Wet Process.

Clay and chalk are mixed together with a large quantity of water, in a circular wash-mill or basin provided with heavy harrows attached to the horizontal arms of a revolving vertical shaft. By this means the chalk is thoroughly pulverized and incorporated with the clay in a semi-fluid state. The proportions are about one of clay to three of chalk by weight. When a thorough mixture of the ingredients is thus effected, the liquid mass, resembling whitewash in appearance, is conducted into large reservoirs called backs, where it is left to settle.

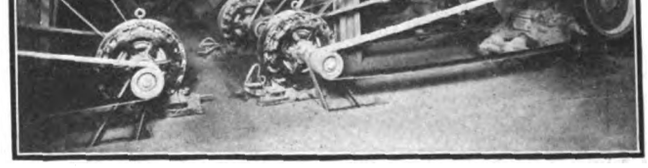
When the heavier material, or raw cement, has settled to the bottom, and the surplus water has become clear on top, the latter is drained off. By subsequent evaporation, the drying process is continued until the raw cement has attained the requisite stiffness.

During the time the mixture remains in the backs, samples of it are taken from time to time and made into cement by burning in sample kilns, in order to test the accuracy of the proportions. When by evaporation, the raw mixture has attained the consistency of stiff clay, it is taken out of the backs by shovelfuls and in that form and condition is removed to rooms and artificially heated or spread out around the tops of the kilns and further dried.

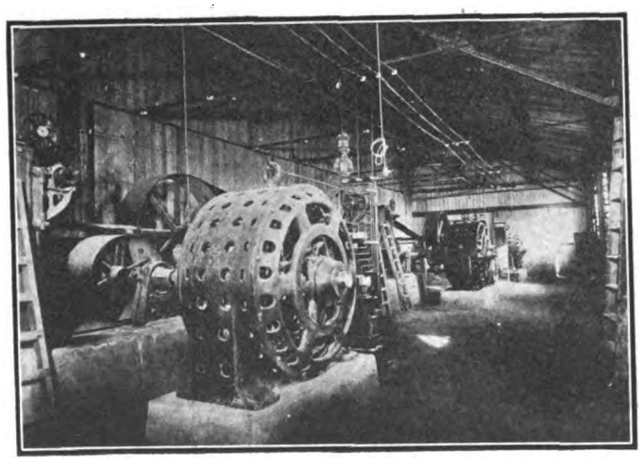
After being dried, although it is not necessary to expel all of the moisture, the cement is burnt in suitable kilns to nearly a white heat, just below the point of incipient vitrification. The kilns may be intermittent or perpetual, the latter being most economical in operating expenses, though somewhat more costly in outlay for construction.

When properly burnt, the pieces of cement called clinker, are of a greenish-brown color, contorted and much shrunken from the heat. The cement clinker is then finely ground between ordinary mill stones, packed in barrels, each containing about 400 pounds net and sent to market.

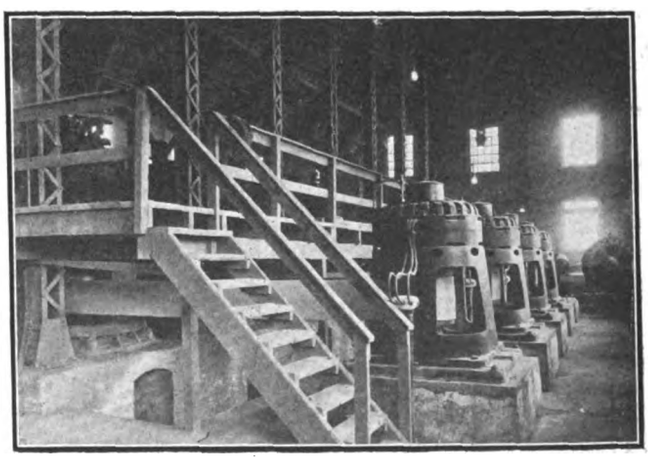
Thirteen 200-Horsepower Squirrel-Cage Motors Driving Tube Mills in Adjoining Room.



Six 40-Horsepower Motors Driving Kent Mills—Chicago Portland Cement Company.



250-Horsepower Squirrel-Cage Motors Each Driving Two Tube Mills.



75-Horsepower Squirrel-Cage Motors Driving 42-Inch Fuller Mills.

Process of Manufacture.

The constantly increasing use of concrete for building has enormously increased the demand for cement and when it is considered that, as stated by authorities, fully nineteen-twentieths of all Portland cement used at the present time is artificial, it will be realized how great is the number of mills required to supply the demand.

In general, Portland cement is made by thoroughly mixing together, in suitable proportions, clay and finely pulverized carbonate of lime (either chalk, marl, or compact limestone), burning the mixture in kilns at high heat, and then grinding the burnt product to a fine powder between ordinary mill stones. There are

Dry Process.

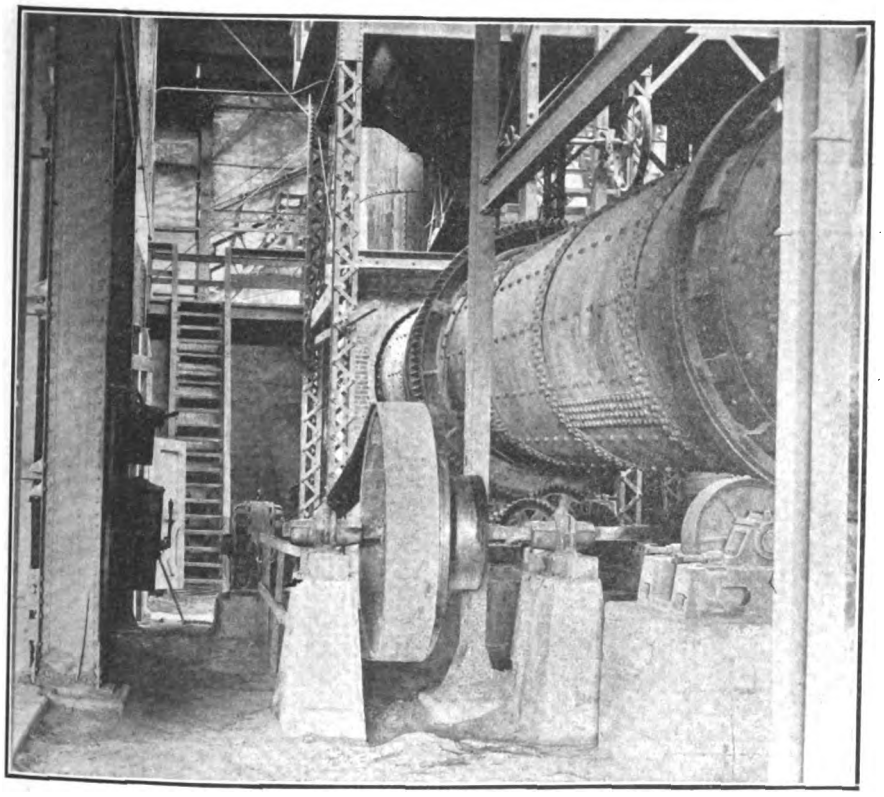
By the dry process any of the compact lime stones, as well as the chalks and marls, may be used in making Portland cement. The raw materials, the carbonate of lime and the clay are kiln-dried at 212 degrees Fahrenheit, in order to expel the moisture and prevent caking in the kiln, and otherwise facilitate grinding and sifting. After drying, the clay and the carbonate of lime are mixed together in suitable proportions and reduced to fine

Digitized by Google

powder. In most localities the proportion will vary from 20 to 23 per cent of clay and 77 to 80 per cent of the carbonate.

One kind of machine will not suffice for grinding the raw material economically. Three machines are generally used in the dry process: A stone-breaking machine of the kind usually employed in breaking stone for roadways or for concrete. Through this the dried and mixed materials are passed, issuing therefrom in pieces varying from the size of a pea to that of a hen's egg. A further reduction is effected by a vertical mill or edge-runner. The material is then finely ground between horizontal mill stones.

The powdered material is then tempered to a rather stiff paste in a brick-making machine, and made into bricks of suitable size for burning. During this mixing the material is kept warm and the water used for tempering is rendered strongly alkaline by adding 3 to 6 per cent of calcined soda and an equal amount of newly burnt slacked lime. The bricks are dried by artificial means and then burnt at a high heat and ground to a fine powder as in the wet process. The same number of mills is necessary for grinding the cement as for pulverizing the raw materials. The clinker is first put through a stone-breaking machine, then into a vertical mill or edge-runner, and lastly is ground to an inpalpable powder in a horizontal mill.



75-Horsepower Motor Driving Rotary Dryer, 6 by 50 Feet.

In 1914 the United States produced 1,247 tons of asbestos, valued at $16,810.

New Method of Making Service Connections.

A system of underground construction, known as the split-fiber system, has been inaugurated by the Boston Edison Company in locations where the regular conduit or tube systems are not warranted because of their cost, and where pole locations cannot be obtained.

The system consists of a three-wire low-tension main made up of two 4/0 conductors laid side by side, each in a two-inch fiber pipe, along the top of which a slot has been cut. The conductors, which are ordinary weatherproof line wires, are placed in the pipes, which are then filled with melted coal-tar pitch. This solidifies on cooling and waterproofs the line wires. The neutral wire is an ordinary 1/0 weatherproof line wire laid in the earth between the fiber pipes. After the pitch cools, the two fiber pipes are covered by a two-inch Kyanized spruce plank to protect the main from disturbance if excavation is made later.

Small wooden boxes 12 inches square and 6 inches deep contain the service connection, the fiber pipes being cut off flush with the inside of the box. Fiber pipe 2.5 inches in diameter is used for connection with the building, with standard rubber and lead cables. The box is filled with molten pitch and a plank cover laid over it. If an additional service is required on the line, it can readily be added by building a service box on the existing main, opposite the house.

The new system, while more expensive than overhead construction, is much more economical than the regular conduits, with manholes, lead-covered cables and wiped joints. An experimental installation made several years ago in Dorchester has been found unimpaired on examination recently.

Electric Cookers for Workmen's Houses.

On the advice of its electrical engineer, C. S. Davidson, the Barnes (England) municipal council will put twelve electric cookers, costing $20 each, in some workmen's cottages that it has had built. This figure includes cost of wiring and installation. Calculating upon a life of ten years for the cooker, and allowing for five-per-cent interest and redemption of capital during that period the yearly rental is to be fixed at $2.50. The makers of the cookers offered to maintain the cookers at $1.25 each per annum, but Mr. Davidson believes that if his department does this work the cost will be considerably less. The charge to consumers is to be two cents per kilowatt-hour. Experience of the different seasons leads the engineer to expect a yearly consumption of 624 kilowatt-hours per cooker.

Electric Light Plant for Construction of Dam in Wilderness

In the construction of a 1,000-foot dam for the Great Northern Paper Company, at Ripogenus Gorge, on the west branch of the Penobscot River in northern Maine, a complete electric lighting plant has been installed by the Aberthaw Construction Company, of Boston, which is doing the work. A small power station has been built and a generator set with a 25-horsepower gasoline engine installed. This furnishes ten 1,000-watt nitrogen-filled lamps for construction work, which is being prosecuted at night, and also lights the camp buildings.

The development at Ripogenus is a link in the extensive hydroelectric development of the river for paper manufacturing purposes. The dam is 50 miles from the railroad, and will form a lake 25 miles long as a reservoir for generating power.

Utility Sells Stock to Customers on Partial-Payment Plan.

The Northern States Power Company, operating plants in Minnesota, Wisconsin and Illinois, has decided to sell stock, in amounts not exceeding 10 shares, to its customers on the partial-payment plan, at the rate of $5 per share per month. The company in making this offer took into consideration the value of having a large number of customers stockholders.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Unique Advertising Stunt of Dayton Company.

An innovation in electric-fan advertising was the scheme adopted by the Dayton (O.) Power & Light Company of placing 12 16-inch oscillating fans on the same number of lighting standards on two blocks of Main Street on July 31. Attached to each standard was a sign reading, "Keep Cool. The Dayton Fan & Motor Company Made In Dayton Electric Fans Operated by the Dayton Power & Light Company."

While the fans were placed simply as an advertisement many shoppers took advantage of the breeze and all of the papers commented favorably on the installation.

The Dayton *Journal* made the following interesting comment:

"Shoppers, market tenders and patrons extended thanks Saturday to the Dayton Power & Light Company for thoughtfulness for the welfare of the public, shown when during the early morning there were placed a dozen 16-inch oscillating fans at various vantage points along the east side of Main Street between Third and Fifth Streets.

"That the innovation was appreciated and proved popular was shown by the large number of those who stopped in their journeys up or down street long enough to enjoy to the full the cooling breezes produced by the wind stirrers. Newsboys pushed each other for places of vantage, while tired and heat-fagged marketers halted in their paths with sighs evidencing the relief they felt.

Incidentally the innovation was just another evidence of the enterprise of the power and light company in contributing its share to the general welfare work of the community."

Large Power Contracts Secured at New Orleans.

All electricity for light and power for the New Orleans Cotton Warehouse and Terminal will be supplied by the New Orleans Railway & Light Company, according to the terms of a contract recently signed. The connected load will aggregate 2,800 horsepower. The terminal project is a development of great interest and importance to the entire country, as it is designed to establish New Orleans as a great deposit market for cotton. The plant covers 150 acres, with yard tracking for about 2,000 cars and a cotton storage capacity of about 675,000 bales. Electric locomotives will be used exclusively for handling trains within the terminal.

Another important power contract recently secured by the New Orleans company calls for an installation of 882 horsepower in motors and 12.5 kilowatts in lighting, for the operation of a 200-ton raw-water ice plant, for icing fruit cars. There are two main ammonia compressors, each driven by a 350-horsepower 2,300-volt motor, two deep-well pumps are driven by a 35-horsepower 2,300-volt motor and the auxiliaries requiring from 1.5 to 20 horsepower, are driven by 230-volt motors. These auxiliaries aggregate 112 horsepower. The plant has been running about five weeks, and in the first month the consumption was 322,000 kilowatt-hours.

The load is particularly valuable to the company, as it is off-peak.

Parcel-Post Delivery of Lamps Successful in Boston.

The delivery of incandescent lamps by parcel post has proved so satisfactory in the Boston territory that the Boston Edison Company is rapidly extending this system to cover all outlying districts. The delivery by mail is found much more economical and satisfactory than the old method of periodic wagon delivery, and this is especially true in localities where branch electric shops have been established. It has been the experience of the Boston company that during the summer months effective calls drop down to as low as 17 per cent of all calls made.

Novel Method of Advertising Electric Shop.

At the recent outing of the benefit association of the Union Gas & Electric Company, Cincinnati, O., held on July 24, the employees of the Electric Shop made a decided hit, being marked by enormous sun-flowers, worn as badges, and having with them a goat as a mascot. The latter was paraded over the grounds wearing a blanket bearing the name, "Electric Shop," and the force was much applauded for its showing.

Group of Electric Shop Employees With Mascot.

Hot Weather Sales Record at Toledo.

April 26 was the hottest day for that month in Toledo's history, exactly as was the case in New York, Chicago and many other cities. But the new-business department of the Toledo Railways & Light Company perspired to some effect and much profit. Sensing the talking point advanced by nature the salesmen chalked up this record: 26 electric fans, 18 electric irons, 14 vacuum cleaners, 1 motor driven meat chopper, 1 electric vibrator, 100 horsepower in motors, representing seven contracts; 1 sewing machine motor and several house-wiring contracts.

Digitized by Google

Electric Meter Housing for Rural Districts.

The Pacific Power & Light Company, Portland, Ore., has recently adopted a simple and effective housing for electric meters installed in ranch sections of its territory. This housing, shown in Fig. 1, has been designed to carry both meter and switch, in upper and lower compartments, respectively, and is provided with peaked roof so as to make it watertight.

Fig. 1.—Meter Housing for Rural Installations.

The outside cover, or door, for the lower section is fastened with screws, and only to be removed for testing or repairing of meter; the upper door is hinged at the bottom to allow of ready access. Two small rectangular holes, provided with glass, are arranged in the lower door to allow for meter reading without opening.

A view of the meter housing as used in operation is shown in Fig. 2. These boxes, painted a light gray color, are mounted on a substantial framework several feet from the ground. When desired, however, they are placed directly in the pump house.

Used primarily in the irrigation districts for individual ranch owners who operate on a moderate scale, these boxes have eliminated considerable meter trouble as formerly evidenced. Many farmers do not go to the expense of erecting proper shelter for pumping equipment, and under these conditions the electric instruments are left exposed to the weather or covered by a few boards. This meter housing has gone far to correct this abuse.

B. C. Bailey, manager for the Pacific company at The Dalles, originated this plan.

Expansion of Electric-Vehicle Business in Boston.

Electric storage-battery trucks, replacing trolley mail cars, have been adopted by the United States government for the handling of mail in the postal district of Boston, Mass. The new vehicles begin service August 15.

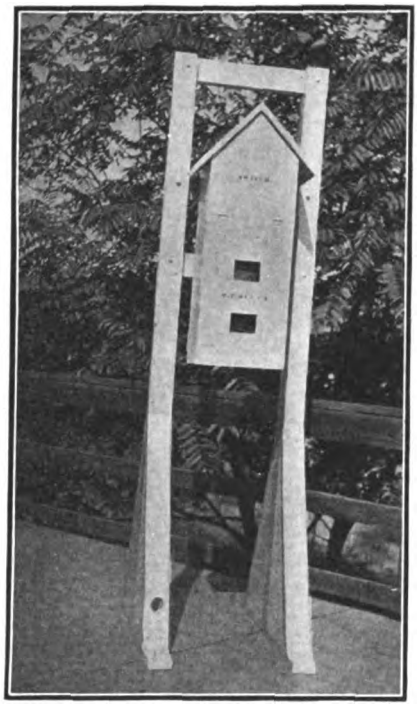


Fig. 2.—Housing as Used in Operation.

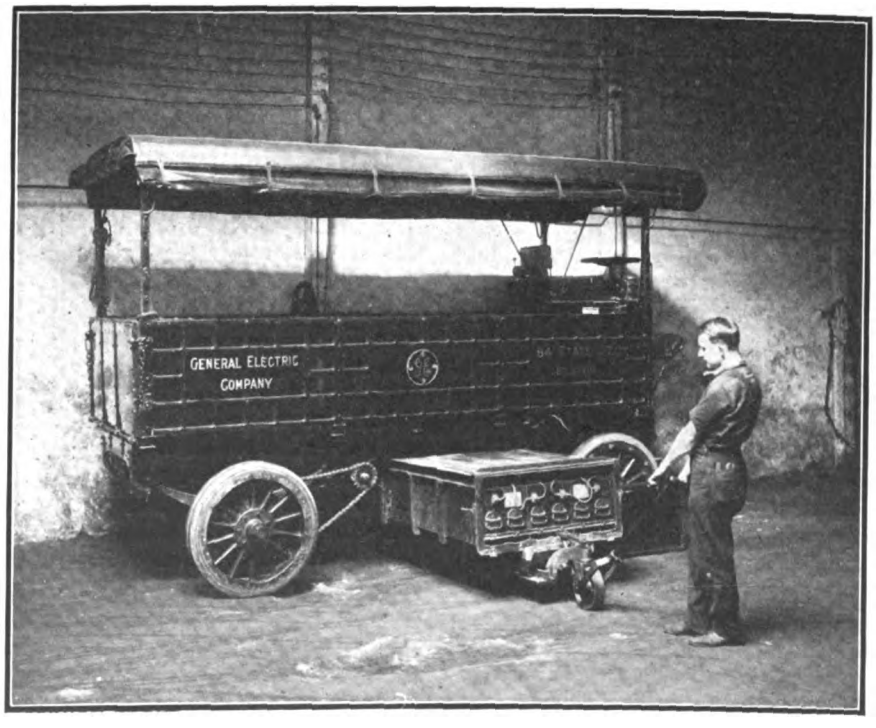
The Boston Mail Delivery Company, with a capital of $50,000, has been organized by the same parties who have the contract for handling the mails in the New York district. There will be 13 mail trucks, of General Vehicle Company manufacture, each of 1.5-ton rating. Ten trucks are for delivery only, and two for collecting the sacks from postal stations and delivering them to the general postoffice. The former will be manned by a chauffeur only, and the latter will have a mail clerk in addition to the chauffeur. Each of the Boston Elevated Company's mail cars run hitherto, has carried a conductor, motorman and clerk.

The sacks had to be taken from the loading platforms in the postoffice basement in horse-drawn wagons, which entered the building by a ramp from the street at either side, and then transferred to the cars, which stood in the center of the street. This double handling of the sacks is now obviated, the electric trucks entering the building and loading and discharging at the basement platforms.

Some of the suburban mail service now handled on the railroads will be performed by the new trucks. Mails "worked" at the north and south terminals will be handled by truck from those points, but sacks directed to the general postoffice, arriving by train, will continue to be hauled by wagon.

The longest run to be made on any route is 23.5 miles; the next longest, 18.5 miles. These runs cover a circuit of the suburbs and include stops at several sub-postoffices. The cars will be run during the day and well into the night, and some extra trips will be made on Sundays.

Garaging and care of the trucks will be performed at the Boston Edison Company's Atlantic Avenue electric garage, where interchangeable storage batteries will be kept charged, to be



Method of Handling Batteries in Boston Garage.

Digitized by Google

immediately substituted for spent batteries when the trucks come in from their runs. This service will be performed under the plan lately inaugurated by the General Vehicle Company, the Electric Storage Battery Company of Philadelphia and the Boston Edison Company, by which General Vehicle trucks are supplied with charged battery service on a mileage basis, as described in our issue of July 17.

The battery equipment consists of 44-cells, 15-plate Ironclad, and there will be 15 batteries for use of the cars. With the addition of two more trucks soon, other battery units may be added. Present charging facilities, which include 18 stations, are sufficient for present requirements, but with the growth of the electric-vehicle mileage-selling plan, the Edison Company may adopt a method of handling the batteries by means of an elevator which will bring up the units from a basement to position beneath the car, such as is in operation at the Hertford Street Garage in London, described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of August 15, 1914; or else provide roller runways to transport the batteries from the charging positions to a point alongside the trucks, whence the trays are rolled into place horizontally. At present, however, the batteries are moved on a hand truck, as shown in the illustration.

Those in charge of the Boston Mail Delivery Company's business say that the electric trucks will greatly facilitate the handling of Boston's postal matter, will diminish delays through the breakdown of trolley service, and deliver mails at suburban postoffices earlier than the Elevated Company's cars have been able to do it.

A Salesman's Window Display Competition.

Since the opening of the new Electric Shop in Little Rock, Ark., the problem of maintaining good window displays has proved an interesting and a difficult one, and in searching for the best solutions, a personal competition was inaugurated among the salesmen to see who could devise the one appealing display of electric appliances. Each member of the commercial department of the Little Rock Railway & Electric Company was delegated to take charge of the window displays for a week and dress the windows according to his own ideas, without assistance from the commercial manager or another member of the staff, thereby pitting each man against his fellows. The results have been surprisingly good, and in a great number of cases have developed an ability in the art of window dressing that the man himself had not suspected.

Mixing.

The United Gas & Electric Engineering Corporation, New York, controlling properties in some 20 cities, presents the following pertinent message to its employees in a recent issue of its monthly *Bulletin:*

No matter how large the holding or operating company of a public utility may be, much of the success of the subsidiary company is dependent on the personnel of the local representatives.

The holding company maintains a large variety of departments, always at the service of the underlying companies, to meet their needs in engineering, purchasing, advertising, selling, litigation, financing and other advisory capacities, and a general policy of operation is outlined at the "home office," subject to change or variation to meet local conditions, but for the net results, the dollars and cents that pay dividends, the local management is responsible.

Successful operation of the utility would not be possible if customers were dissatisfied, the public in arms against the corporation and dissension existed among employees. The hypothetical existence of conditions of this nature would seem impossible, and is for any length of time, yet there are companies operating today, in which such conditions exist in varying degrees, and principally because there is something lacking in the personal touch of the local representative.

It is impossible for a human being to grasp the true nature of the holding company, for he cannot visualize the object, it seems intangible, and for this reason it is the local management, the real flesh and blood individual, for whom the likes or dislikes of a community are formed. The local manager and his assistants, therefore, carry a large share of the burden of responsibility for the attitude of the public toward the utility.

So it behooves those of us who daily meet the customers of the company to demonstrate through our own actions and demeanor, that the word "corporation," as applied to the public utility, does not stand for the soulless, blood-sucking octopus as is popularly believed. It is up to us to be good "mixers," to make acquaintances and friends for ourselves and for the company which employs us.

Now there is mixing of many kinds and degrees. There may be on the one hand the exclusive type, which concerns itself with only the high and mighty of the locality, and, on the other hand, there may be the diffusive type that wastes itself on unimportant and useless acquaintances of the Tom, Dick and Harry" style. Neither of these is a perfect asset to the company, although, as a rule, the latter is to be preferred to the former, especially in the smaller cities and towns. While all people, particularly those immediately involved, deprecate pride or aloofness which borders on snobbishness, in the local representative, they also appreciate a certain amount of dignity.

In this matter, tact is a vital item. To know everyone, to be cordial and interested in each one, to make a personal and individual case with each, to avoid useless discussions, partisanship and cliques, to show to each that respect, cordiality, affability and geniality, demanded and approved by them, is the highest type of tactfulness, and is the best asset of the representative of the utility company.

Memberships in local commercial, industrial and benevolent organizations are valuable assets to the public utility if used actively. By this is not meant that the representatives of the utility should be "joiners" of every secret organization with the grip and password at their fingers' and tongues' ends, ready to take on any new responsibility suggested or offered—but in almost every city there are certain organizations, private, public, social and commercial, an active membership in which is often a strong factor in the popularity of the individual, and one which, if properly handled by him, will add greatly to the benefit to the company.

Another phase of vast importance is that representatives, from the manager down, be readily accessible to everyone, and if, at the time of inquiry, the person in question is out of the office or busily engaged, intelligent information should be given as to the earliest possible moment an interview may be had. Formality, delay and red-tape are things of the past with the up-to-date company, and should be relegated to the scrap heap along with other obsolete equipment.

Of course it is an acknowledged fact that "too much of a good thing is good for nothing," but there is the happy medium that must be striven for, and care must be taken that the part does not become greater than the whole.

The other portion of the problem is a personal one with the representative, if he forgets that he is only a representative and begins to presume an ownership of the corporation, and if instead of the corporational "we," he gets into the habit of the egotistical "I," then it is time for suggestion, guidance or criticism. It is a good motto to take as much interest in the business as though it were your own, but it is also well to be able to distinguish which is egotism, thoughtlessness and personal aggrandizement, and which is honest endeavor for the best interests of the company.

Digitized by Google

SUCCESSFUL COMMERCIAL MANAGERS.

Charles B. Yonts.

Charles B. Yonts, general contract agent of the Illinois Northern Utilities Company, serving a number of towns in the northern half of Illinois, has been closely identified with the sales end of the central-station business for the past nine years, and during that time has established an enviable record for achievement in furthering the uses of electricity for every purpose.

Starting with the McKinley Traction System in 1906 as sales manager at Danville, Ill., he was made manager of the new-business department for the entire system in 1910, and in this position had entire charge of the commercial activities of properties operating in a number of towns in central and southern Illinois, Iowa and elsewhere. In 1912 Mr. Yonts resigned to accept the position of general contract agent with the Illinois Northern Utilities Company, which position he now holds.

The most successful period of his experience was with this company from May, 1912, to August, 1914, during which period he doubled the number of electric customers on the lines. Most of the customers were taken on by a systematic house-to-house wiring campaign, subletting all of the work to the contractors, a policy which has had a great deal to do with the success of the campaign.

The company does the wiring on a basis of so much per outlet, enabling the salesman to make a price complete, ready to light, to the prospect on his first visit, making the same price per outlet to everyone.

Featuring special five-room house-wiring propositions has been of great assistance, as also the fact that the company has offered special inducements during the dull months of February and March and July and August of each year. In conjunction with the house-wiring campaign more than 4,000 electrically heated and operated appliances for the home have been sold. Most of these appliances have been sold at the regular resale prices, concessions being made only on special campaigns.

The profit from the sale of the merchandise, after a liberal handling charge has been added, has been more than enough to pay the operating costs of the sales department.

Another thing that aided materially in increasing the number of customers was the reconstruction of the street lighting systems of the different towns. Of the 39 towns in which the company operates 26 new street-lighting contracts have been signed during this period. In each case the candlepower of the lamps was increased, as was the cost of operation, yet, on account of the improved service, the increased cost was overlooked. In almost every case the street-lighting conditions created a lot of criticism favorable to the company, and, of course, was a good thing for the salesmen.

Regarding power business Mr. Yonts says: "We had a rather unusual experience in the power end of our electrical business in this territory. A large part of our power business is grist milling, this being a dairy district. We found mills in almost every town of 1,000 inhabitants or more. Most of these plants were using steam, and we got them changed over to motor drive. Later, we lost one customer by the

Charles B. Yonts,
General Contract Agent, Illinois Northern Utilities Company.

installation of a crude-oil engine, he being enabled to operate much cheaper than with electricity. We were then forced to use a more efficient machine, and to better appreciate the story, will say that the gristing is done with both the Burr and the attrition mills. The attrition mill has a much higher efficiency than the old Burr mill. In a number of cases we got the customers to change over to attrition mills, belt-connected to a motor. Still the operating costs were too high, and competition growing keener, we were forced to change over to the direct-connected attrition mill. This mill has an efficiency of almost three to one over the old Burr mill. I merely state this in passing to show that in a period of two short years some of our customers have changed their equipment three times to improve the efficiency, and in each case it paid. This forced us to bring the more modern appliances to their attention.

"My first experience in the electrical business, which might be well worth relating, was that of electric lighting to compete with gasoline lighting plants with a 10-cent rate per kilowatt-hour and 10 cents per gallon for gasoline. In a town of 15,000 inhabitants in 1907, when the tungsten lamp was first put on the market, we replaced 22 gasoline lighting plants with these lamps, which increased our annual income $4,000.

"The second step of my education was the electric sign business. We placed 69 signs in this same town within a period of 18 months. By selling the sign outright to the customers and giving them a flat rate of 10 cents per two-candlepower carbon lamp per month, burning from dusk until 11 o'clock each and every night of the year, on these signs alone our annual income was increased more than $8,000 While this was as far back as the year 1907, and might not be of interest to the present-day salesmen, yet there are just as great opportunities in some cities today as there were then, and no doubt if the same methods were employed the results would be equal.

"We are right now in the midst of a 'clean up' house wiring campaign. In our territory most of the prospects have been called on and given a price on the cost of wiring their residences for electricity. During the months of February and March we offer a 15 per cent reduction from our regular prices, giving the customer the choice of 24 months to pay, or five per cent discount for cash, and stating the reason for making this discount at this time, as that of keeping our men employed during a dull season. To avoid a bunch of orders coming in the last two weeks of this campaign period, we offered an inexpensive portable lamp with every contract signed during February.

"To appreciate our reasons for making this very special campaign, one must know that we now have better than one electric customer to every six inhabitants in the territory in which we serve, yet for the month of January we added 82 customers. We think the campaign successful so far, when general business conditions are considered."

Change at Grand Rapids.

Grand Rapids-Muskegon Power Company has changed its name simultaneously with a change in the incorporation of the Consumer's Power Company, in which it has been a subsidiary. The latter concern has ceased to be a Maine corporation and has reincorporated under the laws of Michigan. The Grand Rapids-Muskegon Power Company becomes a part of a new corporation and will hereafter be known as the Grand Rapids plant of the Consumer's Power Company.

Digitized by Google

Wiring Contracts in Columbus.

The Columbus Railway Power & Light Company, Columbus, O., is one of the central stations which is co-operating very actively with the electrical contractor in advancing the wiring of old residences as well as commercial properties.

The company has prepared a form of contract for residence wiring between customer and electrical contractor and this includes the deferred-payment feature. Payments when desired can be made in five monthly installments. Upon securing a customer this contract is turned over to one of the local contractors, each of those desiring this class of work being given an opportunity in turn to secure one of these contracts. The contract includes a schedule of outlets and fixtures for the various rooms of the residence, a general provision being to supply 40-watt lamps and pull-chain sockets. Concealed wiring is invariably specified. An extra page of the contract form is given over to illustrations of typical fixtures, a choice of which is offered the customer. One regulation set of fixtures with the accompanying wiring for an eight-room house is supplied for $49.75.

For commercial wiring the form of contract varies only in the form of schedule of outlets and fixtures, which provides for a greater variety of equipment. In this case no typical installation is offered for any specified sum, but the selection of equipment is left to the customer.

Commercial Growth of Northern States Power Company.

The Northern States Power Company, a subsidiary of H. M. Byllesby & Company, operating plants in Minnesota, Wisconsin and Northern Illinois, is maintaining its past record of new-business gains during the present year. In the two and one-half years ended June 30, the number of customers served advanced from 48,366 to 72,650, a gain of 50 per cent.

At Minneapolis the new-business gains of the first six months of 1915 were better than the new business added during the corresponding period of the year before. The electrical output for the period increased materially. A 65-mile transmission line is under construction to give service to Osseo, Rockford, Delano, Watertown, St. Bonifacius and Waconia.

A contract recently signed at St. Paul calls for power to operate 2,665 horsepower in motors in the Great Northern Railway shops and roundhouse. Service will begin soon to the new railroad building, where the lighting and power demands total 2,100 horsepower, or more than the electrical needs of many cities of 10,000 population. The first artificial ice plant in St. Paul will also be one of the company's new power customers.

St. James, Minn., has decided to close down its municipally operated electric plant and purchase current from the Northern States organization on a wholesale basis, the city doing the local distribution. Contract has been signed and a 14-mile transmission line will be built from Madelia to St. James. Mapleton, Minnesota Lake and Winnebago City are also new customers, the latter city having sold its municipal plant to a private company which will buy current at wholesale.

In the Fairibault territory Eagle Lake has recently granted the company a franchise and a six-mile extension will be run from Madison Lake. The village of Rosemount was recently added to the service and requests for service from a number of other towns are under investigation.

The Elizabeth Light & Power Company, Elizabeth, Ill., has entered into a 20-year contract with the company for its supply of electric energy. High prices for zinc ore have caused unusual activity in the Illinois-Wisconsin zinc mining field, where the organization supplies power to the mines and reduction plants. Recently 200 additional horsepower has been installed in mines, and several hundred additional horsepower are in prospect.

Initial Concentric Wiring Installation in Boston.

The Boston Edison Company has wired three houses with bare concentric wire in the Roxbury District. Data as to the cost of the installations have not been worked out as yet, but it is evident from the hours of labor involved in the last installation, as compared with the first, that costs under this system will be as low as its advocates have forecasted.

In wiring the third house, which has 20 outlets, about 22 hours of workmen's time were consumed in talking with interested visitors and explaining to them the mysteries of the novel system, and also in experimenting and in learning the best and most efficient methods of work.

General Electric Company tinned-copper solid shell conductor was used, with twistons and American fittings. Lights have been turned on in the houses, to the full satisfaction of all parties concerned. It is expected that the special concentric fittings which are being developed by the General Electric Company will be ready for use in the autumn.

Eight houses have been wired under the bare concentric system in Baltimore.

San Francisco Has Largest Electric Sign.

Berry Brothers, varnish manufacturers, have an electric sign at San Francisco which is 100 feet long and 50 feet high. It is said to be the largest in the world. This sign flashes at the rate of over 2,500 flashes per minute. The following information of the sign is of interest: The aggregate candlepower of the lamps used for illuminating the sign totals over 100,000, representing lamps of every conceivable size and color. The electrical construction represents over 75,000 connections and six months' time was required to build and erect the sign. Approximately 550,000 feet of wire and 2,857 switches were used.

The sign operates day and night except on Sundays.

Electric Ventilation for Harrisburg Schools.

The Harrisburg (Pa.) Light & Power Company has invaded a new field, which promises interesting and profitable development, through the adoption of electric motor-driven ventilating systems for the public schools. The first two installations have brought one 5-horsepower and one 10-horsepower variable-speed motors to the lines. The public schools in Harrisburg have heretofore been ventilated by engine-driven fans operated in connection with the steam-heating plant, and during extremely cold winter weather it has always been found difficult to get up sufficient steam to produce satisfactory ventilation for the opening hours of the morning session. The electric ventilating system will eliminate this trouble.

Increased Capacity Galena Power Plant.

Continuously increasing demands for electrical power in the Illinois-Wisconsin zinc mining field have necessitated the installation of a 2,500-kilowatt turbine in the steam station of the Interstate Light & Power Company, at Galena, Ill. The new unit will be installed by the engineering department of H. M. Byllesby & Company, together with a number of improvements in the boiler room. When the work is completed the Galena station will have a total capacity of 10,000 horsepower.

Electric Iron as Premium.

A premium in the shape of an electric iron is offered by the Nashville (Tenn.) Railway & Light Company, to those who during a stated period contract for wiring of their homes. The work is done on the basis of easy payments to run through the year.

Digitized by Google

Electrical Construction

CO-OPERATION OF THE CENTRAL STATIONS WITH THE ELECTRICAL CONTRACTORS AND DEALERS IN ELECTRICAL SUPPLIES.[1]

By S. V. Walton.[2]

Co-operation, in order to amount to anything, must directly benefit the co-operators and before one would-be co-operator can benefit another he must know him and know something about his problems. Such occasions as this tonight furnish the opportunity to get acquainted with the other fellow, and once the ice is broken, if there is a mutual desire to get at the bottom of things, there is no further difficulty, providing the desire is sincere and each of the parties to the transaction has confidence in the other.

The men gathered in this room represent one of the greatest industries of the age, although yet in its infancy, an industry that undoubtedly will play a very important part in the future development of this great country of ours. I think I am safe in saying that electricity is already looked upon as the servant of mankind, one that never complains and is always on the job, and it is easy for me to imagine how it can be made to serve in countless places where it has not yet been put to work in the various industries, on the farm and in the home.

The business naturally divides itself into two branches—the central stations that supply the energy and the other interests—manufacturers, jobbers, dealers and contractors—that supply, or should supply the devices for utilizing that energy, putting it to work, if you will, so that it will be of some benefit to mankind. The central stations have their problems peculiar to themselves, many of which they have already solved, and the other interests named have their problems. I believe this association of contractors and dealers is maintained for the purpose of solving these problems.

The fact that there are problems that are of mutual interest to the two branches of the industry just named has been recognized for some time and various attempts have been made to bring about the proper kind of co-operation. Some of these attempts have met with success, but more of them have failed, largely because of lack of confidence on the part of one or the other, and as long as this lack of co-operation exists there will be no real co-operation.

W. W. Freeman, of Cincinnati, one of the best known central-station men in the country, in a talk before our Electrical Development and Jovian League, during the recent N. E. L. A. convention, gave a definition of co-operation that appealed to me. He said in effect that real co-operation was working together on equal terms with confidence on each side, for the accomplishment of something that is of advantage to all those interested. He objected to the expression "team work," as that, in his mind, implied the thought of being driven, and no real lasting results can be accomplished unless the co-operation is spontaneous.

It is my opinion, and that of the company I represent, that there exists at this time between the central stations on the one hand and the contractors and dealers on the other, a fairly good understanding of each other's problems, a feeling of confidence on the part of each that the other is going to play the game fairly with all the cards on the table, and for all there is in it, and a mutual desire that is spontaneous to work together, each looking out for and respecting the interests of the other, for the simple reason that by so doing the interests of both will best be served and the industry as a whole be benefited most.

This condition of affairs has not been brought about over night or by any miracle, but by years of patient effort on the part of a few who have long realized the necessity of such co-operative work. I believe the work of perfecting the organization of contractors and dealers has been one of the hardest things to accomplish, largely on account of the large numbers interested and the great diversity of interests, and great credit is due to the men who have worked so hard and so long in bringing this situation about.

Probably the central stations have been to blame to some extent for the delay. I am sure they have not helped as much as they could, but how could they treat with every contractor and dealer separately? They were organized, and it remained for the other interests to become organized, so as to deal with them on an equal basis. I am reminded at this point of a story I read a few days ago, which I think will apply and help to bring out what I have in mind.

"There was a darky down in southern Indiana, who was walking through the fields and had a long blacksnake whip—regular old Missouri eleven-inch tip—and he was so expert he could take a petal off a flower. His friend said to him: 'Can you kill a bee?' With certain deftness he cracked his whip, killed the bee, and then his friend asked, 'Can you kill two bees in succession?' and he took that blacksnake and crack! crack! he killed two bees and then four bees in succession. Finally he struck at a bee up in the tree and he hit a hive, and all the bees immediately started after him. They let his friend alone, for they seemed to know who had done the damage. Well, he dropped his blacksnake and ran, with the bees all after him, and his friend yelled after him: 'Why don't you use that blacksnake?' and he cried back, 'Why, man, those bees are organized!'"

After all, if each of the interests will stick to the job, the central stations to manufacturing and selling to their consumers electrical energy, the contractors and dealers, backed up by the manufacturers and jobbers, to supplying such consumers with devices for consuming the energy, and both working in full confidence in each other to make electricity in the fullest sense the servant of mankind, not only will the interests of both be served, but incidentally the poor consumer will get what he is entitled to, and public opinion favorable to the central-station companies will be created and maintained.

The fact that your association believes in such a policy is evidenced by amendments to your by-laws, several sections of which bear particularly on this phase of the situation, and to make the point clear I will read them:

"It is fully recognized that the economic and proper channel of distribution of electrical supplies is through the

1 Paper read at meeting of California Association of Electrical Contractors and Dealers, San Francisco, July 20.
2 Manager of the Commercial Department, Pacific Gas and Electric Company.

Digitized by Google

electrical supply jobber to the dealer and contractor, who, in turn, serves the consumer. By this method the dealer and contractor is enabled to have the advantage of a complete stock of electrical merchandise in the warehouse of the jobber which can be drawn on at any time, no matter whether it is one item or a hundred, and can be assured of prompt shipments and satisfactory service from every standpoint."

"The dealer and contractor is the natural channel for distributing various electrical devices to the consuming public. He carries the material in stock and displays it on his counters and in his show windows. The consumer is thus enabled to see the material which he is purchasing and knows that he is getting full value for his money. He can get promptly any information he needs or instructions in the use of the various electrical devices, which is a service that could not be rendered satisfactorily by correspondence with some distant point."

"In order to gain the full confidence of the public in the industry we represent, the class of material furnished and the excellence of workmanship in its installation must be of the highest order. We should never recommend for sale an article in which we have not absolute confidence, and a full knowledge of the functions it will be called upon to perform.

"We should not consider an installation as tending to promote the best interests of the industry, unless it has met with the unqualified conviction on the part of the contractor that it is of the highest class. An installation made by an electrical contractor, simply because it will pass inspection, is undoubtedly bad practice."

The Pacific Gas and Electric Company has recently become a member of your association after a very careful study of the situation, and by so doing has subscribed to your constitution and by-laws with a full knowledge of what they contain. It has, therefore, agreed that the interests you represent should handle the merchandising of current-consuming devices. I do not mean that our company has definitely decided to retire altogether from the business of merchandising such devices as we are not yet fully satisfied that this end of the business can be handled entirely by the interests you represent. I can assure you, however, that our merchandising policy will be such that there will be no objection on the part of any of your people to our continuing in the business. I can say to you gentlemen that in announcing this policy we have absolute confidence in your ability to carry out your end of the bargain, and in your desire to work with us in building up a profitable business.

We are going into this matter with plenty of enthusiasm, and you will all agree with me that with an understanding of each other's problems, confidence in each other and enthusiasm for the job, results that will be entirely satisfactory to both of our interests are sure to follow.

CO-OPERATION BETWEEN ELECTRICAL CONTRACTORS AND JOBBERS.[1]

By W. L. Goodwin.

Some eighteen months ago I was approached by several of our contractor customers who desired to enlist the co-operation of my company toward a betterment of conditions in the contracting business. They desired co-operation toward the end of building up a representative association of contractors. Many discussions followed and it developed that if the support necessary to establish a stronger and better organization of contractors was to be hoped for, it would be advisable to prepare a new constitution and by-laws as well as thoroughly establish certain basic principles on the part of the contractor which would enlist the support of jobbers.

The paper on "Co-operation," which has been read was the result of these conferences. It stands for everything which may be considered as a high ideal for an electrical contractors' association and justifies the support of jobbers in general. I believe that every jobber at least in this section of the country, is in hearty sympathy with the principles of the paper. With this paper as a working basis, much progress has been made to elevate the standard of our business. Other movements to better their conditions among contractors had met with failure, invariably resulting in disruption of the organization due to dissension among the contractors. Unquestionably these failures were due to a lack of a well defined and definite operating basis on the part of the contractors.

Jobbers, recognizing these failures in the past, did not feel disposed to lend their support to any movement which was not reasonably sure of success.

The present constitution and by-laws of the California Association of Electrical Contractors and Dealers, supplemented as it is by the paper on "Co-operation," seems to provide the basis for an association which not only will be the means of improving conditions in the industry but complying as well with the legal objections which present themselves in most association efforts.

The original plans have been followed out almost to the letter and I might say that you have not as yet started on the main structure. You are still working on the foundation, as it were, and in that respect I would caution all members of the California association not to be overanxious for results, bearing in mind that we are in the midst of a period of depression that is almost unbearable, but if we can obtain the co-operation which is evidenced by your presence here and profit by the results of a co-operative effort during such a period through which we are now passing, what will the results be when business generally returns to normal?

The contractors, therefore, must be careful in their local association work as well as in their state association work that they do not ask or expect too much from the various interests at this particular time and that their every act will command the respect of the other interests.

In the development of an association of this kind large interests have to be considered. The central stations, at least in this section of the country, are institutions representing a vast amount of capital, desirous of advancing their own interests, improving their load factor, extending service to consumers in every direction with profit to themselves and without increased cost to consumers.

How can we best work together to bring about this condition in order that all interests may profit, namely, manufacturer, central station, contractor, dealer and jobber.

We have been able to attract the attention of central-station representatives, as evidenced by their presence here tonight. However, you as contractors and we as jobbers realize that we have a great responsibility before us. The problem has been squarely put up to the contractors. The possibilities are here, opportunity evidences itself on all sides if we measure up to qualifications and determine the part we will play in the industry in the future.

If the present movement in California fails, I predict that it will be many years before any other associated effort will succeed and unquestionably many of those present who are now successful in the contracting business will find it desirable to retire to some other business.

On the other hand if we fulfill what seems to be our obligation there is no question in my mind, nor should there be any question in the mind of any jobber, that the electrical business will for the first time in its history be reaching what may be considered a safe and solid commercial and financial institution, something which does not exist in the industry today.

In the work of organization there are many problems to be met. The

1 Paper read at a meeting of the California Association of Electrical Contractors and Dealers, San Francisco, July 20, 1915. The author is vice-president and general sales manager for the Pacific States Electric Company.

Digitized by Google

various interests, as Mr. Walton in his paper has pointed out, namely, the manufacturer, central station, contractor-dealer and jobber, have been trying for a period of over twenty years to do business absolutely contrary to the methods we now outline. So you can realize that it is not an easy task to change the policy of an organization capitalized in the millions and get them to see conditions from your viewpoint. Having impressed some of the larger interests with the sincerity of this movement, those present representing the smaller institutions should realize the opportunities of the future if it goes on with the success which it has met during the past year.

In this process of development, it is necessary not only to change the policy on the part of business institutions generally, but it is also necessary to change the personal conduct of the individuals in these institutions.

Change of policy will not spell success without the personal belief of the individuals in these companies as to the sincerity of the movement. It is necessary that we elevate the standard of the electrical contractor and dealer; and those who take advantage of the situation, grow up with this movement and qualify with the requirements will succeed. Those who do not, will in my opinion, fall by the wayside and disappear. Our responsibility to the central station is indeed great. In order that the public may be better served it is to the interests of the central station that the dealer and contractor properly establish himself with representative stores and provide for facilities for the distribution of lamps, current-consuming devices, household appliances, motors and other devices which aggregate in volume millions of dollars per year and whether you as contractors and we as jobbers serve faithfully and well or whether we fail to serve faithfully and well is a responsibility which each and every one of us must as individuals assume and collectively prove our ability to render this service. If we do, our success is assured both individually and as a class.

On the other hand, we have had very little encouragement from the central stations generally and to my mind the central station is the one branch of the industry which controls the entire situation. They should assume the responsibility of holding together the several interests. In many sections of the country the central-station management assumes an attitude that they alone are concerned in the success of the industry. The other interests have been almost entirely ignored and as a result a most demoralized condition presents itself in such localities.

The policy on the part of the central station has been such as would offer no encouragement to either contractor or dealer. The insane desire to increase their load has been at the cost of almost every other branch of the industry. Unless the central-station management recognizes that the business of the contractor and dealer is just as legitimate as his own and that they should both work together for each other's interest, antagonism on the part of each is bound to result. Municipal ownership, as inefficient as it is, will ultimately predominate.

It behooves managers of central stations to look far into the future and to make some effort to improve the condition of the contractor-dealer.

Fortunately for us of the West, or at least in this section of the country, central stations realize that the other branches of the industry can assist them in increasing their load on existing lines and consequently improving their load-factor, and to this extent are encouraging the contractors and dealers in the establishment of representative retail stores from which the consumer may be served.

Central stations generally recognize that their prime responsibility is in the sale of energy, and it should be recognized that when they involve themselves in the sale of current-consuming devices they do so with two ideas in mind; first, their belief that they can add to their lines increased current, and second, that the dealers generally are not in a position or have not proven their ability to render this service for them.

To the representatives of the National Electrical Contractors' Association who are here from other sections of the country and who may not be so positive as to the success of this movement, let me give you this thought. What is the bonus to be gained if the movement does succeed; and is it worth while? Except in isolated sections, particularly in some of the larger cities, further associations of contractors must look for their membership in numbers to the combination contractor and dealer.

True, in the larger cities you will always have the specialists in straight contracting work, but the combination contractor and dealer is the institution who will make up the bulk of your membership and to whom you must look in order to produce for the central station that which it requires, namely, the proper serving of the public in lamps and current-consuming devices. If this be a fact, and I think that we all admit that it is, careful consideration must be given to the small dealer in order to bring him up to a standard where he can be of value to the organization.

I think we will admit that the contractor-dealer has been deficient in some of the vital things necessary to the conduct of any successful business. His general business methods have not been up to standard. His credit rating is very low and the caliber of men attracted into the business has not been all that we would wish for. The stock carried has not been representative and has not been of the nature that interested consumers generally. Methods of figuring prices have been such that success was impossible.

If the busines can be placed on a solid foundation where financial success is assured and the standard is raised, a more desirable class will be attracted to our industry. By reason of the great progress which is being made in the industry it constantly requires new capital in all branches to take care of development. Annual earnings are not sufficient to provide for increased business and capital will only be attracted to an industry that offers reasonable assurance of a proper return on investment.

This has not been possible in the past, either from the standpoint of the contractor-dealer or jobber. The selfish interest of each branch of the industry has long been responsible for conditions as they now exist, and these conditions will only be improved as all of the interests work together for the common good.

As I have pointed out, one of the great difficulties which jobbers have had to contend with in their dealings with the contractor is the lack on the part of the contractor of a definite and well defined business policy.

How many contractors present here tonight have a well defined policy which they follow from day to day without regard to the consequences? Institutions that operate without a policy, drifting along from day to day and week to week without knowing what they are doing and how they are doing it, will not long succeed. That has been the trouble, generally speaking, with the contractor. They have no definite policy either in the purchasing of material, in their methods of figuring work or the manner in which it is installed. Nor have they any idea of initiating campaigns to produce business. It has also developed that many contractors have not contributed to the uplift of the industry to an extent that will justify their existence. I mean by that that the contractor cannot justify his existence in the electrical industry if he is to sit

Digitized by Google

in his office waiting for a set of plans to be figured, submitting a figure and upon being the low bidder proceed to do the work. This is like the shopkeeper who stands behind the counter waiting for a chance customer to drop in. Any institution that continues along such lines is bound ultimately to be eliminated. Each one of us must create a certain amount of new business. The contractor certainly must do his part. That has been and still is the objection of the central station to developing the contractor, and while I do not want to appear to be complaining about any particular contractor, I simply want you to get that thought in order that you may realize that if you are to maintain your place in this movement, you must do some creative work. It is not necessary to outline how creative work can be done. That is a simple matter. It is clearly understood by any wide-awake institution. The representative of any central station, manufacturer or jobbing institution will give you many ideas for the development of new business.

Now with reference to the organization of contractors and particularly to those members of the National Electrical Contractors' Association who are present this evening. The contractor organizations in the United States remind me very much of the story of the doctor who was a golf enthusiast, and who had as his caddy an old Scotchman. After a time the old man became ill and called upon the doctor to prescribe for him. Knowing the old man's weakness for strong liquor and realizing that he must prescribe something along that line, he suggested two pills and a dram of Scotch whiskey to be taken every night for five or six days. He asked the old Scotchman if he had been faithful in taking his medicine, to which the old man replied: "Well, I am about five days behind with my pills, but I am five days ahead with my whiskey." That is about the status of your contractor organization today. You are years ahead with your national association, but years behind with your state and local associations.

I would suggest to the members of the national association that they encourage first the formation of local associations, consolidated into state associations, which may be one or more in each state, and through a per capita tax of the state association draw their membership into the national association. By such a method there can be added to the membership of the national association in a very short time 5,000 members. I believe we of California can deliver to the national association, under such a plan, in the neighborhood of 300 or more new members. I would suggest that at this meeting you consider the advisability of the appointment of such committees as may be necessary to provide amendments to your by-laws to provide for this condition. With such a good, strong state association in California, representation in the national association is far below what it should be. Every member of the state association should be a member of the national association, and I believe this condition will prevail in the very near future.

I believe that the meetings of the national association held only annually are not of sufficient frequency to keep pace with the times. The industry is advancing out of all proportion to your organization, and something must be done to provide at least quarterly meetings of some character. That, of course, is impractical with the national association as it exists today, but there should at least be meetings of your directors or executives who are directing its affairs. Quarterly meetings are, however, practical within the state associations, and in that way greater progress can be made and the national association can individually take up the problems which may be discussed in the state meetings.

Jobbers generally throughout the country should, and I believe do, recognize that contractors and dealers, by reason of the position they occupy, are entitled to recognition in some manner, a condition which has not prevailed in the past. I believe that almost every jobbing institution in the country today is giving much thought to this subject.

Manufacturers also are beginning to realize that not only is the jobber necessary to the progress of the industry, but likewise the dealer and contractor is essential for the proper distribution of their products. The industry is entirely too young to even consider the elimination of either of these interests, and the further we progress the more justified is our existence.

The reason that the contractor has not had proper protection in the past has been due to a lack of organization of his craft. You have not presented a unity of strength and proven by a united effort your ability to handle the problems which face you. You have not been a unit as to what you wanted, and until you are you cannot hope to gain much.

As a jobber distributing the goods of manufacturers, I must have protection on the part of the manufacturer, and I likewise recognize that the contractor-dealer is entitled to similar protection. Such protection to the contractor is not only desirable, but is essential to his ultimate success. Protection will come only when the contractors themselves, by their conduct and their ability to serve the consumer, justifies their protection.

Protection will come much quicker if the contractors present not only a united strength, but prove as time goes on that they are capable both in their commercial dealings and their financial rating to meet the problems which face them. The industry may be retarded, but not brought to a standstill because of the inability of any individual or class to perform their proper obligations.

Another point which I would like to impress upon the contractors is their almost insane desire to obtain price advantage over competitors.

I happen to know that many of the larger contracting concerns of this country believe that the position they occupy and their future success depends entirely upon a price advantage over their competitor. That unquestionably is a wrong impression, and the sooner the contractors realize that a uniform price to all will be for their best interests, the sooner we will reach our goal. One-half of the time spent in creating new business, in producing satisfactory work and satisfied customers, would result in greater returns to the contractor than does his present endeavor to gain price advantage.

It is absolutely essential to the life of any sound business that prices should be standardized. Our great concerns cannot continue in the manufacture of high-grade articles unless the retail price to the public can be maintained. Any endeavor on the part of commercial institutions to obtain in the sale of their product a reasonable and satisfactory profit has been looked upon by the government officials as an illegal combination in restraint of trade. With one arm they wave such aside as destroyers of public morals and with the other arm they are enacting laws which eventually not only control, but legalize on the part of the government, compulsory price maintenance. In every department of the government price maintenance is in order. Try, if you will, to purchase from our government anything which it has to sell at reduced prices; endeavor, if you please, to purchase postage stamps at reduced prices, or endeavor to transmit articles by parcel post at price advantage over your competitor. The government compels the railroads to name one price for all. Within the several states competition between public utilities has been so severe as to make

Digitized by Google

investments unprofitable to all. The creation of our state railroad commissions was brought about to eliminate this condition. The public realize that price competition results in good to no one and through the creation of these state commissions authorize them to first establish rates at which the utility companies may sell their product to consumers, determine the minimum rates at which their bonds may be sold, authorize the issuance of bond issues and so regulate and control them that not only the utilities are reasonably assured, under efficient management, of a proper return on investment to its stockholders, but protects them against ruinous competition. Both the utility and consumer is today profiting by such regulation.

Our governments, national, state and municipal, are fast coming to the point where they recognize that combinations of business institutions within certain limitations are justified, and I believe that in the activities of our new Federal Trade Commission the big institutions of this country will see the light of day as they have never seen it before.

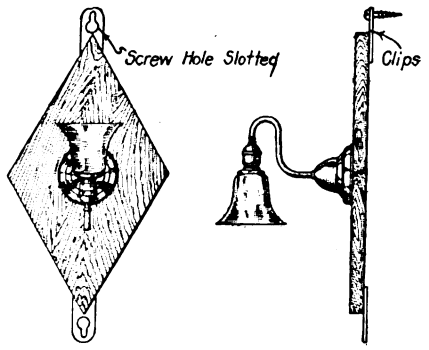
In this respect we are fortunate in that we will shortly be visited by representatives of the Federal Trade Commission. I hope that they will look into the activities of this present co-operative association movement on the part of the contractors, and that when they know the details under which this present movement is progressing and when they know the results that we hope to accomplish and how we hope to accomplish them, that they will consider this not only a step in the right direction, but that such associations are not only right and proper, but that they are absolutely essential to the very life of the American business institutions.

We all recognize things we have had to contend with in the past, that is to say, that each branch of the industry has operated without regard to the other branches of the industry. From the paper which Mr. Walton has read, you should recognize that you have with you a representative of a central station that is composed of individuals with souls, men whose reputations in the community are unquestioned. They have evidenced on the part of their company a desire to assist you in this work, and I hope they will be able to enlist the co-operation of other central stations in this commendable movement.

During the meeting of the National Electric Light Association in San Francisco last month I had an opportunity to talk with many of the representatives in attendance. I pointed out to them how the industry could be advanced with their co-operation, how the central station can elevate the standard of the electrical contractor and dealer by helping him solve his problems and by encouraging him in the merchandising end of the business with a willingness on the part of the central stations to assist him in solving these problems, and now, gentlemen, I trust the encouragement you will receive on the part of the jobbers generally, and unquestionably on the part of manufacturers, will inspire you to greater effort, and you should return to your homes with the thought that your time spent in California has been more than a pleasure jaunt and that you may realize that the future holds in store for you a condition such as was never anticipated even under the most ideal conditions.

Showing Bracket Fixtures.

Instead of the old-fashioned way of screwing bracket fixtures to the wall of the show room, we mount ours on a diamond-shaped piece of wood, stained dark, flat finish, and put a clip at each end so that the whole block and fixture can be readily reversed to show the fixture



Mounting Bracket Fixtures.

with the lamp pointing up or down, as many brackets look better pointing up than down. E. M. Raetz.

Cincinnati Contractors Hold Picnic.

Wednesday, August 4, was set aside as the annual outing picnic of the Electrical Contractors' Association of Cincinnati. There was a good turnout of contractors from the city and vicinity. The party assembled at 9 a. m. at Fourth and Sycamore Streets and proceeded by automobiles to the beautiful grounds of the Ivanhoe Club, Perintown, Ohio. After an excellent country dinner and short rest the annual baseball game was held; the contestants were A. G. Sturtevant's Socket Sellers and Al Beattie's "Carpet Baggers." William B. Hubbell acted as umpire. Following this exciting game there came refreshments, boating and bathing, more refreshments and, late in the day, the return to the city.

Among the Contractors.

The partnership known as the Bothwell-Guthman Electric Company, 15 Spring Common, Youngstown, O., has been dissolved, J. Howard Bothwell purchasing the entire interest of Irvin W. Guthman. Mr. Bothwell will continue the business at the same location and will shortly incorporate under the name of The Bothwell Electric Company.

The commissioners' court of Dallas County, Texas, has awarded the contract for rewiring the old court house to the F. E. Newberry Electric Company, of Dallas, at $7,000.

Contract for installation of the "white way" system which has been decided on by the Board of Commerce, of Lexington, Ky., has been awarded to the Harry I. Wood Company, of Louisville, and work will begin as soon as possible. The representatives of the Board of Commerce are getting the names of the individual members of the board to the contract after which work will begin. The plans provide for a total of 97 standards to carry two lamps each.

The Harry I. Wood Company, Louisville, Ky., which took the contract for wiring the plant of Gamble Brothers, lumber workers, in Highland Park, extended the original contract by suggesting to the firm the advisability, since the workmen were on the ground, etc., of wiring the plant for electric lighting, current to be supplied by the company's own equipment. This is a nice job and desirable, coming as it did. Conduits are being installed throughout and Mazda lamps will be supplied.

Various good contracts are being executed by the Wood Company. One is for installation and wiring of a group of buildings for W. C. Martin, who will use a part of the plant of the old Falls City Woolen Mills on Preston Street as a broom factory, renting the other buildings to power users. The Wood company is installing a 220-volt three-phase alternator and exciter and switchboard here, the equipment throughout being Triumph.

This week the company began execution of the contract for wiring the freight and passenger station of the Louisville & Nashville Railroad at Lewisburg, Tenn., which includes 17 standards in the yards. The Lexington "white way" job will be begun about the middle of September, and will keep a crew busy for 60 days. Other contracts the Wood company has out in the state include that for the new First National Bank at Paris, and a telephone system in the Price Memorial Hospital at Harrodsburg, Ky.

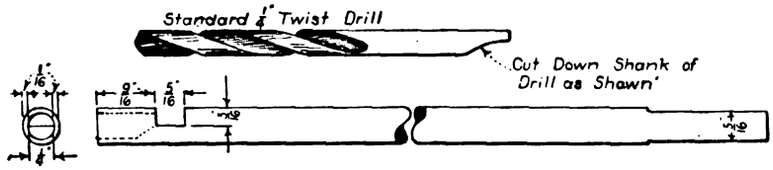
Digitized by Google

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Extension for Breast Drill.

In wiring back of switchboard panels it is often hard to use a brace or breast drill on account of studs, busses, supports, etc. I have found the tool illustrated here to be of great use as an extension for one-fourth-inch drills, the standard size for expansion shields and lead "slugs" for fastening cleats with wood screws. It is made up of a piece of three-eighths-inch round steel, 12 or 18 inches long. One end is turned down to fit chuck of brace; the other end is centered and drilled out with a one-fourth-inch drill to a depth of nine-sixteenths inch and then slotted, as shown, in order to fit the shank of drill. This is simply an ordinary one-fourth-inch twist drill with its shank ground, as shown. This can be done on an emery wheel. The slot in extension also allows drills to be easily removed after using.



Extension Piece for Drill.

H. W. Parsons.

Hanging Fixtures Plumb.

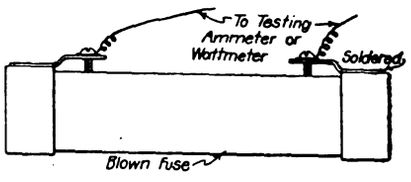
Owing to crooked threads and uneven plaster it is often very difficult to hang a fixture plumb. I always carry a few pieces of thin lead casing from twin cable in my tool bag for the purpose of wedging the crowfoot or fixture studs out. By placing a few pieces between the bottom of the box and the stud or crowfoot (as the case may be) the screws can then be screwed up, pressing the crowfoot into the lead until the fixture is plumb.

Bert Wicker.

Testing Motors.

In tests of motors, using ammeter and wattmeter connected in a cabinet or other fuse junction, I make use of the device shown in the accompanying illustration.

Take a burnt-out fuse of the same capacity as the cutout and solder a terminal on each end as shown. Connect the ammeter or wattmeter leads to these terminals and insert the device in place of the regular fuse. This puts the ammeter or wattmeter in series with the motor. In order to maintain protection in the circuit, a fuse should be inserted at some other point.



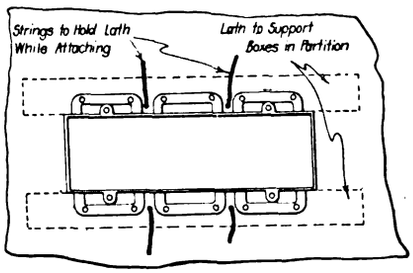
Old Fuse With Terminals.

This scheme obviates the necessity of disconnecting the motor or disconnecting any of the wires in the cabinet.

William E. Estlick.

Setting Switchbox in Plasterboard.

I was called upon to set a three-gang switchbox in a plasterboard wall the other day and there being no lath to fasten my boxes to, I struck upon the following idea. First measure and cut out a hole in wall to take your boxes, then get two pieces of lath a little longer than box and drive a finishing nail through about a third of the way from each end on both, then pull a piece of twine through all four holes and knot the ends. Then punch or drill very gently four holes in wall for twine to come through. Next set your box in after pulling in wires and screw your boxes fast while you are holding the lath solid with twine. When you have all the screws in and switches set cut your strings and your plate will cover the strings' holes.



Setting Gang Switchbox.

Ernest Knierim.

Emergency Locknut.

A good substitute for a locknut is to saw about one-fourth inch off of a coupling.

E. A. Shoemaker.

Oil-Can Spouts.

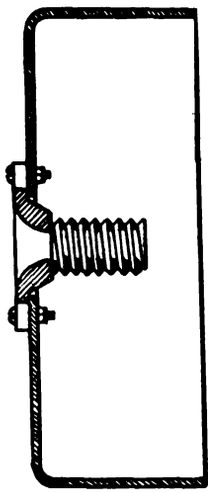
Recently in oiling ceiling fans I had occasion to use a long-spouted oil can, and having only a short-spouted can in my kit, I used the following scheme with good results. I inserted a piece of bell wire in the nozzle of the can. The oil then ran along the wire to the place I wished to oil.

W. A. J. Hahn.

Fastening Fixture Stud.

Ordinarily the fixture stud is fastened with nuts and screws to the inside of the back of the outlet box. I have found it advisable to drive out the center knockout of the back of the box and pass the threaded part of the stud thru this opening, so that the legs are on the outside of the box, and then fastening with nuts and screws in the usual way.

This makes a strong support for heavy brackets and permits an easy adjustment of the stud by means of the screws.



Mounting of Fixture Stud.

Joseph J. Drucker.

An Emergency Compass.

Often on a repair job and especially motor work, the use of a compass is imperative and one is not always to be had immediately. I have several times made use of the following device which with a little care can be used in place of a compass.

Magnetize a short length of steel wire or a large needle; mark one pole the north-seeking pole; run the steel through a small flat cork, having each end beyond the cork equal. Put the cork in a saucer or a glass of water. While this device will not act as quickly as a compass it will answer the same purpose and the material can be found and device made in less time than is necessary to send for or procure a regular compass.

Robert Oster.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

INDIANA.

Merchants Heat and Light Company. The decision of the Commission upon the investigation of the rates of the Indianapolis Light and Heat Company was reported in last week's issue (ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, August 7, p. 235). In that connection brief mention was made of the companion decision affecting its competitor, the Merchants Heat and Light Company. Both decisions were handed down on the same date, July 30, 1915, and the same rates were established for both companies. The order in the Merchants Company case contained rules for measuring radiation in the hot-water heating plant. The company now has three central stations from which is supplied hot-water heating and steam-heating service and electric service. The Commission says that the situation is a complicated one, rendering difficult the apportionment of costs between the three services, and that it is further complicated by the necessary changes in the plant and equipment which are now underway, in preparation for the furnishing of municipal lighting service.

Municipal Lighting Service.—In regard to the municipal lighting service the decision says: "It appears from the evidence that the power load of the company is much greater than its lighting load and that the municipal lighting if carried in addition to the present commercial lighting will not make the night load of the plant as great as the present day load except that it may raise the present early-evening and late-morning peak somewhat. This municipal lighting has been referred to by the defendant's engineer as a by-product, but we regard it as entitled to bear its due proportion of the operating and fixed charges of the plant. The difficulty at this time is to determine what that proportion is or rather may be."

* * *

"The municipal lighting being wholly a matter for future development we will assume that the rate fixed by the defendant and the municipality is fair to both parties and pass that part of the case by without consideration. In fact no question of the fairness of the rate was raised on the hearing and it could not well have been presented since the service was not to be installed for some time and the equipment was then being constructed and placed and could not then have been satisfactorily valued."

Rate Theory.—The Commission does not go into an extended discussion of the various elements in the valuation as was done in the case of the Indianapolis company, but concludes that a fair value of the property of the Merchants company used and useful as of June 30, 1914, including going value, supplies and working capital is $2,000,000.

Taking up the problem of rate-making, the decision says:

"Electrical engineers have given much thought to the matter of developing and devising fair and scientific rates for electric current.

"They have by various processes deduced rules whereby they assume to determine accurately and scientifically just what is a fair rate for each user of current furnished by an electric utility. These rates are made on the theory that the actual cost of producing whatever amount of current or electrical energy any one patron may use in a given time can be ascertained. These costs include the operating expense or cost of generating and distributing the energy, a fair return on the investment, the amount of which is measured by the value of the tangible and intangible properties of the utility, and a depreciation fund which is provided for the purpose of and should be sufficient to replace the plant when the same may become worn out or obsolete."

Cost Theory.—"By this method of rate-making it is attempted to allot to each patron his proportion of whatever sum would be a fair income on the amount of the investment which has reasonably been made and such part of the operating expenses as necessarily must be incurred in order to begin supplying such patron with electricity, plus a proper amount to be set aside as a depreciation fund and which is necessary in order to replace and repair the plant and keep it in a condition that will enable it to continue to produce electricity. The patron's proportion of this sum is determined by ascertaining the proportion of all the current he would use in a given time to the whole amount that all the patrons would use or 'demand' during the same period of time. To this demand charge is added the cost of generating whatever quantity of current may be actually used by the patron.

"A third step is sometimes introduced which is denominated the customer's charge. This charge is fixed by calculating just what part of the operating expenses are made solely for the benefit or on account of the individual customer and charging him directly with the same in addition to his demand charge. This customer's charge includes cost of reading meter, entering the account on the books, sending statement, collecting account, work on customers' premises and many other refinements of division and adjustment, all of which are assumed to be precisely the same on account of each customer and this without reference to his demand or the amount of energy used. This charge being deducted from the operating expenses greatly reduces the cost of generating the energy and by a liberal transferring of operating expenses to demand and customers charges the apparent cost of generating energy is very low. The manifest tendency and intent of any reasoning or analysis of cost conditions which increases the demand and customers' charges is to reduce the cost per measured quantity of energy production and this inures to the benefit of the customer who uses a large amount of energy.

"No doubt if accounts were so kept in operating an electric utility that these several factors entering into a rate could be exactly determined a rate or charge based on actual cost, with that cost including an income on the investment, might be accurately worked out.

"The minuteness of detail which would be necessary in attempting such a task in accounting would make it impractical. The course pursued is to apportion the cost of reading meters equally between the customers and also the cost of collecting the customers' bills, and services on the premises and the income return on the cost of the meter and services and the material and labor in installing the same. This is so done for the reason that the keeping of an individual account showing these expenses in detail against each individual customer would be prohibitive on account of the expense of doing it. It could not be possible, however, that the costs and expenses would be equal as to each and all customers of any utility for these various items. There might not be a great difference and there will be some difference in favor of some customers as compared with others and this slight difference repeated each month would amount to a substantial difference in a year. So that the best that can be said for any of these scientific rate-making theories is that they are approximately correct. We have no criticism to

Digitized by Google

make of any of them. They are the most nearly correct of any thing that has been brought to our attention, but they are far from being absolutely so. In addition to the inequalities above referred to in distributing demand and customers' charges it can be said that the cost of distributing current to customers is not and cannot be the same per unit to each and all. There will be a greater loss by leakage and in transformers when the customer is five or ten miles from the power plant than in a case where he is only one square away.

Value-of-Service Theory.—"There is and will ever be a certain and not inconsiderable amount of the arbitrary factor in rate-making. Notwithstanding the recent revulsion against the old practice of ascertaining what the business will stand, we still have that element with us in determining what should be charged for a utility service or commodity. And it is the presence of that very element that has caused the scientific or cost theory of rate-making to go to the farthest limit in shifting costs away from operation into demand or customer charges in trying to retain the substance without the form of this element. The defendant company has a rate schedule on file with this Commission making a rate of 7.5 cents per kilowatt-hour for the first 200 kilowatt-hours during the month for lighting and 4.5 cents per kilowatt-hour for the first 200 kilowatt-hours during the month for power.

"It necessarily costs just as much to generate the 200 kilowatt-hours for power as it costs to generate the 200 kilowatt-hours for lighting, and the only reason for making the difference in favor of the power rate is an arbitrary one, because the business will stand the rate in the lighting case and will not stand it in the power case. And this is so because the power user has steam power that he can use and put in competition with the electric power. In order to justify this arbitrary measure it has become customary to speak of that part of the current distributed for power as a by-product which may be sold at any price it will bring without doing violence to the rights of any one.

"That is, we consider the electric lighting plant to have been originally constructed solely for the benefit of the light user, and that he is primarily liable and must see to it that a profitable income is assured. After that is assured the generator may be kept running at times when little if any lighting is demanded, or in excess of the lighting demand when current is being used for lighting, and the current thus generated is just so much clear gain which may and should be sold for whatever it will bring and the proceeds of such sale placed in the general operating income and thereby enable the utility to reduce the cost to the lighting customer.

"This sounds good and would even be good logic if it did not occasionally become sophistry.

"It inures wholly to the benefit of the lagging customer to the detriment of the pioneer. The man who moved first and made the electric lighting plant possible must forever carry the burden and allow the one who comes in at the eleventh hour not simply equal but far greater benefits than he receives."

Power Service.—"The defendant company had on the first day of July, 1914, a connected power load nearly five times as great as its connected residence lighting load and an active connected power load thirteen times as great as the active residence lighting load.

"It does not appear entirely right to consider the aforesaid light user as the one for whose exclusive benefit the plant was constructed and the power user as a benefactor who is doing a benevolent thing in using a large wattage of current at whatever price he is willing to pay and thereby lighten the load of the light user by that much."

Lighting Service.—"The domestic lighting schedule should have its full share of the arbitrary factor in rate-making. Just as it is found necessary to reduce the price of energy supplied for power in order to meet the competition of steam power, so it is necessary and manifestly right to arbitrarily reduce the lighting schedule below what is scientifically determined by the aforesaid plan to be actual cost, in order to prevent the light patron from being driven off the circuit by prohibitive rates.

"Assuming that the demand rate can be worked out so as to very nearly apportion to each patron the exact cost of serving him and that each patron ought to pay the actual cost of his service if it can be ascertained, yet the fact remains that rates for electric lighting and power have been built up on 'what the business would stand' theory. This early method of fixing rates is now discarded by most economists, but it has not and can not at this time be wholly eliminated. It is found in all flat meter rates of electric lighting plants, and is in fact the popular rate and the only one which all patrons of a lighting plant can understand. It is conceded by the defendant company that the so-called demand rate while being more nearly correct so far as ascertaining the actual cost of each customer's service is concerned, is not a practical rate to be applied to domestic lighting for the reason that the demand would be so great in many instances that it would be prohibitive. And the petitioners suggest a flat meter rate in which the demand or ready-to-serve charge is distributed throughout the schedule, not scientifically correct, but by commingling the actual demand with 'what the business will stand' making a compromise rate that will be practical and fair. The defendant has had such a schedule in force so far as we know during all of its existence, and we believe such a schedule should be continued for the use of those patrons who desire service thereunder. * * *

"In this plant the power user is the predominant factor. The plant has been built up for him and there can be no justification for calling his service a by-product and selling it to him for less than actual cost and forcing the price of current sold to the domestic consumer to the highest point it will stand in order to make the income account show a net surplus. * * *

"Power rates have been beaten down to the low point by competition with other power so that we do not feel that it would be right or proper to make a reduction in these rates unless the revenues of the defendant were sufficient to allow a substantial reduction in all classes of service." * * *

Conclusions.—The Commission says that the company's income does not justify a reduction in all the rates of the defendant. The competitive situation which has existed in Indianapolis has brought the rates to a comparatively low level. "The greatest evil that has resulted from these competitive conditions is such as result from like conditions everywhere, that is, discriminations whereby favored customers secure rates below what is really justifiable and those not so favored are required to pay an excessive rate to take care of the losses caused by the favored customers' charges." * * *

The chief aim in adjusting the rates has been to eliminate this discrimination, and the Commission says that by cutting off the lower or discriminatory rates a slight reduction can be made to those who are paying the higher rates.

New York Commissions Issue Joint Order.

For the first time in the history of the Public Service Commissions of New York State a joint order was adopted last week at a joint meeting of the two Commissions, the meeting being held at the office of the Commission for the First District, New York City. The joint order provides for the removal of grade crossings and other obstructions. It also orders a shifting of the tracks and the construction of a viaduct to carry the street. Mount Vernon is in the Second District, and the improvements there were ordered some time ago by the Second District Commission, but owing to conditions in New York City, just south of the Mount Vernon line, the new highway there could not be used until a connection from the New York City end was provided; and the joint order is to bring about the completion of the improvement on the New York City side.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 296.—High Cost of Rendering Bills.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

No. 300.—Fire-Extinguishing Materials.—How do sawdust and carbon-tetrachloride compare with each other and with water and with sand for extinguishing fires in varnishes, transformer oils, etc.? How do the two substances first named act to quench a fire?—H. D., Chicago, Ill.

Answers.

No. 289.—Combination Electric Radiators.—I have just heard of a newly patented electric radiator which resembles a hot-water radiator and has an electric coil heat the water in the pipes; it is said to be more economical than a straight electric radiator. I fail to see this and should like to have it proven.—W. T., Cleveland, O.

The intensity of the heat radiated by the electric radiator is often much greater than the circumstances require, and particularly so since the psychological effect of the evident warmth may be produced even by a very mild degree of heat. Consequently, if the intensity of radiation from a heater turned on for only a short time could be partly bottled up and slowly distributed, the effectiveness of the heating apparatus might be greatly increased. This has been demonstrated in allied lines both by the so-called gas-steam radiators (in which water is warmed or even vaporized by the heat of gas flames and then slowly parts with its latent heat) and in gas heaters in which the flames traverse crevices in vitreous blocks which radiate the warmth long after the gas has been turned off. The radiator referred to by W. T. probably operates on the same general principle, viz., that of imparting the heat rapidly to a considerable mass of material (such as water) having a high specific heat, from which heated mass the warmth may be gradually radiated after the current has been turned off. Such a radiator, while not any more efficient than what the inquirer calls a "straight" radiator, as far as the conversion of electric energy into heat is concerned, may easily be more economical wherever a quite moderate radiation is ample if prolonged over a considerable period of time.—A. S., Chicago, Ill.

No. 292.—Sunspots, Magnetic Storms and Weather.—A short time ago a statement appeared in the newspapers that an exceptionally brilliant display of the aurora borealis was connected with great activity in the sunspots and that it also produced serious disturbances on telegraph circuits and magnetic compasses and accounted for our prolonged rainy weather. Has any definite conclusion been reached by astronomers, meteorologists and other scientists as to the interconnection of these phenomena? Is there any basis for ascribing an electrical or magnetic relation between them?—F. L., Beloit, Wis.

The present state of knowledge as to the nature of sunspots and their relation to the aurora borealis and magnetic storms on the surface of the earth seems to prove beyond doubt the electromagnetic nature of these phenomena, which have been elucidated mainly by the electron theory. Already in 1879 William Crookes found that electrically charged particles, electrons, as they are now called, are emitted by a hot body when under sufficiently low pressure. Since the sun is now an eminently hot star and the surrounding pressure of the universe very low it could, with great certainty, be assumed that electrically charged particles (anode and cathode rays) are emanating from the sun's surface. Now if such electrically charged particles are revolving with great velocity they produce a magnetic field just as a current flowing in a helix of wire produces a magnetic field. If, therefore, a proof could be found that magnetic phenomena are connected with the sunspots it would be evidence for the exactness of above assumption. The discovery of Zeeman of the doubling of the lines of the spectrum by a magnetic field delivered that proof. The investigations of Hale and other astrophysicists with the spectro-heliograph have shown indeed that certain lines of the solar spectrum are doubled in the spectrum of the sun's spots. From deduction of terrestrial phenomena of the same nature and their measurement it was even possible to determine the field strength of the magnetic fields produced by the sunspots. These latter are therefore huge vortices of electrically charged particles emitted by the sun and rapidly rotating, extending far upwards into the so-called photosphere of the sun.

After what has been said the aurora borealis is a natural consequence. The electrons emitted by the sun contain also cathode rays and when these penetrate into the magnetic field of the earth they are subjected to deflections towards the magnetic poles. This is like the phenomenon which is brought about in the Crookes tube, the evacuated tube being represented by the thin atmosphere in the upper regions where the cathode rays become luminous and produce the aurora borealis. Birkeland has succeeded in reproducing this phenomenon in a laboratory experiment and a mathematical theory of it was given by Stoermer; an abstract of both appeared some years ago in the *Scientific American*. The electromagnetic nature of the aurora borealis thus being established it is comprehensible that this will have an influence in the magnetic phenomena on our earth. The earth can be taken not only as an enormous magnet, but also as an electric conductor together with its atmosphere, rotating in the magnetic fields set up by the sunspots. It has been observed that electric currents are constantly flowing in the interior of the earth which are ascribed to the outer magnetic fields. These currents show similar slight variations as the magnetic components of the terrestrial magnetism. But if now, due to a certain activity in the sunspots, a sudden and heavy variation in the outer magnetic fields occurs, it is evident that just as in ordinary electric circuits surrounded by magnetic fields a variation of the otherwise steadily flowing current must be produced either by induction or by alteration of the resistance in the circuit, which is due to the ionization of the air by the cathode rays. So not the aurora borealis directly, but the activity in the sunspots which causes the former, will cause also the heavy magnetic disturbances known as magnetic storms, which affect sometimes seriously the telegraph and telephone service.

The relation between sunspots and weather has not yet been so firmly established as the other phenomena. The sunspots have in their maximum and minimum number a period of about eleven years and a coincidence of the minimum of the sunspots and a maximum of rainfall seems to have been observed. This, however, is not yet generally accepted, and much more material must still be collected on this subject in the meteorological stations of the earth.—H. A., Pittsburgh, Pa.

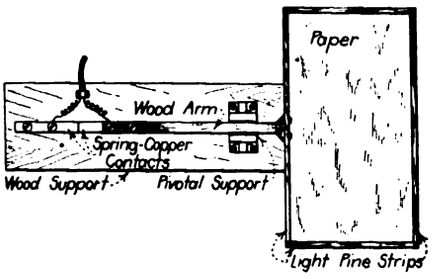
No. 294.—Alarm for Air-Blast Transformers.—A railway substation has a bank of air-blast transformers that are now unprotected against failure of the forced ventilation at times of heavy load. What is the simplest and most reliable alarm system for this purpose?—N. P. C., Indianapolis, Ind.

It is generally customary for manufacturers to furnish an air gauge with each air-blast transformer, which generally consists of a U-tube, or water tube, with a graduated scale showing the air pressure. Of course, this is simply a

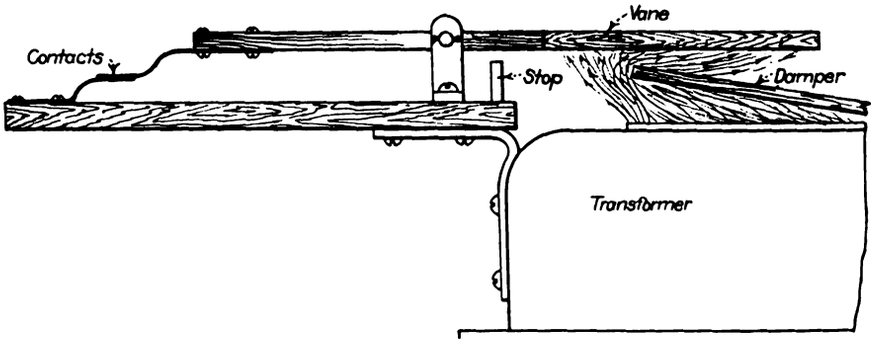
Digitized by Google

visual indicator and has to be observed rather closely. For giving an alarm in case of air failure, both visually and by means of a gong, the arrangement shown in the accompanying illustrations will give satisfactory results. It depends upon the current of air passing out of the upper damper of the transformer for operation.

The device for making contact and giving an alarm in case of air failure is shown in Figs. 1 and 2. The latter figure shows how it is attached to the transformer case. The device consists essentially of a vane made of light pine strips and paper, which is attached to a movable arm capable of closing a circuit through a system of signals. The length of the vane should correspond approximately to the dimensions of the damper opening and the width should be about half the length. The vane and movable arm should be so balanced that the current of air under normal conditions will keep the vane raised and the contacts closed. To get the proper balance small counterweights can be attached at either side of the pivotal support. The paper used for the vane should be shellaced and glued to the wood frame.

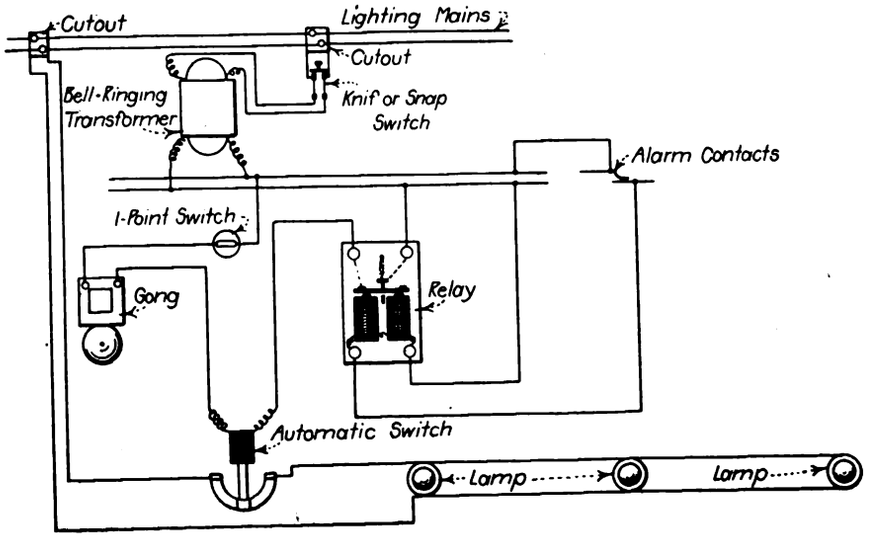


No. 294.—Fig. 1.



No. 294.—Fig. 2.

Fig. 3 shows the connections for a combination lamp and gong alarm. The contacts of the alarm device are connected to the electromagnets of a pony relay, current being supplied from a bell-ringing transformer. The relay contacts are arranged to close the secondary or signal circuit when the armature is released by the opening of the alarm contacts. This closes the circuit through a vibrating gong and an automatic switch. The latter controls the circuit containing several red incandescent lamps which may be located in different positions for sightliness. When the air fails the vane drops by gravity and opens the main contacts at the transformer. The relay releases the armature and the contacts of the secondary circuit are closed, operating the vibrating bell and the automatic switch. The latter closes lamp circuit and lights the red lamps. For the sake of convenience, it is well to insert a switch on the primary or the secondary side of the bell-ringing transformer as indicated by the diagram of connections. The alarm can, by means of counterweights, be arranged to operate at maximum and minimum pressures. It is the practice ordinarily to use about 150 cubic feet of air per minute per kilowatt of loss, the air being forced through the transformer at a pressure of from 0.5 to 1.5 ounces per square inch.—N. G. M., Auburn, N. Y.



No. 294.—Fig. 3.

No. 297.—Electric Stabilizer for Steamships.—I have heard that motor-driven gyroscopic stabilizers have been used with success on some German steamships to diminish their rocking during violent storms. In view of the appalling disaster to the Steamship *Eastland* in the Chicago River on July 24, would the use of such an electric stabilizer have prevented the rapid listing of the boat and been more reliable than water ballast?—T. M. E., Evanston, Ill.

As the actual cause of the *Eastland* turning over is not definitely known at this time, it would be premature and unwise to attempt to say that a gyroscope would have delayed the disaster. The indications are that under similar conditions, but less extreme, a gyroscope would have materially delayed, and perhaps have prevented, such an occurrence.

The *Eastland* overturned because it was top-heavy. The load may have been normal; the load distribution as it should be, that is, only the permissible loading on each deck; yet the boat became top-heavy because either the water ballast in the tanks was insufficient, or because the boat rested on the bottom of the river. It is possible, even probable, that the load was greater than it should have been; that the water ballast was lacking or at least insufficient; and that the boat's keel rested on the river bottom. It is possible that it was the combined effect of the above that caused the cessation of equilibrium, and cost nearly one thousand lives.

The principle of using a gyroscope is right. The suggestion is a very good one, and most opportune. Whether a gyroscope, in this instance, would have delayed the capsizing is problematical for two reasons. Firstly, no attempt was made to maintain the ship's stability, nor was any attention paid to signs of distress, apparently. Secondly, a gyroscope designed for the ordinary stabilizing would not have sufficient momentum to care for the conditions that are thought to have obtained prior to the overturning of the *Eastland*, on account of their radical departure from the normal.

The electrically driven gyroscope opens up a very promising field for boats designed as the *Eastland* is thought to have been designed; for stabilizing ships during periods such as existed before the *Eastland* turned over. The gyroscope has already amply demonstrated its superiority over the water pendulum or water tanks for maintaining stability. Already it has been suggested that the

Digitized by Google

gyroscope be used for rocking boats off sand bars, etc. The conditions to be met are not far different from those of the *Eastland*. The writer saw the gyroscope used by Lewis Brennan in England in about 1906 for his monorail cars; the application is very similar to a boat resting on the river bottom.

The gyroscope is in wide usage in the British and German navies for the steering of submarines and torpedoes, while the gyro compass is a necessity on battleships during the time of battle, because of the numerous magnetic influences that make the ordinary magnetic compass practically worthless. The gyroscope is now being installed on all American submarines, it is believed. For stabilizing ships and for reducing the effect of heavy, tossing seas the gyroscope is now in use.

Much work has been done on applying the gyroscope, but the results, and even the present-day applications, are not generally known. The gyroscope is no longer in the experimental stage, it is an actual commercial piece of apparatus. There are gyroscopes weighing thirty tons, capable of exerting a force couple of four million pound-feet and more now in use. For anyone desiring to learn what has been and is being done in marine work with the gyroscope the following will be found very lucid and useful. The arrangement is according to what will be most useful as applied to the *Eastland* disaster.

"Electrically Driven Gyroscopes in Marine Work." H. C. Ford. A. I. E. E. *Proceedings*, June, 1914.

"Stability of Ships—Notes for Commanders." George Nicol. *Inst. Marine Engineers*, January, 1913.

"Engineering Applications of the Gyroscope." E. A. Sperry. *Journal of the Franklin Institute*, May, 1913.

"Gyrostats and Gyrostatic Action." Prof. Andrew Grey. *Nature*, April 10, 1913. Address before the Royal Institute.—K. R., Chicago, Ill.

A floating ship is always subject to various external forces disturbing it from its position of equilibrium, and it is necessary to investigate the stability of such a position, *i. e.*, to determine whether the ship after receiving a small disturbance, will tend to return to its former position, in which case its equilibrium is stable, or whether, on the other hand, it will tend to move still farther from the original position, when the equilibrium is unstable. In the case under discussion only the effects on *transverse stability* need be taken into consideration.

Granting that the *Eastland* was stable (or even neutral), then doubtless either water ballast or the gyroscopic stabilizer would have been sufficient protection as long as the list was such that the righting moment remained within the limit of safety. In the case of a large list the resulting action is problematical (in this case, as we have seen, the result was fatal). The gyroscope method of balancing will very likely eventually win out over all other methods.

It is possible for a small quantity of water with an extensive free surface to render a ship unstable in the upright condition. The loss of stability at moderate listing angles is usually a maximum when the tanks are about half full. A further drawback to the water ballast is the comparative slowness of filling or emptying the tanks as per necessity. From the press reports it seems that the engineer on the *Eastland* attempted to fill the tanks counteractive to the list, but this could not be done quickly enough.

Until a few years ago the gyroscope was little known or heard of except as a child's toy, although as far back as 1852 its action was investigated by the French scientist Foucault, who published the results of his experiments in which he laid down very clearly the laws of its action. Among other things he demonstrated that when a gyroscope was given a forced motion of rotation about one of the axes, it would powerfully resist such force while at the same time tending to place its axis of spin in line with or parallel to the axis of the impressed force. For sake of brevity this law will not be discussed, but suffice it to say that its explanation is well known and directly follows the application of Newton's laws.

Several other investigations followed those of Foucault's and about 1903 Dr. Schlick, a German engineer, proposed the use of the gyroscope for stabilizing ships. To add strength to his proposal be devised an application of the foregoing principle and fitted it to the steamer *See-bar*. The flywheel of the gyro was one meter in external diameter, weighed 1,100 pounds, and was run at 1,600 revolutions per minute; its axis was initially vertical, and the casing containing the wheel was capable of revolving about a horizontal athwartship axis, the center of gravity of the apparatus lying slightly below this axis. A brake was fitted to control the longitudinal oscillations of the casing. When the wheel was revolving and the axis held by the brake, no effect was produced upon the motion of the ship; but when the axis was allowed to oscillate freely in the middle-line plane the period of roll was lengthened to 6 seconds, but no other extinctive effect upon the rolling was experienced. However, by suitably damping the longitudinal oscillations of the gyro (by means of a brake), a large extinctive effect upon the rolling was experienced, and during the trials made, the apparatus stopped practically all rolling.

The very high development of gyroscopic appliances (especially the gyroscopic compass) during the past few years has been due largely to the efforts of a pioneer in the electrical art, Elmer A. Sperry, who for some time now has devoted practically all of his time to this pursuit.

A type of gyroscope possessed of many tons of stored energy which may be harnessed and made to work not only to hold a mammoth ship against rolling in high seas, listing, etc., but actually to roll the ship for the purpose of sliding off a sand bar or breaking through an ice floe has been built in the last few years. Satisfactory tests and thorough investigations have been made and a gyro of thirty tons weight capable of exerting a force couple of over four million pound-feet is under construction for stabilizing the steamer *Ashtabula*, used as a car ferry on Lake Erie.

In two papers read before the Institute of Naval Architects and Marine Engineers, in November, 1912, and December, 1913, Mr. Sperry has treated very ably and comprehensively the subject of stabilizing ships, has made some striking comparisons, and demonstrated that the stabilization is practically complete. Practical data of great value were obtained from the construction of an active gyro plant which was repeatedly tested out on the United States ship *Worden* during the summer of 1912.

A symposium of results proves conclusively that the active type of gyroscope as applied to the control of a ship's rolling motion or listing tendency is of vastly greater efficiency and economy *than any other form of stabilizer yet proposed*. The economy is evident from a comparison of the space and weight required in an installation of the active gyro relative to that required by the most effective form of water damping tanks or other stabilizing means. The results further show that it is now possible to *stabilize completely* any ship against rolling by means of an active gyroscope, requiring a very small percentage of the weight and space available in the ship. An excellent paper on this subject is one presented before the A. I. E. E., in 1914, by H. C. Ford. This paper and the "discussion" thereon enters into details of mechanical features, calculations, etc.

It would seem from the above disclosures that the question can be answered directly in the affirmative. Had a gyro plant been installed on the *Eastland* in the first place, the fatal list would not have occurred in case the ship were *completely afloat*. If, as certain press reports indicated, the accident resulted from grounding of the keel, then the writer would conclude still that the gyro attachment would have counteracted listing tendency by virtue of the ability of such an installation to rock a boat off a sand bar without incurring the least danger of a capsizing.—P. B. W., Verbena, Ala.

Digitized by Google

THE FEDERAL TRADE COMMISSION INVESTIGATES THE FOREIGN MARKET FOR AMERICAN ELECTRICAL GOODS.

By Waldon Fawcett.

"Our home market has been so good that we have really heretofore given little attention to the exploitation of our foreign business. Now we are suffering for it." The speaker was Edwin M. Herr, of the Westinghouse Electric & Manufacturing Company, and his remark was addressed to the members of the new Federal Trade Commission—the "supreme court of business," lately organized as a result of legislation enacted by the Congress of the United States at its last session. The foreign market for American goods, and particularly for American-made electrical equipment and supplies, was the topic under discussion.

"We are suffering," continued the head of the Westinghouse Company, apropos the firm's foreign trade, "because we do not get the volume that we ought to get of foreign business to help us even up the fluctuations in our domestic business, which are inevitable." Yet, Mr. Herr explained in answer to questions, that about 10 per cent of Westinghouse business is foreign. "We do something above $3,000,000 a year in exports," he elaborated, "our total business running something between $30,000,000 and $40,000,000."

A number of representatives of electrical manufacturing interests and kindred lines have appeared during the past few weeks before the new Trade Commission. The consensus of opinion among these spokesmen for the industry is that expansion of our foreign trade in electrical staples and specialties is earnestly to be desired. For instance, the expressions on the part of Mr. Herr were emphatically endorsed by W. H. Heulings, vice-president of the J. G. Brill Company, of Philadelphia, builders of electric motor cars, one-third of whose business is foreign. Said Mr. Heulings, in discussing this subject: "Generally when domestic business is poor, foreign business is a little better. We always have a little something to look to in foregn trade."

It is significant that the Federal Trade Commission has given exceptionally liberal representation to the electrical interests in its hearings on foreign trade extension—not less significant indeed than that this important new federal body should have selected a study of the overseas trade situation as the first subject on its program. This attitude is the more interesting when it is borne in mind that most of the leading firms in the electrical industry are not keen for that legislative authority to maintain common sales agents abroad, which is besought by many business men, and to ascertain the actual need for, which is the primary purpose of the Trade Commission in its present probe.

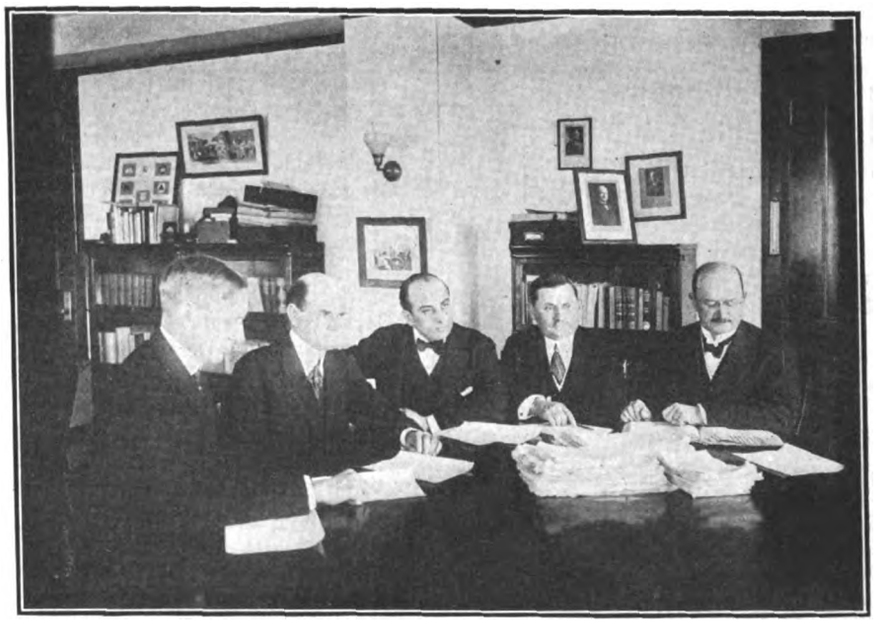
Electrical men in general will probably find most interesting the disclosures made in the testimony of three leading officials of the Westinghouse Company, because the opinions advanced from this quarter are the result of a special and exhaustive investigation which has been in progress by Westinghouse executives for several months past. "During the past six months," explained Mr. Herr when addressing the Commission, "I have taken opportunity, as things are very much disturbed in South American territory, to send one of my assistants, Mr. Townley, on a tour of investigation throughout the entire continent of South America."

While he has left many details to his subordinates, Mr. Herr, as evidenced by his extended remarks, has reached very definite conclusions as to the needs of the export electrical trade. "I, personally, and my company," stated Mr. Herr, "are very greatly interested in the exploitation of our foreign trade. We do a considerable business in foreign markets, but ought to do a very much larger trade, and I believe, under proper conditions, we could do it.

"The thing that I feel is most pressing is the ability to get proper financial connections in the South American countries and better transportation opportunities. We are considerably handicapped in the matter of finance, but I am glad to say that is being remedied, from all the information we have been able to gather, to the effect of the recent exploitation in South American countries of our branch banks. This is destined to be very helpful to us. I might add that my company, in America, does very little export business to Europe; considerable to Africa, but very little to South America. We are represented in Europe by companies there—British, French and Italian companies."

Commissioner Hurley asked the question: "Do you compete with your English and French and Italian companies in South America?"

"No," was the reply, "we have heretofore handled the South American countries, and the British company has had representatives there. Yes, you might say it was competition, because they sold goods and we sold goods in the same territory. Of course, we were very close to their representatives."



The Federal Trade Commission—From Left to Right: George Rublee, William J. Harris, Joseph E. Davies (Chairman), Edward N. Hurley, William H. Parry.

Whether Westinghouse would have any desire to co-operate with other electrical manufacturing companies in exploiting foreign trade was the purport of the next question by Commissioner Hurley.

"We would have, of course, very great interest," responded Mr. Herr, "in co-operating with our foreign companies in every way possible and it might be possible, under proper conditions, that we could co-operate with other electrical manufacturers. I think that is a subject that is very important, owing to the fact that our foreign competitors have no restrictions in that respect whatever, and we are meeting very drastic conditions as to prices from German, French and British com-

Digitized by Google

petition in our lines of manufacture."

"The Germans are your chief competitors?" was the next question.

"The Germans were perhaps our most severe competitors in South America," admitted the Westinghouse executive, referring to conditions as they existed up to the outbreak of the war, "but we compete also with British and French manufacturers there also. We have suffered more from German competition than from any other foreign competition. I have felt that the Germans had a great deal more assistance in their arrangements, that they can possibly make under the law, than we have; and I think there is a field where the American manufacturers can be very greatly helped. That has got to be done with due regard for the possibility of these foreign competitors of ours establishing agents and subbranches in our country to enable them to get into any organization or arrangements that might be made for American manufacturers. It might work to our very severe detriment."

Members of the Federal Trade Commission Taking the Oath of Office.

Answering questions as to the policy of his company, Mr. Herr said: "Our very greatest interest in foreign trade, aside from the mere broadening of our field and extending the business, is the evening up of the load upon the factory. It is every difficult and very expensive to administer a manufacturing business under constant fluctuation of that business. During the times of depression our overhead expenses naturally go on in very large volume; and the costs necessarily go up.

"It is extremely advantageous to have a business as the foreign business in our line has been heretofore. When we are depressed here our foreign business tends to even up the load upon our manufacturing facilities. It tends to keep our employees more steadily employed, and enables us to produce our goods at better costs than we could possibly do if we had that kind of a load to even up and did not have our foreign trade to help us."

The manufacturer corrected an erroneous impression evidently held by some members of the Trade Commission, to the effect that the export electrical trade is largely in supplies, rather than in extensive installations. Mr. Herr explained that his firm not only does a supply business, but has furnished large equipments of all kinds in South American territory and in African territory. "In fact," he added, "our goods are sometimes specified. The American goods have a very excellent reputation—I do not mean ours especially, but I mean American-made goods in the electrical line—for the high quality of the product, and we are frequently specified as against foreign competition. But they cut the price on us so severely and are able to produce goods and enter combinations—entering the market in ways that are very much to our disadvantage—that we find it very difficult to negotiate these high-class products when produced in competition with them. The financing of large projects through German and British financiers has affected us very seriously, of course, but there are still other agencies."

The Westinghouse spokesman disclaimed any personal knowledge of the reported purchase by the Simens-Schucktwerke people of the plants of competitors in Italy and France. Nor could he, in answer to questions, give any first hand information as to how the electrical manufacturers of Germany conduct their business through cartels. "We get the information," he said, "that they are able to exploit by means of the assistance not only of combinations among themselves, but also by direct government assistance. They are favored in their export trade as against their domestic trade, due to freight discriminations, etc."

Asked whether Westinghouse would not prefer to go it alone in the foreign field, rather than to come into any joint selling agency, Mr. Herr said: "We probably would. We have not considered the likelihood of having joint selling agencies, but I can well understand that there are many lines of business where they would be highly advantageous." He reiterated the need of proper financial connections, adding: "We are extremely handicapped in almost every foreign country by the lack of financial information available."

He also referred to the need of an American merchant marine and in reply to a question as to whether his company had found it necessary to adopt any new methods in foreign trade since the war, said: "No, our methods are not particularly different from what we did before the war. We have had some few cases where customers were caught and could not get their goods, but not anything of any great amount. I think that was due largely to the depression in South American territory.

Calvert Townley, assistant to the president of the Westinghouse Company, was able to give to the Commission particularly up-to-date information, because he has lately returned from a trip during which he visited most of the countries of South America. He declared that Latin-American markets are closed to a considerable share of Yankee-made electrical goods. Two reasons were assigned for this state of affairs. One explanation is that a large share of public-utility enterprises are financed by European capital and consequently orders for equipment go to European firms. A second explanation lies in the "leaks" of information due to the circumstance that the banks through which American firms must do business are conducted by foreigners. Without vouching for the stories, Mr. Townley told of the reports generally current to the effect that German banks in South America copy American bills of exchange and invoices, with the result that the information thus gleaned as to American competition, prices, etc., is quickly placed in the hands of German firms.

Evidently, Mr. Townley thinks that in the electrical field at least, all would not be smooth sailing for common selling agencies abroad. The chief obstacle he foresees is the difficulty of ar-

Digitized by Google

ranging combinations between producers of high-grade and low-grade products. He fears that the high-grade manufacturers might refuse to go in. There could be no objection, he thinks, to such a pooling of sales machinery in certain lines and he cites as an example the incandescent lamp business, there being on the market many lamps of high grade but different in quality—a state of affairs which affords no objection to all the lines being handled by one representative. Mr. Townley summed up his opinion of the South American electrical market in the sentence: "Generally speaking, electrical equipment follows the investment."

Maurice Coster, export manager for the Westinghouse Company, has furnished the Trade Commission with a wealth of inside facts about the export trade in electrical goods to Russia, South America, etc. One of his most interesting disclosures was with respect to German competition in South America. Said he: "The Germans have been able to reduce their selling expenses by making agreements between themslves as to the territory to be exploited. For instance, a few years ago, we would hardly ever meet any German competition in the Argentine except that of the A. E. G. Company. On the other hand, in Chile we would have nothing but the Siemens-Schuckertwerke competition, whereas we would find all the leading American electrical companies competing with each other in Argentina and Chile.

"By reducing their selling expenses the Germans have been able to sell cheaper apparatus. I think if we should go to our principal competitor in this country and make such an agreement we might be called to task on the ground that we were moving against the provisions of the Sherman Act. We would like to make such an agreement because South America is an immense field. It can easily be divided up. In Brazil, for instance, there is a very decided pro-American feeling. We do not need to meet German competition in Brazil—not always. On the other hand, in the Argentine, where there is so much German and English and Italian capital, we absolutely have to meet competition." Through bills of lading constitute another boon sought by Mr. Coster. He would like to see an arrangement whereby a railroad shipping, say from Chicago to Rio de Janeiro, would be permitted to issue through bills of lading and make special combination freight rates with the steamship companies.

Walter C. Fish, of the General Electric Company, discussed especially, for the benefit of the Trade Commission, the labor equation in the electrical industry with reference to its effect upon foreign trade. Said he: "A great many people think there is no nation so industrially efficient as we are, but I am sorry to say that is not so. There are portions of Europe fully as efficient as we are and paying one-half the wages. This brings to my mind the question of not only obtaining foreign trade but of subsequently retaining it. I haven't the slightest doubt that we are going to get more of it. Especially will we get foreign business where the per cent of labor, so to speak, in the value of the product is comparatively small. Our start in increasing foreign business will be along such lines."

The General Electric official advocates selling combinations among firms operating in the foreign field for the purpose of cutting down general expenses and likewise to prevent business houses from "needlessly knifing each other." Furthermore he urges "playing up to the coming generation" by establishing trade schools and apprentice systems. He protests, however, that the industry cannot afford the restriction of output which is today manifest in many directions, supposedly due to the influence of labor leaders, etc. "Our costs in this country," concluded Mr. Fish, "must be as low as possible—and fair at the same time—if we are to have any show whatever where labor constitutes an appreciable part of the value of the product to be exported. I am familiar with the costs, in many European countries, of articles quite similar to those which I chance personally to manufacture and I tell you we cannot afford to go backward."

Several firms in the electrical field that have not, individually, any need for common selling agencies have declared for them to the Trade Commission on the theory that such sales facilities abroad would aid the smaller concerns in the industry. In connection with a declaration in favor of cooperation in export, Vice-president Heulings, of the J. G. Brill Company, gave this bit of advice: "If you have a business large enough to subdivide, take your foreign business in one hand and your domestic business in the other and keep them far apart and you will have plenty to do."

Combination with competitors to work out problems in connection with specifications—this is the need of the hour as the situation is sensed by Everett Morss, president of the Simplex Wire & Cable Company. Until within the past year his firm has done comparatively little export business. But since the outbreak of the war, and particularly during the past few months, inquiries for rubber-insulated wire and cable have been so numerous that the firm has taken space in a leading English electrical paper and is going to "make a drive" for foreign trade. The head of the Simplex Company says that his concern does not expect to make any money the first two or three years, but it is building for the future. Incidentally he has not lost sight of the fact that he can afford to market electrical goods abroad with no margin of profit if he is enabled thereby to raise factory production and hold down overhead charges on the entire output.

"If we are going to make a real drive for export," said President Morss, "it might be necessary for us to make a combination in some way with a number of our competitors in order to work out the question of specifications. Practice in Europe is quite different from what it is here. We have in many instances got to change the point of view of the foreigners before they will take our goods and combination is necessary to educational work—to overcome prejudice."

In proof of the superiority of the American processes to which foreign consumers need to be converted, the Simplex executive cited a personal experience with a leading English manufacturer who was bemoaning the fact that a certain theoretically advisable process could not be used in cable manufacture and who was rendered all but speechless when told that the impossible process had long been in successful use at the Simplex plant. In short, to get foreigners to take American electrical goods is, in many instances, Mr. Morss declares, not a question of competition of quality but merely "competition of state of mind."

Transmission Line in Connecticut Nearing Completion.

A 66,000-volt transmission line connecting the Falls Village hydroelectric station of the Connecticut Power Company with the Dutch Point steam station of the Hartford Electric Light Company is nearing completion, and will be put in operation in about a month. The length of the line is about 60 miles and there are 700 66-foot towers, spaced about 450 feet apart. The cost will be about $250,000.

When completed, the transmission line will be used as a reciprocal feeder between the two stations, the water power company furnishing energy to the lighting company during seasons of abundant water, and the opposite course will prevail when water is low and the summer load at Hartford permits of sale of surplus energy. The capacity of the Hartford Electric Light Company's steam station is 30,000 horsepower and of the Connecticut Power Company's station 9,000 kilowatts.

Digitized by Google

English Electricity Works Conference.

English municipal electrical officials had to vary the arrangements for their annual convention held recently owing to the war, and the reports of the several committees showed that their operations had been greatly interfered with owing to the state of war. Major H. Richardson, city electrical engineer of Dundee, the president for the year, was called out on military service and in his absence A. C. Cramb, borough electrical engineer, became acting president. The place of meeting in consequence was changed from Dundee to London and all social functions were abandoned, the usual four or five days' convention resolving itself into two days' meetings, held at the Institution of Electrical Engineers.

The Incorporated Municipal Electrical Association has 377 members, 174 of whom are chief engineers of electricity undertakings, and nearly as many non-technical municipal committeemen. The association approached the war office, pointing out the desirability of preventing electricity works staffs from enlisting without special permission, and to prevent the staffs at work from being below the minimum necessary for safe operation. The war office agreed that those who were of necessity engaged on such works were doing service of equal use to that of fighting men, but declined to grant badges or certificates of exemption.

The new Development Committee to whose proceedings reference was made in these pages a few months ago, reported upon the difficulties of carrying on its particular class of work in time of war. It was only able to meet once in three months, but its various subcommittees did a certain amount of business. For instance, the publicity sub-committee took preliminary measures toward a scheme of co-operative advertising, printing and publicity work, and has approached the publicity committee of the London electric supply companies with a view to combining the publicity efforts of all classes of electricity undertakings, avoiding wasteful overlapping and bringing about an organized campaign for the development of public electricity service. It is hoped that under more favorable conditions than obtain at present some means may be found for co-operating with the Society for Electrical Development, Inc., of the United States.

The Electrical Installations subcommittee is proceeding along the following lines:

(1). To examine, tabulate and describe the various methods of wiring in use, with advantages and disadvantages, with a view to bringing about any possible reductions in the cost of installation work compatible with safety.

(2). To obtain the assistance and opinions of practical men in touch with this class of work, and to promote discussion on the subject.

(3). To promote practical criticisms of accessories in common use, in connection with installation work, with a view to collating information which would be valuable to manufacturers and users.

(4). To take an early opportunity of considering alternatives to the present design of plug contacts for heating, cooking and other purposes, particularly in regard to the possibilities of superseding the ordinary pin or concentric patterns by some more satisfactory form of plug contact.

The domestic appliances sub-committee has made plans for conducting various investigations regarding hot and boiling plates and other apparatus primarily for domestic use, but also usable for business and other purposes. It will deal with the whole of the apparatus from its connection with the permanent wiring of the installation; that is, where the work of the electrical installations sub-committee leaves off.

The report of the electric vehicle committee chiefly consisted of a summary of the periodical reports of its proceedings to which we have given publicity during the past year. The following reference was made to the affiliation with the Electric Vehicle Association of America: "The committee desire to again refer to the most useful results that have followed upon the continued affiliation with this important association through the membership of their honorary secretary. The association, both through its most energetic executive secretary, A. Jackson Marshall, and the chairmen of its various committees, has shown itself most anxious to help this committee whenever such help has been asked. The committee desire to place upon record their appreciation of the value of this co-operation, and their thanks for much useful information received."

A discussion took place on a joint report by two prominent chief engineers (A. S. Blackman of Sunderland, and T. Roles of Bradford) on "The Practical Result of the Point Five Tariff." In regard to results at Bradford it was stated that although domestic consumers had not been approached individually for the purpose of explaining the advantages they would enjoy by changing over from the flat rate to the "point five" tariff, more than half of such consumers had elected to be charged on the latter system, and had introduced electric heating or cooking apparatus. "This is all the more remarkable when it is borne in mind that no general attempt has been made to induce consumers to install heating and cooking apparatus, the staff of the business-development department having been fully occupied in dealing with power supplies." The Bradford Electrical Contractors' Association, through its secretary, expressed the contractors' view of the "point five" tariff as follows:

"The domestic tariff is one that is popular among your consumers in that it is quite simple and easily understood; in this it differs materially from the maximum demand system which I find to be quite beyond the grasp of the average lay mind, and . . . looked upon with some degree of suspicion. By enabling one set of wires to be used for both heating and lighting, the domestic tariff simplifies the wiring of a house, and, therefore, reduces the initial cost of the installation and by so doing tends to popularize the use of electricity . . . the extensions of the wiring are easier and not so costly as when the house is wired in duplicate for both heating and lighting. . . . Where the domestic tariff is in operation it is much easier to persuade the user to extend both his lighting and heating installation than is the case when the user takes his energy at the old flat rate; the argument that the additional load will only add so much electricity at one cent per unit to his bill usually proves irresistible. The large increase in the number of radiators installed in Bradford during the past few years is undoubtedly a direct result of the domestic tariff, and I believe that it is only under this system of charging that electric cooking will make appreciable headway. Looking at the domestic tariff from a contractor's point of view, I am satisfied that it is a system of charging which makes for increased business, and as it appears to give satisfaction to the user, it has my emphatic approval, coupled with the hope that the principle may, at an early date, be extended to those of your consumers who are occupiers of shop, warehouse, and other business premises, and who are at the moment excluded from the scope of this tariff."

Hammond System of Torpedo Control.

John Hays Hammond, Jr., of Gloucester, Mass., in a recent lecture in that city, stated that naval officials of the United States Government will recommend to Congress the purchase of his system of wireless control of torpedoes and will advocate the establishing of stations on the seaboard for operation of the apparatus, with a view to harbor protection. Mr. Hammond announced that he will transfer his experimental work to Fisher's Island, Long Island Sound.

Digitized by Google

THE FIRST INDICATION OF WHAT THE COURTS WILL CONSIDER UNFAIR COMPETITION UNDER RECENT LAWS.[1]

By Elton J. Buckley.

It seems to me as if the entire trade of the United States were waiting for some court decision which will declare what is to be considered unfair competition under the two most recent anti-trust acts—the Federal Trade Commission Act and the Clayton Anti-Trust Act. The Federal Trade Commission Act, it will be remembered, prohibits "unfair competition," but does not pretend to say what unfair competition shall be. The Clayton Act does name a few acts which are to be deemed monopolistic or unfair, but these for the most part are only generalizations, and the details will have to be worked out by the courts.

This gives special interest to a case which has just been decided in Indianapolis, Ind., involving most of the questions of monopoly and restraint of trade. The Government sued a large manufacturer of a certain store appliance, whose products are sold all over the United States. The charge was the use of oppressive methods destined to destroy competitors and restrain competition. The manufacturer decided not to defend the suit and allowed the court to enter a decree against him. I have just been sent a copy of this decree, which sets forth particularly what shall be considered unfair competition in this manufacturer's case. His case, however, will not be very different from many other cases.

The decree is handed down under both the Clayton and the Federal Trade Commission Acts, and is about the first detailed indication of the way the courts will look on various acts of competition. This particular court was the United States Court for the Indiana district.

As I regard the decree as of great importance, I reproduce from it the acts which the court said could no longer be legally done:

From employing spies to get information regarding competitors' business by taking employment in the latters' factories, shops or offices.

From price-cutting below cost of production and from discrimination in prices for the purpose of harming a competitor.

From bribing, hiring or employing architects, fire marshals, insurance representatives or municipal officers or employes to use their influence in promoting the sale of its own products or in preventing the sale of competitors' products.

From getting or trying to get cancellation of orders taken or of sales made by competitors or interfering in any way with contracts of competitors. The defendant company had, according to the complaint, what it called its "knockout squad," a force of special salesmen whose duty it was to cause cancellation of competitors' contracts.

From making false representations to customers, real or prospective of competitors, concerning the standing or business methods of the competitors, with the intent to injure them in their business.

From bringing or threatening suit against competitors and their customers, real or prospective, on the assertion, known to be false or not believed in good faith to be well founded, that the products of competitors are an infringement of the patent rights of the defendant company.

From agreeing to indemnify customers, real or prospective, of competitors against loss if they cancel contracts with competitors.

From inducing or hiring draymen, railroad employees or other persons to obtain from shipments made by competitors or from other sources, the names and addresses of their customers; except that salesmen in reporting prospective customers on whom they have called, or employees engaged to make canvasses for the purpose of ascertaining the names and addresses of prospective customers, may report the name of the appliance owned by the prospect if the purpose is not to injure the competitor.

From inducing or hiring salesmen, agents or other employees of competitors to leave their employment to enter that of the defendant company. However, such change may be made if without inducement from the defendant company.

Readers will note that several acts are forbidden here with very many concerns are regularly doing today in the course of every-day business. I do not believe, however, that these acts would necessarily be illegal if done by any concern. The defendant manufacturer in this case is the largest producer in his line. He has no monopoly, but he might be said to have control. Therefore the standard which would be set for his acts would be much more rigid than the standard set for the smaller man who made a small fraction of the total output. For instance, a manufacturer making one per cent of the total output in his line could do many things, and do them legally, that the dominant figure in the industry could not do at all. He could hire competitor's salesmen, for instance, without being guilty of unfair competition, although he might be liable to a civil suit by the employer whose salesmen he coaxed away. He could also, in my judgment, persuade customers to cancel orders given to competitors, though again there would be the chance of a civil suit for damages by the concern losing the order. It is one of the penalties of greatness—that the legal restrictions about one are much tighter than those about one's smaller competitors.

1 Copyright, 1915, by Elton J. Buckley.

Platinum Production Larger.

The placer miners of California and Oregon saved 570 ounces (troy) of crude platinum in 1914, as compared with 483 ounces in 1913, according to statistics collected for the U. S. Geological Survey by J. M. Hill. The greatest increase in production was in Oregon, which showed a gain of 85 ounces.

From this crude platinum 525 ounces of metallic platinum were extracted, valued at $23,625 figured at the average market price, $45 an ounce. The Boss gold-copper-platinum mine, near Goodsprings, Clark County, Nev., produced 110 ounces of platinum.

Besides the platinum obtained from sands and platinum ore 2,906 ounces of this metal were obtained from new material, of both domestic and foreign origin, by smelters and refiners of gold and copper bullion and mattes.

The secondary platinum industry handled 40,826 ounces of platinum, which was obtained from refining scrap metals and sweepings of the jewelry and dental trades.

Even if the imports of foreign platinum were greatly reduced, there are apparently sufficient stocks of this metal in the United States to meet domestic requirements, for the price of platinum, which rose to $50 an ounce just after the war was declared, had by July, 1915, fallen to $37 an ounce, or $8 an ounce less than the average in 1914. Another explanation of this low price may be the increasing use of tungsten, molybdenum, and nickel-chrome alloys in the electrical industry, and the use of plated ware in jewelry and dental work.

The following table shows the production of platinum in 1913 and 1914:

WORLD'S PRODUCTION OF PLATINUM IN 1913 AND 1914, IN OUNCES.

Country.	1913	1914
Russia, crude	[a]250,000	[a]241,200
Canada, crude	50	30
New South Wales and Tasmania, crude[b]	1,275	[a]1,248
Colombia, crude	15,000	[a]17,500
United States domestic, crude	483	570
United States refined platinum from foreign and domestic matte and bullion	1,100	2,905
Borneo, Sumatra, and others	200	(c)

[a] Estimated.
[b] Chiefly iridosmine.
[c] No basis for estimates.

Digitized by Google

OPERATION OF MAZDA "C" STREET LAMPS.

By Carroll H. Shaw.

The following data are the results of tests conducted on a street-lighting system composed of four individual circuits, each equipped with approximately sixty 20-ampere, 600-candlepower compensator-type street series Mazda "C" lamps, operated at 7.5 amperes.

Fig. 1 shows, first, the variation in watts consumed by the lamp and compensator combined; second, the variation in the voltage across the terminals of the complete fixture; and third, the power-factor of the unit under varying values of primary line current. It is found that for each variation of 0.1 ampere in the series circuit, there is a change in the energy consumed in each of the units of from 10 to 11 watts. This is equivalent to a 2.5-per-cent increase in energy consumed by the unit with an increase of one per cent in line current.

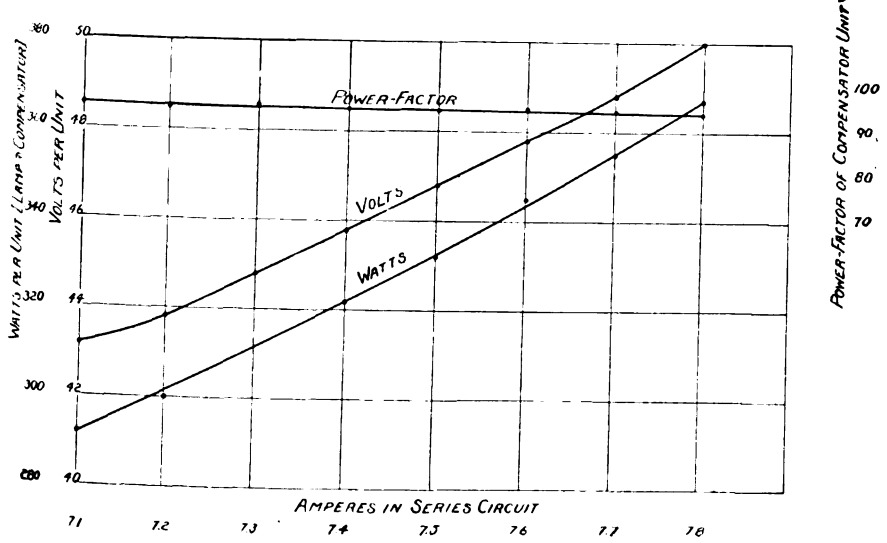


Fig. 1.—Curves for Street-Lighting Circuit.

The increase in current results in an increase of light from the lamps, a decrease in the life of the lamp, an increase in the wattage consumption, and a slight decrease in the effective power-factor of the unit. It has been found also that the frequency of the alternating-current service considerably affects the energy required, and although no satisfactory tests can be shown for a commercial circuit, due to the impossibility of varying the speed of equipment more than five per cent, it has been found that the change in energy consumed is almost directly proportioned to the frequency obtained.

In comparing the power taken by each unit and the total power delivered to the regulator, it is found that there is a loss of 73 watts per lamp, or, in other words, 18 per cent of the power taken is required to operate the equipment and to make up the line loss.

It is interesting to note that the wattage of the unit complete is 332 at rated current. These lamps were rated at 600 candlepower, 300 watts, when originally placed on the market and the compensator was rated at from 25 to 30 watts.

Memphis Jovians Active.

Memphis Jovians will have charge of the big automobile parade, which will be a feature of the convention of the Cotton States Merchants' Association, which is to be held in Memphis, Tenn., on August 17, 18 and 19. It is expected that there will be at least 1,000 automobiles and motor trucks in line, including the cars of the delegates, who are, as far as is possible, coming to the convention by motor. W. R. Herstein is chairman of the Jovians Parade Committee.

Boston Electrical Men Hold Outing.

An outing of electrical contractors and workmen of Greater Boston was held at Baker's Island, Salem Harbor, August 7, with about 200 in attendance. The day was spent in get-together festivities, which included field sports and a clambake, with corn, lobster and other delicacies.

The following were the committee in charge: R. H. Hallawell, R. S. Hale, H. A. Holder, L. C. Billings, F. L. Barnes, A. J. Hixon, H. S. Potter. The steamer *Griswold* carried the party to and from the island.

Massachusetts Institute of Technology to Receive Big Fund.

The Attorney-General of Massachusetts has approved of the transfer of a fund of $5,500,000, left to Howard University by the late Gordon McKay, to the Massachusetts Institute of Technology. The will of Mr. McKay specified that Harvard should establish a school of mechanics, electricity, physics, engineering, manufacturing and commerce. The trustees of the University felt that the Institute of Technology could better carry out the work intended by the donor. The trustees of the will have asked the supreme court to permit the transfer.

Tesla Sues Marconi on Wireless Patent.

A suit has been brought by Nikola Tesla against the Marconi Wireless Telegraph Company of America, seeking the annulment of one of the chief Marconi patents. Simultaneously with the suit for the annulment Mr. Tesla has brought a suit against the Marconi Company for infringement of his patents.

This litigation is a new development in the Marconi Company's claim to ownership of all basic patent rights in the transmission of wireless messages.

The dispute over patent rights between the Marconi Company and Mr. Tesla began in August, 1914, when the Marconi Company sued Fritz Lowenstein, a German engineer, alleging that certain wireless apparatus sold by him to the United States Navy was made in violation of Marconi patent 763,772. It was announced then that Mr. Tesla would testify for Mr. Lowenstein, alleging that the Lowenstein devices were developed from Tesla patents 645,576 and 649,621, which were granted prior to the Marconi patent.

In the present suit Mr. Tesla bases his action on the allegation that his two patents were granted in 1900, and that the Marconi patent was not granted until 1904. The bill of complaint asks for a decree adjudging the Marconi patent null and void, and asserts that the Marconi patent covers the inventions and combinations of apparatus described and claimed in the Tesla patents.

The answer of the Marconi Company denies that the Marconi patent covers the inventions or combination of apparatus described by the Tesla patents, and also denies that it is guilty of any infringement. The company claims that its patent was granted to Guglielmo Marconi on the proof of independent invention by Marconi, not due to or based on any invention of Tesla.

A hearing took place before Judge A. N. Hand, in the federal district court in New York City on August 5.

The Geological Survey now has available for distribution its annual statement on silver, copper, lead and zinc in the central states in 1914.

Digitized by Google

BOOK REVIEWS.

"Telegraph Engineering." By Erich Hausmann. New York: D. Van Nostrand Company. Cloth, 406 pages (5½x8¼ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $3.00.

"This book is intended for electrical engineering students, and as a reference book for practicing telegraph and telephone engineers, and for others engaged in the arts of electrical communication."

The following chapters indicate the scope of the book: Chapter I, "Simplex Telegraphy"; Chapter II, "Duplex Telegraphy"; Chapter III, "Quadruplex Telegraphy"; Chapter IV, "Automatic and Printing Telegraphy"; Chapter V, "Telegraph Office Equipment and Telegraphic Equipment"; Chapter VI, "Miscellaneous Telegraphs"; Chapter VII, "Municipal Telegraphs"; Chapter VIII, "Railway Signal Systems"; Chapter IX, "Telegraph Lines and Cables"; Chapter X, "Theory of Current Propagation in Line Conductors"; Chapter XI, "Submarine Telegraphy." Appendix giving: I, Trigonometric Functions; II, Exponential Functions; III, Logarithms; IV, Hyperbolic Functions.

It is seen that a wide field is covered in this book of 395 pages. It is obviously necessary to select with extreme care the topics and details that are to be discussed in order to successfully supply the needs of the public, for whom the book is intended. It would seem that the requirements of the undergraduate student were fully met. The topics chosen cover quite completely all phases of telegraph engineering which it is desirable for them to consider. The diagrams are well drawn, and the descriptions, while concise, are clearly expressed. The equations needed for the calculations of the various engineering details are given, and always accompanied by illustrative examples. Cost calculations in a number of cases are made, and the importance of exact design is emphasized. The theory of "Current Propagation in Line Conductors" is well developed, and if thoroughly mastered by the student would be of permanent value to him in his future engineering work.

For more advanced students, or for well trained engineers the book, if used for reference, has certain limitations. Alternative methods are seldom given. Methods of testing are not considered, and the disturbances caused by the failure of circuits or apparatus to conform to the normal have not been treated. The use of unusual symbols or of customary symbols having unusual meaning reduces the value of the book for reference, particularly as it is necessary to sometimes search for the definition of the symbols that have been used. References to more detailed discussions of the subjects treated are seldom given. In a book of this character it is, of course, unnecessary to give the sources from which much of the work is obtained, but the failure to do so sometimes limits the usefulness of the treatment without materially affecting its bulk. The proof reading has been exceedingly well done, but a careful engineer will not be satisfied with a single reference for important constants or equations upon which to base his calculations.

The exposition of the many subjects discussed is almost without critical comment, the presence of which would add much to the value of the book.

The competent instructor can supply the alternative methods, the references, the critical analysis and the results to be expected from a probable departure from simple normal conditions, which will supplement this volume, and so make it in its brief, logical, well balanced presentation of telegraph engineering an excellent book for the engineering student. CARL KINSLEY.

"Alternating-Current Electricity and Its Applications to Industry." By W. H. Timbie and H. H. Higbie. New York: John Wiley & Sons, Incorporated. Cloth 534 pages (5x7½ inches), 370 illustrations. Supplied by Electrical Review Publishing Company, Inc., for $2.00.

The increasing importance of alternating currents in the industrial field makes it necessary to have a wider knowledge of the theory of alternating currents; that is, it is not enough for only graduates of engineering schools to be versed in the elements of alternating-current theories and practice, but the man that handles the apparatus should also be familiar with the characteristics and principles of working of the apparatus and machinery under his care. This necessity has resulted in the production of several elementary texts on alternating currents and the book before me belongs to this class. It can be read by anyone who has a rudimental knowledge of trigonometry. The treatment is quite elementary and yet it is thorough and will serve admirably as a foundation for more advanced study.

In order to hold the interest of non-technical men, as well as to give the reader some idea of the industrial importance of alternating currents, the subject is introduced by a chapter on "Modern Systems of Power Transmission." As this introduction is intended merely to give the student the proper background, the technical accuracy of the discussion should not be too closely scrutinized. Nevertheless, it seems unfortunate that greater care was not exercised to avoid confusion, if not inacccurate statements. Throughout the chapter the terms "power" and "energy" are used interchangeably. For example, on page 4 the author states "steam engines, gas engines and water wheels when used to convert power into mechanical energy, etc., are for convenience sometimes called prime movers." This seems to the writer to be a new use of prime movers. A similar looseness of expression is found in Article I on the first page, where it is stated that "electricity is nearly always generated in one way or another from some kind of mechanical power." One of the essential, but nevertheless difficult accomplishments in textbook writing is consistency and accuracy in the use of technical terms. In view of the many good features of the book, the slight discrepancies mentioned above should not be taken too seriously.

The real study of alternating currents begins in Chapter II, where the author takes up the discussion of fundamental ideas. Chapter III treats the theory of parallel circuits; Chapter IV is devoted to power and power factors; Chapter V to inductive reactance; Chapters VI and VII to alternating-current generator; Chapter VIII to wave forms, and Chapter IX to armature windings of alternating-current machines. The outstanding feature of the text is the simplicity of the treatment. The authors use many mechanical analogies and their pump analogy which, in modified forms, illustrates not only the fundamental theory of alternating current, but makes clear the action and reaction in series circuits, parallel circuits, and phase relation, deserves very high praise. As a whole, the illustrations serve the purpose for which they are intended very well, but the attempt to give concrete ideas to the student seems to be overdone. For example, Fig. 154, is an outline of a generator on which has been drawn the conventional delta connection. It is very doubtful if any student will get the slightest notion of the actual connections from such a diagram. Why give to a beginner a notion which will lead him astray? Chapter IX on armature winding is deserving of special mention. Here, as in other parts of the text, we find the authors have given close attention to all minor details.

A most excellent collection of problems serves to make the book very useful to the teacher who may not have the time nor the facilities to make individual collections. Taken as a whole, the book may be safely recommended as an elementary text on alternating currents. C. M. JANSKY.

Digitized by Google

New Electrical and Mechanical Appliances

Street-Lighting Fixtures for Type C Mazda Lamps.

Specially designed fixtures are required for the Mazda type C lamps of high candlepower, in order to successfully utilize these lamps for the severe conditions of street-lighting service. The life of the lamp and the efficiency of the complete unit are vitally affected by the globe shape, ventilation and weatherproof qualities of the fixture. Inasmuch as the lamp-renewal cost per year for each fixture greatly exceeds the first cost of the complete fixture, it is self evident that any construction increasing the life of lamp without decreasing the efficiency of the complete unit is of prime importance, and that no make-shift device should from an economical standpoint be considered for installation with these comparatively expensive lamps.

Of first importance in the design of any fixture for this service is ventilation, as the heat radiated from lamps of the gas-filled type is comparatively intense and without ample ventilation the life of

Fig. 1.—Fixture Complete Without Reflector.

the lamps is very seriously curtailed. By careful experiment over a considerable period of time, the Westinghouse Electric & Manufacturing Company has determined the proper arrangement to give the maximum ventilation, and at the same time provide a weatherproof unit and also enable the proper screening of all openings to exclude insects. The latter feature is an important requirement with street-lighting fixtures but one that has been infrequently fulfilled. The high operating temperature of the Mazda type C lamp necessitates its careful protection from rain and snow. Consequently, the ventilation must be so arranged that the lamp is not in danger from this standpoint.

The appearance of a street-lighting unit is always of importance, inasmuch as it occupies perhaps the most conspicuous position of any piece of electrical appara-

Fig. 2.—Fixture Complete, Showing Globe Lowered for Removing Lamps.

tus. The unit shown in the accompanying illustrations is of symmetrical appearance, both when equipped with reflector and when used without the reflector. A 20-inch reflector of the concentric type gives the fixture the most finished appearance. The globe is of acorn shape to utilize the light to the best advantage. A diffusing globe is recommended on account of the high intrinsic brilliancy of the lamp, and because good street lighting requires minimum glare.

These fixtures are specially constructed with a view to maximum durability and accessibility. The case is of solid copper, finished in black enamel. The wires are brought to binding posts of neat, convenient and durable construction, as worked out in the best design of arc lamps. The globe is hinged at one side, and latched at the other, by means of a corrugated band of copper. This readily enables the replacement of lamps with but one hand. A specially designed skeleton socket has been adopted as standard for this fixture..

This fixture is primarily designed for use with the very efficient high-current lamp, and is equipped with an autotransformer to enable installation on existing 6.6 and 7.5-ampere, constant-current, alternating-current circuits. The 15 and 20-ampere lamps have a very much higher efficiency than the 6.6 and 7.5-ampere lamps. Even considering the losses in the autotransformer, the energy saving at one per cent per kilowatt-hour on a 4,000-hour-per-year schedule is sufficient to cause a saving equivalent to the additional first cost of the autotransformer within 18 months. At the same time, the use of the autotransformer eliminates the necessity for a film-cutout socket, inasmuch as the open-circuit voltage of the secondary amounts to only two or three times the lamp voltage, and this transformer is not injured by continuous operation on an open circuit.

The Westinghouse company has adopted as standard a core-type autotransformer for this purpose after careful consideration of the merits of all types. The efficiency of the core-type transformer is inherently higher than that of other types

Fig. 3.—Luxsolite Fixture With Globe and Case Removed.

because of its compactness and shortness of the iron circuit. Also, because of this construction, the power-factor is materially better, which has the effect of enabling the constant-current regulator, on which these fixtures should always be operated, to carry considerably more load than if the autotransformer had a power-factor even one or two per cent lower. The insulation of this autotransformer is

Digitized by Google

very important, because of the temperature under which it must operate. The winding is insulated from the coils by means of Micarta washers and the complete unit thoroughly impregnated with Bakelite, being therefore unaffected at any ordinary operating temperature.

Use of Telephone in Restaurants Takes the Din Out of Dinner.

The old-fashioned waiter with the stentorian voice and unlimited lung cacapity, who has been looked upon as an essential element in restaurants, is doomed to retire with the horse car, the kerosene lamp, and other antiquities. Use of the telephone is bringing about quiet and repose from nervous tension so conducive to enjoyment of a good meal in restaurant, hotel dining room, or lunch room.

Knight's Restaurant in Philadelphia, Pa., is noted for its "ready to eat" dishes. A large blackboard with the menu lettered upon it is fastened on the wall in plain sight of the patrons. The selection is made and the waiter notified. He does not proclaim to an audience that one has ordered "Ham and," nor does he call it down a speaking tube and repeat it five times until the chef on the other end understands. He simply takes a hand telephone from a convenient hook and quietly gives the order to the chef below. There are no delays, nor mistakes. The cook gets the order correctly at once and within a short time one gets the dinner ordered. The system consists of a hand telephone used by the waiter and a chest transmitter and watch-case receiver used by the chef. It was supplied and installed by the Western Electric Company. It is said that this outfit takes the din out of dinner.

Appleton Conduit and Pipe Supports.

Since conduits are coming more and more into use for wiring work many cases are being met with where the ordinary hangers and clamps for supporting the pipe are either entirely unsuited or inconvenient to install. This has prompted the Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill., to place on the market two new conduit and pipe supports, which are illustrated herewith.

The new conduit hanger, which is shown in use in Fig. 1, is made in two parts. Of these the supporting base, Fig. 2, is provided with jaws that can be readily drawn together by means of the clamping screw. The clip, Fig. 3, is first snapped over the conduit and then slipped between the jaws of the supporting base. When the screw is tightened a firm grip is obtained on the conduit. These hangers are made of spring steel and are either black enameled or sherardized. They are easily and quickly installed.

Fig. 4 illustrates the new Appleton pipe clamp, which is of unique design.

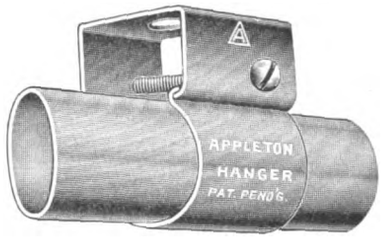


Fig. 1.—Appleton Hanger in Use.

This clamp is constructed of steel and is therefore not only light in weight but is practically indestructible. It makes an inconspicuous fastening, especially where the conduit is installed on tile, brick and concrete walls. It requires but a single screw or bolt to secure it in place and obviates the drilling of two holes. Its use saves the cost of one expansion bolt or screw and is an economical advance in conduit installation. This clamp is made for one-half, three-quarter and 1-inch conduit.

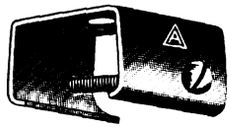


Fig. 2.—Supporting Base for Hanger.

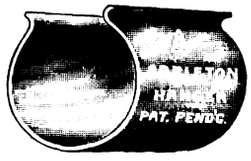


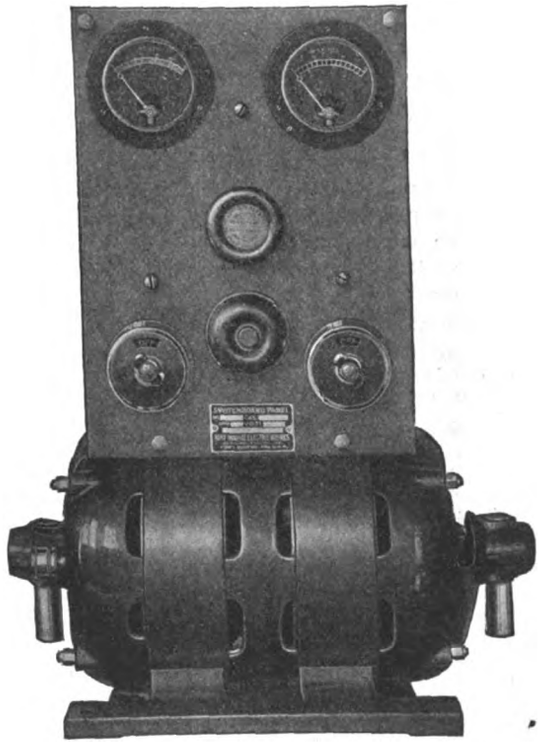
Fig. 3.—Clip for Conduit.

Fig. 4.—Appleton Pipe Clamp.

Small Battery-Charging Outfits for Automobile Ignition and Lighting Batteries.

A new line of battery-charging outfits has been designed especially for service in garages for charging automobile ignition and lighting batteries. These outfits consist of small motor-generator sets on which are mounted small switchboard panels bearing all the switches, instruments, etc., necessary for their control. They are to be connected to the incandescent lighting circuits by means of lamp cord and plug, the motor-generators being supplied for service on 110 or 220-volt, 60-cycle, alternating-current circuits, or on 110 or 220-volt, direct-current circuits. The motor-generators are supplied to deliver direct current at 12, 18 or 24 volts, such voltages being specifically adapted for charging ignition and lighting batteries.

The switchboards have a snap switch in the line circuit, for the purpose of starting and stopping the sets; a snap switch in the circuit from the generator to the batteries to be charged, for opening the charging circuit; a voltmeter for reading the voltage delivered by the generator; an ammeter for reading the charging current; a field rheostat for raising or lowering the voltage of the generator end of the set and, therefore, serving to adjust the battery charging current. A small push-button switch, placed in the center of the board between the two snap switches before mentioned, is provided so that the voltmeter is not in circuit except when it is desired to read the voltage delivered by the set. The rheostat provided on the switchboard in all cases has sufficient capacity to reduce the voltage of the set to that proper for charging a battery of any lower voltage down to and including a six-volt battery.



Battery-Charging Outfit.

These charging outfits are so small that they may be placed at any convenient point in the garage, and when placed upon a work bench they will take up but very little room. They need practically no attention in service other than an occasional filling of the

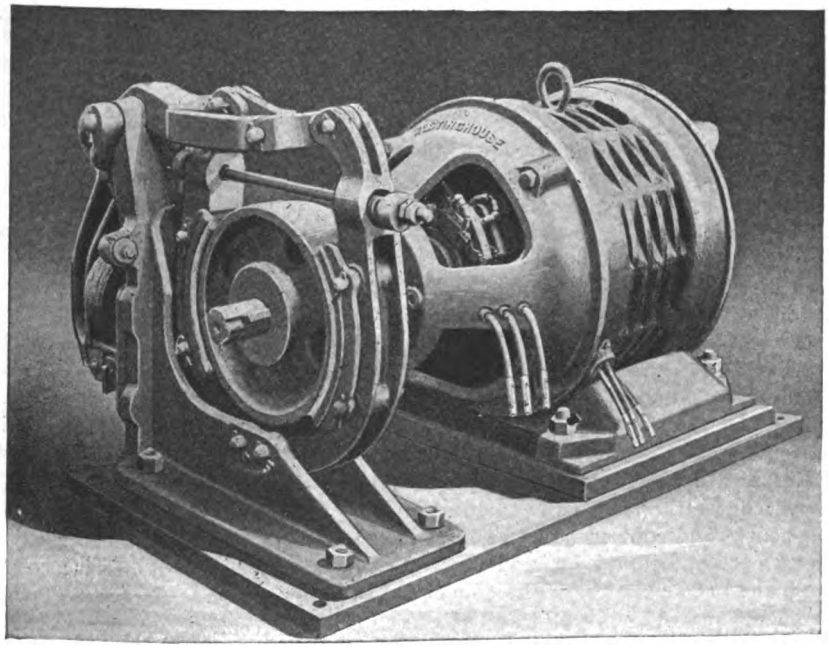
Digitized by Google

bearing grease cups with oil. The switchboard, bearing all of the instruments, rheostats, switches, etc., properly wired leaves as the whole work of installation simply the necessity of connecting to the lighting circuit and to the battery by lamp cord. The outfits are supplied in two capacities, 175 and 250 watts output, such capacities having been found specifically adapted to the service of charging automobile ignition and lighting batteries.

The outfits are manufactured by the Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

New Alternating-Current Magnetic Brake.

The new alternating-current magnetic brake illustrated herewith has been designed especially for use with induction motors operating cranes, hoists, roller lift bridges, and many different classes of mill machinery, and it is applicable wherever frequent stops and reversals are necessary. The operating magnet is single-phase and may, therefore, be used on polyphase circuits.



Alternating-Current Magnetic Brake.

The action of the brake is simple. When the controller is thrown to the off position, two brake shoes are forced by means of springs against a cast-iron brake wheel which is keyed to the motor shaft. When the motor is started, the magnet coil is energized and the action of the magnet, operating through a lever and a toggle, forces the shoes apart and releases the brake.

In the design of this brake, the Westinghouse Electric & Manufacturing Company has embodied several improvements. It is a complete self-contained unit that can be mounted directly beside the motor or on a special sole plate, as shown. Since the application of its braking action is not dependent upon gravity, it can be mounted in any position, from the horizontal to 90 degrees in such a direction that the movable magnet lever has no tendency to fall away from the stationary magnet core. This makes it especially desirable for applications where the position of the motor changes during the operation, as on a roller lift bridge. The overall height has been reduced to a minimum so that it can be used in places where headroom is limited, as, for instance, in crane service. The insulation is such that the brake is adaptable for use outdoors and exposure to the weather without any modification whatever. No dashpots are used, thus all possibility of trouble due to sticking is eliminated. The brake shoes are made of cast iron to which are fastened woven asbestos-fabric linings. The wheel is made of cast iron, and the coefficient of friction between the brake wheel and shoes is not materially affected by oil, grease or water.

The pressure on the brake shoes can be varied by means of nuts on the spring rods and wear on the shoes can be taken up by means of an adjusting screw. Two springs are used and only two adjustment points are necessary. If the operator fails to take care of the adjustment which compensates for wear on the shoes, the result will not be a failure of the brake to set, it will only mean that the machine cannot be started, as the brake will not release.

With a view to facilitating repairs, axle-steel pins held in place by cotter pins have been used wherever this is possible.

This brake, known as type A, is made in sizes ranging from 5 to 100 horsepower for 25 and 60-cycle, 224, 440 and 550-volt circuits.

New Johns-Manville Lighting Showrooms in New York.

When the H. W. Johns-Manville Company took over the sales arrangements for the famous Mitchell Vance lighting fixtures and combined with them those for the Gill Company's Parian glassware it was predicted that something interesting would happen shortly. One of these developments is the new lighting display building in New York.

Next door to the Johns-Manville Building at Madison Avenue and Forty-first Street, New York City, stands an old brown-stone mansion, one of the survivals of that not yet distant period when the Manhattan merchant princes thought Murray Hill the center of residential New York. This building has been acquired by the Johns-Manville Company with the unique idea of showing in appropriate surroundings all the various lighting fixtures for the modern home or office.

The old rooms have been restored and handsomely furnished and each one filled with lighting fittings appropriate to its character. Drawing, dining and bedrooms, hall, stairs and office, all have their proper setting and arranged so that the architect or his client can come and study quietly the exact effect of each type of lighting and each kind of fixture.

Hitherto the trouble in displaying lighting equipment has been that it was impossible to get a correct idea of the complete fixture in advance. The metal parts usually came from one house, the glassware from another, and, if any special design or scheme were called for, it was only obtainable after considerable trouble.

Under the new arrangement the various departments of lighting design will be co-ordinated and, in co-operation with the architect, it will now be possible to arrange a lighting system which will form an architectural unit with the building as a whole.

Among the special displays in the new lighting showrooms are those showing the efficiency and economy of the J-M Linolite system; this system is making rapid strides in favor for the lighting both of public and private buildings. The Frink system of concealed lighting for banks, offices, etc., and the Frink Polaralite signs are also shown as wonderful examples of applied design. The beauty of Mitchell Vance brass and bronze work and the unique translucency of Gill Parian glassware form an exceptionally pleasing combination made available by the enterprise of the H. W. Johns-Manville Company. All of these are exhibited in endless variety and serve to make a visit to the new showrooms amply repaid, the displays on the first and second floors being particularly complete.

Digitized by Google

Telephones Aid Grain Loading.

The Girard Point grain elevator at Girard Point (near Philadelphia) is said to be the largest of its kind in the world and is the only one to have its operations controlled by a system of telephones.

There are four traveling belts that cover the entire great length of the bridge, enabling the operators to load ships from both sides of the bridge at the same time. The man who controls the movement of the belts is stationed at the base of the bridge. He is supplied with telephones which put him in instant communication with any part of the system. The belt attendant on the bridge and the watchman who stays on the pier near the boats that are loading are provided with hand telephones, attached to which are cords and plugs. Desk-set boxes equipped with jacks and special loud gongs are placed at regular intervals on the bridge and pier. The man who controls the belts can summon either of these men to the station where he wants them by pressing the button corresponding to that station which rings the gongs at that desk telephone. The man summoned inserts his plug in the jack at that telephone and receives his instructions. If he wishes to call the man in charge of the belts, he inserts his plug in any of the desk telephones and turns the generator crank which places him in instant communication with his chief.

It is seen from the above that all parties involved in the handling of the grain are in very close and immediate touch with one another, providing a most flexible system of handling the loading of these large grain boats which otherwise, considering the size of the elevator, bridge and pier, would be a most cumbersome and unwieldly operation. The system was designed and installed by the Western Electric Company. This is another example of how the telephone has been put to special work.

Cutting Sheet-Steel Piling With Oxy-Acetylene Blowpipe.

The Florida East Coast Railway Company is just completing the construction of a large drawbridge which spans the St. Johns River at Jacksonville, Fla. Lackawanna sheet-steel piling has been used in the construction of the protecting piers. This piling is driven down in sections. Each sheet or section consists of a three-eighth-inch web and is about 2.25 inches thick on the lock joint.

In all, approximately 860 feet of piling had to be cut off at a uniform height. An oxy-acetylene cutting blowpipe was used, employing Prestolite gas and compressed oxygen, both in portable cylinders. On account of the peculiar construction of the lock joints, the operator was handicapped in making speed, although the work was completed at an enormous saving over the old method of sawing through, which would have been an extremely slow and tedious operation.

At the lock joint practically four sections of metal had to be cut through, requiring frequent changes in the adjustment of the blowpipe. Nevertheless, it is stated that between 40 and 50 lineal feet of piling was cut in seven hours, one man handling the entire job. This is many times faster than the speed of the ordinary hacksaw, which on such a job would require the services of at least two men.

The cutting followed the pile drivers closely so that virtually no time was lost.

Direct-Reading Device for Computing Characteristics of Vacuum Tungsten Lamps.

It is well known that a change in the voltage applied to the terminals of an incandescent lamp changes the candlepower, current, and in consequence the wattage and the watts per candle. If these changes are followed from point to point, relations among the variables may be found and plotted as characteristic curves. The equations of these characteristic curves for tungsten lamps have been found by the Bureau of Standards, and a special application of these equations has been made in a device which gives a solution of problems involving voltage, candlepower, and watts per candle.

In this device the volt scale is movable, and, by setting it to the other scales at a point corresponding to the observed watts per candle, values of per-cent candlepower and of actual watts per candle may be read directly from the proper scales, or the converse problems may be solved. Use of this device results in a decided saving of time when compared with other methods of characteristic evaluation. In connection with the device are given tables of values used in its construction and practical examples illustrating scale settings. Copies of Scientific Paper No. 253 may be obtained without charge upon application to the Bureau of Standards, Washington, D. C.

Electric Trucks Used as Freight Car Shifters.

The use of electric motor vehicles for shifting freight cars on an industrial side track has been put to practical test at the new Fish Pier, at Boston, Mass., where five-ton General Vehicle trucks are regularly utilized to haul cars that have been unloaded, to a storage yard about 500 feet distant, so as to allow other cars on the same siding to be moved opposite the storehouse doors.

A chain coupling is attached to the bumper of the freight car, and the truck is run on the first speed. The car is hauled until it reaches the limits of the paved street opposite the pier, where it is pushed along the track by the truck backing against the other end.

Ordinarily the trucks are employed in hauling ice from the electrically operated freezer of the Commonwealth Ice and Cold Storage Company, to the various fishing schooners tied up at the pier, but this added service makes them of even greater usefulness.

Wireless Receiving Device Patented by Ashton and Curtis.

It is an open secret that the right to use zincite as the sensitive element of a wireless telegraph detector has been in dispute for a number of years.

This question has been at last definitely settled by the issue of a patent, as first and original inventors, to Ashton and Curtis on July 6, 1915, No. 1,145,658, after a long and strenuous contest in the Patent Office comprising three interference proceedings. The right of Ashton and Curtis to use zincite for this purpose has been confirmed by all of the tribunals of the Patent Office, namely the Examiner of Interferences, the Board of Examiners-in-Chief, and the Commissioner of Patents.

The patent comprises the exclusive right to make, use and sell, in an oscillation receiver: (1) the natural oxid of zinc, commonly designated as zincite, as an element of a wirelsss telegraph detector; (2) the combination in a wireless telegraph detector of zincite combined with any electrical conducting medium; (3) any oxid of zinc comprising the formula 80.26 per cent of zinc and 19.74 per cent of oxygen, which is the proportion in which zinc and oxygen combine to form an oxid of zinc, used in a wireless receiver; (4) the structure of an oscillation detector instrument comprising the eccentric supporting relation of the parts whereby all portions of the face of the sensitive element may be contacted with the opposing operative element of the detector.

Bristol Company Receives Grand Prize for Recording Instruments.

The Bristol Company, Waterbury, Conn., has been awarded the Grand Prize (the highest award) for recording instruments displayed at the Panama-Pacific International Exposition, San Francisco, Cal. The Bristol exhibit of these instruments is comprehensive and very instructively arranged. An illustrated description thereof was published on page 1131 of our issue of June 12, 1915.

Digitized by Google

New Reflectors for High-Efficiency Window Lighting.

It is well known that in order to obtain the most definite and efficient results from a reflector it must be designed for particular use with a particular lamp, that is, a lamp of a definite size and shape and in a definite relative position as regards the reflector must be used. Since the advent of the gas-filled tungsten lamps in smaller size, particularly the 100-watt type, new conditions are met when these lamps are to be used for store-window lighting. This is especially true where reflectors using spectral or true mirror reflection are employed. The new lamps have a very concentrated filament, the center of which is located differently from the corresponding size of the vacuum type lamp.

Fig. 1.—"Jove" Reflector.

Fig. 2.—"Jupiter" Reflector.

To meet the demand for reflectors especially suitable for the new 100-watt gas-filled lamps, two new types of reflectors have recently been placed on the market. These are of the silvered-mirrored-glass type with corrugated reflecting surfaces. The corrugations are somewhat smaller than the earlier types of these reflectors. The reflector shown in Fig. 1 is called the Jove reflector and is designed for windows ranging from one to one and one-half times in height compared to the depth. The reflector shown in Fig. 2, known as Jupiter reflector, is arranged for windows whose height is about twice the depth. These reflectors are shaped to give practical uniform illumination on what is known on the line of trin, the distribution curves for these reflectors being shown by Figs. 3 and 4, respectively.

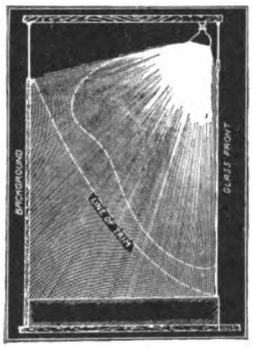


Fig. 3.—Distribution from Jove Reflector.

These reflectors are to be mounted at the upper front edge of the window so as to throw the light downward and against the background where the window display is made. In order to secure the best results the upper front of the window should be draped, painted, or screened off in some manner so as to cut off all view of the lamps and reflectors from persons looking into the window at any position. This gives the proper conditions for effective window lighting in that the source is entirely concealed and the light is thrown upon the goods displayed.

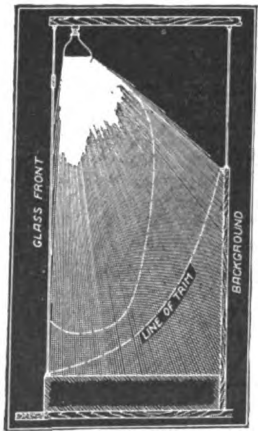


Fig. 4.—Distribution from Jupiter Reflector.

These reflectors are ventilated so as to permit free convection of the heat from the lamps and they also are provided with a special backing to withstand high temperature indefinitely. These reflectors are made by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill.

Electric Steel Production.

There were, at the beginning of 1914, according to the *Elektrotechnische Zeitschrift,* 138 arc furnaces and 35 induction furnaces in operation for the production of steel. The arc system is thus far more generally in use, though judged on the basis of steel output the advantage would appear to be with the induction system. The opinion expressed in recent years that the induction furnace would prove the better of the two, has given place to the conviction that each system has its own special field of operation. So far as the sizes of the furnaces are concerned the problem of a construction for a capacity over 15 tons has yet to be solved. Larger furnaces than the 25-ton Heroult have not yet been constructed, and the practicability of this dimension has not been demonstrated as yet. The Girod system has attained the 15-ton margin, the Nathusius and Röchling-Rodenhauser 12 tons, while the production of castings on the Stassano method is limited to small units of no more than two tons. Nevertheless, units of 30 tons are still being built on the Heroult system and 20 tons on that of Frick. During 1913 the output of the electro-thermic steel works increased in Germany, Austria-Hungary and France, though the increase was less than in previous years. The total production in North America remains nearly stationary. On the whole, it is the general belief now—as against previous opinions to the contrary—that the electro-steel industry has a long period of development still confronting it, and that the experimental stage is far from having been passed.

Herewith is given a list of the several systems and their development in 1913 and 1914. Arc furnaces working and under construction: Heroult, 67; Girod, 27; Nathusius, 9; Stassano, 10; Keller, 6; Chaplet, 8; others, 11; total, 138. Induction furnaces working and under construction: Kjellin, 10; Röchling-Rodenhauser, 17; Frick, 6; others, 2; total, 35. There are, therefore, 173 electric furnaces altogether.

West Virginia Coal.

West Virginia broke all records in coal production in 1914 with an output of 71,707,626 short tons, valued at the mines at $71,391,408. This was an increase of about a half million tons over the production in the previous banner year, 1913. The number of fatal accidents in the mines, according to the Bureau of Mines, was 556.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

CHICOPEE, MASS. — The Fisk Rubber Company will erect a five-story mill, 600 by 110 feet, to be equipped with motorized machinery. The new mill will give employment to about 2,000 persons and will cost about $300,000. W.

NEWBURYPORT, MASS. — Philip Cabot and Lester L. Flint, of Boston, have taken over the management of the Newburyport Gas and Electric Company. Sidney W. Winslow, president, and Andrew W. Rogers, treasurer, retire because of other business, though retaining an interest. The company has 2,300 gas customers and 500 electric customers, and it is the intention of the new management to make a campaign for new business, especially along electric lines, which are capable of large development. The construction of new lines and the installation of generating equipment will follow.

PHILADELPHIA, PA. — A Philadelphia syndicate, headed by Edward E. Mandeville, is forming a merger of gas, power and light companies in New York, according to papers filed with the Public Service Commission of that state. The company to be known as the Orange County Public Service Company, will control the Orange County Company, the Cuddebackville Company, and the Monticello Light and Power Company, embracing a territory which covers the cities of Middletown, Monticello and Port Jervis, as well as the towns of Cuddebackville, Otisville and Howells, with a population of nearly 40,000. The syndicate controls the Port Jervis Light and Power Company and the Port Jervis Traction Company.

BACONTON, GA. — The sum of $5,000 will be expended for a light plant. Address J. B. Miller.

COOLRIDGE, GA. — The Council is planning to extend electric light system. Address the mayor.

NORTH CENTRAL STATES.

LIMA, O.—The Ohio Electric Company in accordance with the terms of its franchise, under which it is required to bury all transmission wires in the business district of the city, will let contracts for the work in a short while. It is estimated that the work will take five or six weeks. L.

WELLSVILLE, O.—The city will construct an electric light plant as soon as it can dispose of bonds which have been authorized for that purpose. No bids were received for them at a recent date fixed for the sale, as buyers declared the rate of four and one-half per cent to be too low at this time.

OWOSSO, MICH.—An electric light system for the boulevards will be installed at a cost of $25,000. Address the president of the Owosso Improvement Association.

DURAND, WIS. — The Durand Light and Power Company has increased its capital from $35,000 to $70,000.

ROCHESTER, MINN.—A new electric light plant will be erected in this city. Address the chairman of the City Council.

MARBLE ROCK, IOWA. — Bonds to the sum of $4,500 have been voted for the erection of electric light system here. Address the town clerk.

CONCEPTION JUNCTION, MO.—An electric light plant will be erected here by T. W. Costello.

KANSAS CITY, MO. — The Blue Springs, Mo., electric light and ice plants, owned by J. C. Waugh, of Kansas City, was practically destroyed by fire July 29, part of the ice machinery being saved. The building was frame and iron. The loss was about $5,000. Mr. Waugh will replace machinery at once. There was a 32-horsepower oil engine and a 20-kilovolt-ampere generator in the lighting plant. M.

KNOBNOSTER, MO.—The Johnson County Light and Power Company has been incorporated with a capital of $5,000, by S. A. Kelley and others.

KILLDEER, N. D.—R. C. Horn, of Dickinson, will install an electric light plant here.

KINGSTON, N. D.—The City Council is planning improvements to the electric light plant. Address the town clerk.

PERU, NEB. — The Peru Electric Lighting and Power Company plans to install an 80 horsepower boiler. Address H. Hallenbeck, manager.

SHELTON, NEB.—An $8,000 electric light system will be established. Address the town clerk.

BELLEVILLE, KANS.—The Commercial Club and citizens are urging upon the city officials the installation of a white way street lighting system. It is said the officials favor it. M.

CHAPMAN, KANS. — The citizens voted almost unanimously to issue $8,000 in bonds to buy the electric light plant and complete it. M.

KANSAS CITY, KANS.—The Public Utilities Commission of Kansas has approved the transfer of the holdings of the Arkansas City Gas and Electric Light Company and the property of the Arkansas City Water Company to the Kansas Gas and Electric Company. The deal has been pending for several years. It is said the consideration for the gas and electric property and company was $300,000. It had been owned by A. A. Newman and Son. M.

MANHATTAN, KANS.—The Manhattan Ice, Light and Power Company is said to be planning the remodeling of its building, and the re-equipment of the electric plant at a cost of about $30,000. E. A. Wright is manager. M.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—Electricity is to supply the power for the operation of the plant, which local business men are organizing to take over and rebuild, of Holloway Tobacco Warehouse, on A Street. Promoters of the new company expect to price the stock low and to enlist tobacco growers in the venture.

PADUCAH, KY. — The Foreman Automobile Company will install its own electric power and lighting plant in a $35,000 garage which it is to build. The structure will be two stories, 144 by 115 feet. G.

BATON ROUGE, LA.—The Baton Rouge Electric Company has had plans prepared for an electric station. The equipment will include three 500-kilowatt Curtis turbines, three 400-horsepower water tube boilers, superheaters, etc. Address Stone & Webster Engineering Corporation, 147 Milk Street, Boston, Mass.

NEW ORLEANS, LA.—It is understood that the Commission Council has broken off negotiations with the New Orleans Railway and Light Company, with respect to the residential lighting rate controversy and has authorized Commissioner Lafaye to engage an expert for the purpose of making a survey, preparing plans and superintending the construction of a publicly-owned lighting plant.

AUSTIN, TEX. — J. C. Andrewartha, of Dallas, consulting engineer of the Southwestern Traction Company, has advised the board of commissioners of Travis county, at Austin, that the company plans to build a trunk line interurban railway from Dallas to this city, with branch lines to San Angelo, Lockhart and a number of other towns. The proposed system will embrace several hundred miles of track. The same interests comprise the Northwestern Traction Company, which plans to construct an interurban railway from Dallas to Denton. D.

DALLAS, TEX.—The Texas Power and Light Company will supply the towns of Troy, Eddy, Bruceville, Thrall, Lorena, and Holland with electric current for lighting and power purposes from the high-power long-distance transmission line which it is building from its station at Waco to Austin, about 100 miles. The company has also taken over the local electric light plants at Moody, McGregor and Thorndale, on the new line. D.

DECATUR, TEX.—The municipal electric lighting system here will be extended. D.

JOURDANTON, TEX. — The construction of a municipal electric light and power plant here has been started by Hudson & Braden, contractors, of San Antonio. D.

MERKEL, TEX.—The Abilene Gas and Electric Company has purchased the electric light and power plant of

Digitized by Google

the Merkel Electric Light Company, and will connect the latter with its central station at Abilene by means of a transmission line. D.

PLAINVIEW, TEX.—The Malone Ice and Light Company, which is building a system of transmission lines in this section, will supply current for light and power to the towns of Lubbock, East Floydada, Lockney, Abernathy and Hale Center. It will also furnish power for operating many irrigating pumping plants. D.

SAN ANGELO, TEX. — Improvements to cost close to $50,000 are to be made to the plant and system of the San Angelo Water, Light and Power Company within the next several months. This announcement was made by officials of the company. Among the improvements will be the installation of several large machines at the power plant. Address general manager.

WESTERN STATES.

BOZEMAN, MONT.—Bids for materials and installation of an ornamental lighting system in special improvement district 100, will be recived by C. A. Speith, city clerk, August 19. Plans and specifications for the improvement are on file in the office of official named. According to plans announced, there will be approximately 74 combination lighting fixtures and trolley suspensions, 16 three-light cluster posts, 8,100 lineal feet trenching in concrete, 150 lineal feet trenching in earth, 150 lineal feet trenching in bitulithic, 9,200 feet of two No. 6 park cable, eight conduits, etc. For further information, apply to city clerk. O.

DILLON, MONT.—The City Council, according to Henry G. Rogers, clerk, has created a special improvement district, wherein an ornamental lighting system will be installed. The territory included in the district is Pacific and Washington Streets, between Cornell and Helena Streets, and from Idaho and Orr Streets to Glendale. It is understood bids for materials and installation will be received in a short time by City Clerk Rogers. O.

CARLSBAD, N. M. — The electric light and power plant serving Carlsbad and the government reclamation project will be materially enlarged. The lower power dam on the Pecos River will be raised, another large generator installed and 6 miles of line into town rebuilt to carry 6,600 volts. Address manager of the Carlsbad Power Company.

SANTA ROSA, N. M.—Plans are being made for an electric light plant and water system for this city. V. A. Harding, of Burns & McConnell, constructing engineers of Kansas City, was here recently in connection with the proposition.

BURLINGAME, CAL.—Application has been made by the Pacific Gas and Electric Company to build new feeder lines into this city.

LOS ANGELES, CAL.—The City Council has instructed the city engineer and city attorney to prepare an ordinance for the ornamental lighting of Hobart Boulevard from Washington Street to Harvard Boulevard.

HEPPNER, ORE. — The Heppner Light and Water Company will soon begin work on a transmission line from here to the town of Ione.

MEDFORD, ORE.—If the voters of this city, at a coming election, express a desire to operate a municipal distributing light and power system in the city the California-Oregon Power Company, which at present supplies current to a majority of the cities in southern Oregon, has agreed to sell its distributing lines in Medford to the city. The matter will be passed on in the near future. O.

SILVERTON, ORE.—The City Council recently retained Prof. C. R. Reid, of the University of Oregon, to make investigations and preliminary estimates of the cost of establishing a municipal lighting system in this city. When completed the matter will be placed before the Council, who has announced its intention of calling a special election to vote on the proposition. O.

CENTRALIA, WASH.—A bond of $10,000 has been filed by H. G. Fleischhauer, who recently entered into a contract to furnish electric current for both light and power to this city at a rate much less than that charged by the Washington-Oregon Corporation. In filing the bond, Fleischhauer guarantees to carry out his contract, which provides for the erection of a power house near Centralia, erection of transmission lines and furnishing of service by October 1, 1915. In the Federal Court, at Tacoma, the Washington-Oregon Corporation which serves this city and vicinity, is striving to obtain a permanent injunction to restrain Fleischhauer from carrying out the terms of his contract, or operating in any territory in which the Washington-Oregon Corporation now supplies service. O.

PE ELL, WASH. — This city is negotiating with C. C. Smith, of The Morton Electric Company, of Morton, Wash., relative to the installation of an electric light and power plant to serve this city. O.

PRESCOTT, WASH.—The lines of the Pacific Power and Light Company, according to statement of officials of the company, will be extended from Waitsburg to this city, construction to start in the near future. The company is now furnishing current to a number of small towns in Eastern Washington. O.

PRESCOTT, WASH.—The Pacific Power and Light Company has been granted a light and power franchise in this city, service to be installed within four months from date.

SEATTLE, WASH. — The application of the Puget Sound Traction, Light and Power Company for a franchise to extend its service through the south end of Kings County, will be heard by the county commissioners on August 31.

STANWOOD, WASH.—A franchise to furnish power and light to this city has been granted by City Council to George W. Kunze, who will take over the present lighting plant owned by L. F. Wuery. The franchise covers a period of 50 years, and the new owner plans to immediately increase the present plant, and make a number of extensions. O.

TACOMA, WASH.—The City Council has ordered the installation of street lights in Lighting District No. 5,507, at a cost of $4,883.

PROPOSALS.

LIGHTING FIXTURES. — Sealed proposals will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until September 2, 1915, for lighting fixtures to be installed in the steerage barracks and storehouse for the United States quarantine station at Portland, Me. Drawings and specifications may be obtained from the custodian at the quarantine station, or at the office of the supervising architect, Washington, D. C.

ELECTRICAL EQUIPMENT. — Sealed proposals will be received at the office of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 24, 1915, for furnishing 8,000 feet of interior communication cable; 1,800 feet of telephone cable; 200,000 feet of double flexible silk conductor; miscellaneous twin conductor wire and miscellaneous bronze silicon wire, as per Schedule 8654, all for delivery at Navy Yard, Brooklyn, N. Y.; eight watt-hour meters, as per Schedule 8642, for delivery at Navy Yard, Boston, Mass.; two non-reversible direct-current motors, as per Schedule 8634, for delivery at Navy Yard, Newport, R. I.

NEW PUBLICATIONS.

BY-PRODUCTS OF COAL.—The Canadian Department of Mines has issued Bulletin No. 323 entitled "Products and By-Products of Coal," by Edgar Stansfield and F. E. Carter. This describes the methods of producing coke, gas, ammonia and tar, and discusses their properties and uses.

NEW INCORPORATIONS.

MASON CITY, IOWA—The Midland Electric Company has been incorporated with a capital of $50,000, by A. W. Zahn and others.

ROYSE CITY, TEX. — Royse Ice and Electric Company. Capital stock $16,000. Incorporators: J. T. Murphy, A. F. Davis and E. C. Murphy.

JACKSON, ALA. — The Jackson Electric Company has been incorporated with a capital of $5,000. The company is to establish a 15-ton ice plant.

BARTLESVILLE, OKLA.—The Anderson Electric Company has been organized here with a capital stock of $3,000. J. F. Anderson is interested.

URICH, MO.—The Urich Electric Light and Power Company has been incorporated with a capital of $5,000, by J. J. Wright, Henry Buesse and others.

BARTLESVILLE, OKLA.—The Anderson Electric Company has been incorporated with a capital of $3,000, by J. P. Anderson, T. M. Finney and others.

PEPIN, WIS.—The Pepin Electric Company has been organized with a capital of $5,000. The incorporators are C. J. Thies, O. E. Jackson and C. J. Johnson.

HIGHMORE, S. D.—The Highmore Electric Light Plant and Power Company has been incorporated with a capital of $25,000, by C. V. Armstrong and others.

ENID, KANS.—The Prince Electrical Equipment Company has been incorporated with a capital of $3,000, by C. C. Wilcox, J. Stuart Trimble and C. C. McVay.

ENID, OKLA.—The Prince Electrical Equipment Company has been organized with a capital of $3,000 by

Digitized by Google

C. C. Wilcox, J. Stuart Trimble and C. C. McVay.

ROYSE CITY, TEX.—The Royse Ice and Electric Company has been incorporated with a capital of $16,000, by J. T. Murphy, A. F. Davis and others.

NEW YORK, N. Y.—The Reinforced Propeller and Insulating Company, Incorporated. Incorporators: Charles M. Berry, George W. Springsted, Jr., and Howard Huntington.

NEW YORK, N. Y.—Improved Arc Light Company, Incorporated. Capital, $4,000. Incorporators: Abraham Greenberg, Harry Turk and Jacob Wagner, all of Brooklyn, N. Y.

DAWSON SPRINGS, KY. — The Dawson Light and Power Company has been incorporated with a capital of $7,500 by James Clark, Jr., Walter S. Clark and Brent Hart.

ROME, N. Y.—Electric Rod Mill, Incorporated; to manufacture insulated wire, etc. Capital, $5,000. Incorporators: Herbert T. Dyett, Frank M. Potter, Jr., and Clarence R. Keeney.

LOCKHART, TEX.—The Citizens' Water Works, Electric Light and Ice Company has been organized with a capital of $100,000, by E. B. Coopwood and others. New plant will be built.

NEW YORK, N. Y.—Ivan T. Johnson Company, Incorporated; electrical contractors, engineers, etc. Capital, $20,000. Incorporators: Ivan T. Johnson, Warren Bigelow and Herbert M. Simon.

INDIANAPOLIS, IND.—The Electric House Lighting Company has been organized to deal in electrical fixtures. The company is capitalized at $25,000. Incorporators: Carl L. Rost, John M. Schmid and Earl F. Gray.

YOUNGSTOWN, O.—The Bothwell Electric Company has been incorporated by Howard Bothwell, Perl M. Bothwell, Ruth Lafferty, J. H. C. Lyon and G. F. Hammond. The company is capitalized at $15,000.

NEW YORK, N. Y.—The Irving S. Van Loan Corporation has been established to deal in electrical machinery, etc. Capital, $5,000. The incorporators are Irving S. Van Loan, John B. Hyatt and William Phipps.

CINCINNATI, O.—The Volto Electric Company has been incorporated with a capital of $30,000, to deal in electrical accessories. The incorporators are Henry F. Grote, P. J. Craig, William Koch, Alfred C. Craig and Frank J. Grote.

PITTSBURGH, PA.—A charter has been granted the Advance Electric Company. The company is capitalized at $30,000, and will manufacture, sell and deal in and with electrical devices of all kinds. The incorporators are: Frank M. Kernan, A. J. Wayman and A. B. Wayman.

CHICAGO, ILL.—The O. K. Electric Company has been incorporated with a capital stock of $10,000. The company is to manufacture electric appliances and do a general manufacturing business. The incorporators are Richard M. Winters, J. H. Westover and Emil Kekich. Z.

CITY POINT, VA. — Hopewell Electric Light and Power Company, Incorporated, Hopewell, City Point, Va. Light and power plant. Maximum, $50,000; minimum, $5,000; par value $10. W. H. Hoyt, president; H. J. Ingram, Jr., vice-president; C. T. Morris, secretary and treasurer, all of Hopewell, Va.

FINANCIAL NOTES.

At a special meeting, stockholders of the New England Telephone & Telegraph Company authorized an increase in capital stock from $50,000,000 to $75,000,000. Directors have formulated no definite plan for use of the additional stock. There is still about $3,000,000 of the previously authorized $50,000,000 stock unissued. It is believed that there will be no sale of the newly authorized stock until late in the year or early in 1916.

Brooklyn Rapid Transit gross income made a comparative gain of $2,000 per day during July, an increase for the month of approximately $60,000. This starts the new year off in good shape and as in the case of Boston Elevated is the first monthly gain in gross since March. The June quarter produced a shrinkage in gross of $123,000 and even the fiscal year to June 30 resulted in no gross gain save as provided through absorption of the Coney Island & Brooklyn.

A plan for the consolidation of the Providence Telephone Company with the New England Telephone & Telegraph Company has been submitted to the stockholders of the local corporation. The combination is to be effected by an exchange of stock on the basis of four shares of New England Telephone & Telegraph for five shares of Providence Telephone stock. In a letter to stockholders, the Industrial Trust Company of Providence, which has been appointed as depositary, explains that if on or before November 1, 50,000 shares of the capital stock of the Providence Telephone Company shall have been deposited, the New England Telephone & Telegraph Company shall be under obligations to exchange its stock for the stock deposited on the basis outlined, but if 30,000 shares are deposited the exchange will be at the option of the New England company. A condition of the plan is that several of the directors of the Providence company shall continue as directors of the New England company. Until it is known whether the plan is generally approved by the stockholders of the local company no attempts will be made to work out any operating details. No change in rates will be made it is stated. The par value of the stock of the Providence company is $50, but its present market price is $96. The company pays an eight-per-cent dividend and has a surplus of $500,000. The capitalization is $5,000,000.

Reports of Earnings.

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
June gross	$ 331,977	$ 317,780
Net	131,098	118,255
Surplus after charges	78,594	67,235
Balance after preferred dividends	62,272	52,144
Six months' gross	1,756,652	1,721,701
Net	655,005	662,065
Surplus after charges	346,540	360,230
Dividends	248,605	270,113
Balance after preferred		

AMERICAN LIGHT & TRACTION.

The American Light & Traction Company has issued a statement of earnings for the year ended June 30, 1915, compared as follows:

	1915	1914
Subsidiary earnings	$3,980,302	$3,697,743
Miscellaneous	754,962	717,867
Gross earnings	4,735,264	4,415,611
Expenses	157,600	139,466
Surplus	4,577,664	4,276,145
Preferred dividends	854,172	854,172
Balance	3,723,492	3,421,973
Common dividends	3,106,665	2,817,455
Balance	616,827	604,518
Previous surplus	9,577,664	8,973,146
Profit and loss surplus	10,194,491	9,577,664

PACIFIC TELEPHONE & TELEGRAPH.

The Pacific Telephone & Telegraph Company reports for the six months ended June 30, 1915, as follows:

	1915	1914
Gross	$5,026,500	$4,766,791
Net	1,127,865	1,159,932
Charges	615,340	568,527
Preferred dividend	480,000	480,000
Surplus	32,525	111,405

ONTARIO POWER OF NIAGARA FALLS.

Income account of Ontario Power Company of Niagara Falls, and Ontario Transmission Company, Limited, for the six months ended June 30, shows:

	1915	1914
*Gross earnings	$ 753,384	$ 739,514
Expenses and taxes	160,100	111,123
Net earnings	593,284	628,392
Other income	87,667	53,076
Total income	680,951	681,467
Refunding expenses	38,322	.....
Int. Ont. Pw. 1st 5s	255,254	249,716
Ont. Transmission 1st 5s	46,750	47,550
Ont. Pwr. deb. and notes	203,439	148,950
Balance	137,186	235,251

*Less purchased power and government rentals.

Decrease in net for 1915 due to purchase of power not at present used but necessary to take care of long-time contracts which will become operative during last half of present year.

GREAT WESTERN POWER.

(Western Power Corporation Subsidiary.)

Great Western Power Co. for the year ended June 30, 1915, reports as follows:

	1915	1914
Gross earnings	$2,770,963	$2,689,448
Expenses and taxes	820,381	1,005,627
Net earnings	1,950,582	1,683,821
Other income	199,342	228,164
Total income	2,149,924	1,911,985
Bond interest	1,243,130	1,182,698
Surplus	906,794	729,287

NORTHERN STATES POWER.

(And Subsidiaries.)

	1915	1914
June gross	$ 369,879	$ 321,311
Net after taxes	197,784	164,275
Twelve months' gross	4,765,096	4,247,413
Net after taxes	2,654,370	2,223,993
Surplus after charges	1,151,941	.....
Balance after preferred dividends	564,872	.....

GEORGIA RAILWAY AND POWER COMPANY.

(and subsidiaries)

	1915	1914
June gross	$ 511,138	$ 522,047
Operating exp. & tax.	294,983	312,881
Net earnings	216,154	209,166
Six months' gross	3,157,834	3,097,746
Operating exp. & tax.	1,858,300	1,790,709
Net earnings	1,299,533	1,307,037

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 9	Aug. 2
American Tel. & Tel. (New York)	122⅛	121½
Commonwealth Edison (Chicago)	133½	134½
Edison Electric Illuminating (Boston)	231	235
Electric Storage Battery common (Philadelphia)	65¾	53
Electric Storage Battery preferred (Philadelphia)	65¾	53
General Electric (New York)	171	171¼
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	4⅞	5
Massachusetts Electric preferred (Boston)	34	34
National Carbon common (Chicago)	147	134
National Carbon preferred (Chicago)	119½	120
New England Telephone (Boston)	131	131
Philadelphia Electric (Philadelphia)	23⅞	23¼
Postal Telegraph and Cables common (New York)	76½	74
Postal Telegraph and Cables preferred (New York)	66	65
Western Union (New York)	70⅝	68½
Westinghouse common (New York)	112¼	101¼
Westinghouse preferred (New York)	131	130

Digitized by Google

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 17,685. ELECTRICAL GOODS. —An American consular officer in Wales has transmitted a detailed report relative to an opportunity for the sale of electric fans, irons, cleaners, lamps, etc. A copy of this report may be had on application to the Bureau of Foreign and Domestic Commerce or its branch offices.

NO. 17,722. INSULATING MATERIAL. — An American consular officer in Chile reports that a machine company in his district desires to purchase tubes which are used for insulating purposes. Sizes should be 7, 9 and 11 millimeters, outer diameter. A sample of the tube may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices. References are given. Correspondence may be conducted in English.

NO. 17,728. WIRE.—The Spanish Government by royal decree has authorized the Minister of the Interior, through the General Director of Post and Telegraph, to buy 35 tons of galvanized wire, two millimeters in diameter; 40 tons, three millimeters in diameter; 100 tons of four millimeters; and 25 tons of five millimeters. This wire is to be used in the national telegraph and telephone service. Offers should be submitted in Spanish. The address of an official to whom communications should be sent may be had on application to the Bureau or its branch offices.

PERSONAL MENTION.

MR. C. M. PIHL, formerly of the Pennsylvania Utilities Company, of Easton, Pa., has been appointed consulting electrical engineer of Phillipsburg, N. J.

MR. J. WASSON, who was for some time connected with the commercial department of the Toledo Railway and Light Company, has become connected with the "Electric Shop," of the Union Gas and Electric Company, of Cincinnati, as a salesman.

MR. LEWIS L. HOLLADAY announces that henceforth he will be associated in his practice of consulting engineering in the field of power plants, utilities and industries, with Mr. Henry Negstad, under the corporate name of Holladay, Negstad & Company, at 109 North Dearborn Street, Chicago, Ill.

MR. W. P. COCHRAN, formerly branch manager of the Westinghouse Electric and Manufacturing Company, at Baltimore, Md., has been appointed assistant district manager of the Philadelphia district, including Baltimore, and will make his headquarters in the former city. Mr. M. H. Jones, assistant to manager, will have charge of the Baltimore branch office.

MR. GEORGE H. HUDSON, who succeeds Day Baker as New England manager for the General Vehicle Company, Long Island City, N. Y., is a native of Gloucester, Mass. He has been identified with automobile interests for many years, having been manager of the Boston branch of the American Locomotive Company. For the past two years Mr. Hudson has had charge of the gasoline truck department of the General Vehicle Company's business at Boston.

PROF. A. M. WILSON, of the University of Cincinnati, addressed members of the Cincinnati Section of the National Electric Light Association and the Mutual Benefit Association of the Union Gas and Electric Company, at a joint meeting held last week. He spoke on the opportunities to be found in work with public service corporations today. President W. W. Freeman, of the Union Gas and Electric Company, who presided, devoted some remarks to the same object. A musical program followed the addresses.

OBITUARY.

MR. BENJAMIN L. CATES, who died recently at Philadelphia, Pa., was a well known electrical contractor, having been identified with the industry for over 25 years. He organized the Pennsylvania Electrical Equipment Company, and in 1910 organized the firm of Cates & Shepard, with Frederick M. Shepard. He was actively interested in civic and professional work, was one of the charter members of the Philadelphia Electrical Contractors' Association, and president of that organization for several years. He was at one time a national director of the National Electrical Contractors' Association. He retired from business about a year ago. He was an active member of the Jovian Order, and had many friends to whom his untimely death has come as a great shock.

MR. ALBERT SILVA, secretary of the Union Light, Heat and Power Company, of Newport and Covington, Ky., died on Saturday, August 7, at an Indianapolis hospital, following an operation for the removal of a cancerous growth. He was 70 years old. Mr. Silva was born in Milan, Italy, coming to this country with his parents as a child. He was a Union veteran, serving in the army for several years after the war. He resided in Newport for the past 40 years, serving in several city offices with high credit, and conducting an expert accounting business. His knowledge of accounting and his familiarity with municipal law resulted in the offer to him of the office of secretary of the Union Light, Heat and Power Company, which he held at the time of his death. His widow and seven children constitute the immediate family surviving. Funeral services were held at the home.

MR. EDWARD H. HOYT, a leading electric railway engineer of New England, died at his home in Haverhill, Mass., August 6, aged 66 years. Mr. Hoyt began his career in the leather business, but later in life took courses in electrical engineering and entered the employ of the Haverhill & Groveland Street Railway Company, afterward becoming electrical engineer for the Merrimack Valley Street Railway Company. Following the consolidation of these lines, he became electrical engineer for the Haverhill & Georgetown Street Railway Company. Later he became president of this road and was also prominent in the People's Telephone Company, of Haverhill. He served in the Massachusetts House of Representatives in 1898 and 1899. He resigned to accept a commission in the Engineering Corps of the army, on the outbreak of the Spanish-American war, and was stationed at forts in Boston Harbor. Mr. Hoyt was a Mason, an Elk and a member of the Ancient and Honorable Artillery Company. He left a wife and two married daughters.

DATES AHEAD.

American Institute of Chemical Engineers. Seventh semi-annual meeting, Los Angeles, Cal., August 16-19; San Francisco, Cal., August 25-28. Secretary, J. C. Olsen, Cooper Union, New York, N. Y.

International Association of Municipal Electricians. Annual meeting, Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention. San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Digitized by Google

With the Electrical Manufacturers

The Metals Coating Company of America announces the opening of an office at 100 Summer Street, Boston, Mass., which will be in charge of Herbert Jaques, Jr., who is prepared to furnish information and to demonstrate the Schoop metal-coating process to interested manufacturers.

Thomas Cusack Company, Chicago, Ill., through its supply department has issued a loose-leaf catalog covering all lines of supplies for painted and electrical outdoor advertising display. Colors, brushes, bulletin boards, reflectors, receptacles, sockets, flashers, transformers, time switches and sign-hangers' tools are illustrated and described as well as a complete line of electric-sign designs and illuminated painted boards. Additional catalog sheets will be issued periodically.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has just issued Bulletin No. 1093, devoted to engine-type direct-current generators. Standard two-wire and three-wire machines, known respectively as types I and IW are described and illustrated. These are built for ratings of 25 kilowatts and larger, with speeds corresponding to those of all standard engines in commercial service. The electrical and mechanical design and construction of these machines are described fully in the bulletin.

The Byllesby Mercantile Corporation, a trading company to build up commerce between the United States and Central and South America, will be conducted entirely separate from the Byllesby steamship enterprise, the Carribbean & Southern Steamship Company, which is operating freight lines to Central and South America, and to Russia and Sweden. This concern is already incorporated and doing business under the name of the Byllesby Mercantile Corporation, with offices at 17 Battery Place, New York City.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued Bulletin No. 61 which describes a new M-shaped tube which is used in the lamp outfits for photographic enlarging. These tubes are provided for either direct current or alternating current. They are 50 inches in length and are bent six times so as to form the rough outline of the letter M. This gives considerable area of source, which is especially desirable in enlarging work. The tube is mounted on a stand with its auxiliary.

Record of Electrical Patents

Issued by the United States Patent Office, July 27 and August 3, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

PATENTS OF JULY 27, 1915.

1,147,700. Automatic Arc-Lamp Cutout. J. E. Boesch, Vancouver, B. C., Canada. Pull on lead wires cuts out lamp.

1,147,701. Automatic Lamp Cutout. J. E. Boesch. Modification of above; cutout located on post.

1,147,703. Electric Furnace. J. W. Brown, assignor to National Carbon Co., Cleveland, O. For treating granular material.

1,147,716. Automatic Telephony. C. L. Goodrum, assignor to Western Electric Co., New York, N. Y. Arrangement of selector and connector switches.

1,147,717. Lamp Receptacle. E. F. Guth, St. Louis, Mo. Integral structure having a socket and pockets where connections are made.

1,147,718. Process of Plating Aluminum. J. A. Hall, New Britain, Conn. After cleansing, article is electroplated in bath containing cyanide of soda and zinc carbonate and desired metal plated on the zinc surface.

1,147,753. Dry Battery. L. J. Schatzel, Fostoria, O., assignor of one-half to O. V. Maurer. Has depolarizing compound comprising carbon, manganese dioxide and potassium persulphate.

1,147,757. Insulator-Supporting Structure. C. P. Seyler, Pittsburgh, Pa. Bow-and-arrow type steel cross arm for three-wire lines.

1,147,783. Method of Treating Metal. E. C. Carter, assignor to National Cash Register Co., Dayton, O. For hardening a desired area of a piece of steel; heat applied by passing electricity into the material by pressing electrodes against it.

1,147,789. Electrical Heating Unit. R. W. Davenport, assignor to Detroit Stove Works, Detroit, Mich. A flat coil has a body of low thermal conductivity on one side and body of relatively high conductivity on other side.

1,147,795. Alarm Device on Windows. C. W. Ervin, Los Angeles, Cal. Circuit controlled by window screen.

1,147,799. Trolley-Line Anchor. L. A. Hausler, Chicago, Ill. Flukes held in extended condition by frangible pin.

1,147,818. Spark Plug. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Particular structure and assembly of casing and insulator.

1,147,820. Electropneumatic Switch. W. M. Scott, Philadelphia, Pa. Circuit-breaker opened and closed by pneumatic device electrically controlled.

1,147,829. Warning-Indicator for Vehicles. F. Triest, San Francisco, Cal. Inscriptions selectively exhibited by appropriate push-buttons and lamp lighted with each inscription.

1,147,831. Restaurant Equipment. W. H. Vary and G. B. Parmenter, Chicago, Ill., assignors to said Parmenter. Electrically controlled conveyors and elevators to move trays to any point.

1,147,847. Electric Vulcanizer. O. C. Dennis, Chicago, Ill. Portable, resistance-heated device; heater automatically cut out on reaching vulcanizing heat.

1,147,859. Emergency Lamp and Box Therefor. I. Goldberg, New York, N. Y. Lamp having circuit open when in casing is automatically lighted on removal therefrom.

1,147,864. Automatic Telephone System. D. S. Hulfish, assignor to Canadian Independent Telephone Co., Toronto, Canada. Automatic switch structure.

1,147,870. Wire Clamp. W. H. Kempton, assignor to Ohio Brass Company, Mansfield, O. For welding ear on grooved trolley wires.

1,147,895. Telephone System. N. C. Schellenger, Chicago, Ill., assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Details of contacts and connections of central-energy system.

1,147,916 and 1,147,917. Electric Heater. A. O. Bailey, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Structural details of car-heater casing.

1,147,928. Automatic Telephone-Exchange System. H. G. Dietl, assignor to Western Electric Co. Relative arrangement of relays, through which transmitter current is supplied, and release magnet of automatic switch.

1,147,932. Connector-Puller for Battery Terminals. B. Ford, Philadelphia, Pa. Device for relatively positioning battery post and connector end.

1,147,949. Pilot and Night Lamp. E. Keen, Brooklyn, N. Y. Auxiliary lamp mounted on pull-cord of main lamp socket, pull switch alternately connecting main lamp alone and main and auxiliary lamps in series. (See cut.)

1,147,950. Automobile Direction-Indicator. Z. Keough, Los Angeles, Cal. Particular solenoid arrangement for operating indicator.

1,147,951 and 1,147,952. Electric Heater. F. T. Kitchen, assignor to Gold Car Heating & Lighting Co. Structures for placing under car seat.

1,147,956. Self-Starter for Internal-Combustion Engines. W. D. Lutz, Allendale Borough, N. J. Switching arrangements for controlling electric motor and magnetic clutch for connecting motor with engine.

1,147,959. Combined Typewriting and Computing Machine. H. Marshall, Cleveland, O. Motor-driven.

1,147,973. Lamp-Support. J. C. Ramsey, Jr., assignor to Aiken Lamp Co., Franklin, N. H. Lamp pivotally mounted on dash and turned from seat, push-button in handle controlling circuit.

1,147,989. Electrical Liquid-Purifier. A. A. Towne, Long Beach, Cal. Liquid treated flows continuously through container and is maintained at constant level therein; also has electrode adjustable to maintain proper relation with liquid.

1,147,997. Conversation-Registering Circuits for Machine-Switching Telephone Systems. F. Aldendorff, assignor to Western Electric Co. Application of registers to automatic system.

1,148,014. Fire-Alarm System. F. Gottschalk, Stirling, N. J. Local alarm circuit intermittently actuates telephone switch hook.

1,148,044. Clip Device. J. G. Peterson, assignor to Manhattan Electrical Supply Co., Jersey City, N. J. Contact dip for switch.

1,148,054. Pumping System. H. F. Rosencrans, Durand, Mich. Electromagnetically controlled water-supply system.

1,148,062. Method of Utilizing Battery-Waste. C. E. Tucker, Hyde Park, Mass. Lead oxide produced by adding a flux to battery-waste, containing lead sulphate and lead oxide, and heating.

1,148,076. Stop-Motion Mechanism for Knitting Machines. W. W. Burke, Bennington, Vt., assignor of one-fourth each to J. E. Burke and A. J. Cooper. Electromagnetic mechanism operated when normal feed of yarn is interrupted.

1,148,101. Headlight. A. F. Kush, Toledo, O. Has several concave concentrically arranged casings each having a light source, all of which sources may be used independently or collectively to vary intensity of light.

1,148,106. Sparking Plug. F. Lux, Ludwigshafen-on-the-Rhine, Germany. Particular structure having main and branch terminals with different spark gaps.

1,148,115. Wrapper. L. D. Morton, assignor to Hinde & Dauch Paper Co., Sandusky, O. Carton for incandescent lamps.

1,148,126. Speed-Recorder. S. B. Storer, assignor to Chicago Electric Meter Co., Chicago, Ill. Chronometer-controlled electrical device makes impression at end of

1,148,128. Detector for Electric Lamps. C. L. Stryker, Buffalo, N. Y. Selected portions of lamp bulb are covered by shields.

Digitized by Google

predetermined time and returns marker to starting position.

1,148,137. Signal Device for Automobiles. J. F. Anderson, Seattle, Wash. Direction indicator operated by selective operation of electromagnets acting on paramagnetic member.

1,148,138. Crucible-Lifting Mechanism. T. B. Barr and F. G. Hoyer, South Bethlehem, Pa. Electrically operated means for opening the tongs.

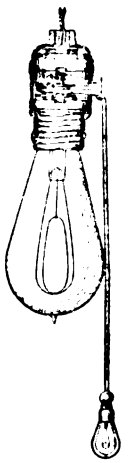
1,148,141. Telephone System for Railway Trains. E. H. Boudwin, Philadelphia, Pa., assignor of one-sixth each to D. W. Harner, R. L. Worsing, C. M. Gage, J. A. Pfouts and A. E. Yohn. Inter-car system making connections through air line.

1,148,142. Signaling System for Railway Trains. E. H. Boudwin, assignor of one-sixth each to D. W. Harner, R. L. Worsing, C. M. Gage, J. A. Pfouts and A. E. Yohn. Modification of above in which connections are made through train line and track.

1,148,152. Electric Battery. F. S. B. de-Mello, Rio de Janeiro, Brazil. Employs oxysulphide of copper as depolarizer.

1,148,157. Electromagnetic Brake. J. L. Earl, assignor of seven-eighths to H. M. Cotten, Morgan City, La. Brake shoe forced against car wheel by magnetic induction.

1,148,179. Insulated Rail-Joint. T. H. McFarland and R. D. Lewis, Carnegie, Pa. Bars secured to abutting rail ends mechanically secured together but insulated.



No. 1,147,949.—Pilot and Night Lamp.

1,148,183. Arc-Lamp Electrode. W. R. Mott, assignor to National Carbon Co., Cleveland, O. For flaming arc; contains precipitated silica in finely divided state and incrusted with a phospho-boric compound.

1,148,184. Electric Arc Lamp. W. R. Mott, assignor to National Carbon Co. For direct current; negative electrode as above and positive electrode containing flaming materials.

1,148,189. Metal Coating for Arc-Light Electrodes. B. Perris, assignor to National Carbon Co. Coating of metal powder secured to electrode by binder.

1,148,218. Battery-Tester. E. L. Clark, assignor to National Carbon Co. For application to battery terminals; plunger raised on flow of predetermined current.

1,148,221. Process for Electrically Welding Turbine-Blades. S. Z. deFerranti, Hampstead, London, England. For securing blades to disk; carrying away of heat by latter during welding is prevented.

1,148,223. Solder-Cored Wire. V. Feeser, assignor to G. Rau, Doublefabrik, Pforzheim, Germany. Has a core carrying solder threads and sleeve inclosing same.

1,148,224. Battery-Connector. P. J. Fitzgerald, assignor to Fitzgerald Mfg. Co., Torrington, Conn. For connecting conductor to terminal of dry cell.

1,148,230. Battery-Depolarizer. M. E. Holmes, assignor to National Carbon Co. Dry-cell mix containing a perhydrol of manganese.

1,148,232. Ammunition-Hoist Control. J. D. Ihlder and W. D. Lutz, assignors to Otis Elevator Co., Jersey City, N. J. Involves two motors, co-operating in one direction and opposed in other.

1,148,240. Slack-Cable Device. D. L. Lindquist and D. Larson, assignors to Otis Elevator Co. For opening elevator motor circuit on slackening of hoist cable.

1,148,256. Switch. J. L. Schureman, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Alternating-current solenoid for successively operating switches for controlling resistance, etc.

1,148,272. Electroplating Apparatus. H. Aderer, assignor to J. F. Jelenko & Co., New York, N. Y. Arrangement of board carrying adjustable electrode supports and lamp serving as resistance and current indicator.

1,148,274. Electrolytic Cell. E. A. Allen and H. I. Allen, assignors to Electron Chemical Co., Portland, Me. Concrete cell body forms anode and gas chambers and supports electrodes.

1,148,279. Self-Inductive Means for Electrical Oscillatory Circuits. G. von Arco, Berlin, Germany, and R. H. Rendahl, Lilienholm, near Stockholm, Sweden. Self induction of flat disk coils varied by varying distances from each other.

1,148,294. Mechanical Horn. G. C. Dean, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Mechanical means for vibrating diaphragm driven by electric motor having axis normal to diaphragm.

1,148,295. Electrical Contact Governor. W. Deats, assignor to Otis Elevator Co. Operated by centrifugal governor balls.

1,148,296. Elevator Service Register. H. A. Desper, Worcester, Mass. Car movement mechanically operates register and electrically controls auxiliary register having resetable and cumulative members.

1,148,299. Chain Switch-Pull for Electric Lights. J. E. Eade, Providence, R. I. Insulating section in pull chain.

1,148,319. Selective Signaling System. R. N. Hill, assignor to Western Electric Co. Semaphores at way stations selectively operated from sending station; includes answer-back signals.

1,148,323. Crane Trolley. E. H. Kendall, assignor to Alliance Machine Co., Alliance, O. Structural arrangement of lifting drums and two driving motors.

1,148,325. Traction Meter. J. G. Kjellgren, Brooklyn, N. Y. Comprises indicators for showing when car is in motion, when motor circuit is in use and when excessive current is used, respectively.

1,148,332. Electric Fan for Umbrellas. S. Onyskow, assignor of one-half to L. Dulikrovich, Jenkins, Ky. Fan on umbrella rod above bows operated from electric motor in handle.

1,148,341. Illuminated Sign. W. H. Spencer, assignor to G. F. Spencer, New York, N. Y. Light in hood to edges of which signs are hinged, outer edges of sign being brought together.

1,148,343. Method of Preventing Punctures in Electric Flame-Arc Furnaces. E. Troye, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Gas of suitable temperature and pressure is conducted between furnace lining and cover on its way to treatment in furnace.

1,148,348. Electric Horn. C. E. Avery, assignor to Manhattan Electrical Supply Co., New York, N. Y. Electromagnetically vibrated diaphragm.

1,148,354. Automobile Lamp-Dimmer. J. D. Carter, Denver, Colo. Special conformation of baffle plates in casing placed in front of lamp.

1,148,401. Process for Treating Osier Bark. E. Petz, assignor to Filzkorkfabrik Gesellschaft M. B. H., Vienna, Austria-Hungary. Spinning fibers, insulating material and cork flour simultaneously obtained.

1,148,411. Electric Alarm. R. S. Smith, Columbia, Miss. When service switch for lights is not connected alarm is sounded at predetermined time, giving notice that lights have not been connected.

1,148,436. Fixture Support and Bracket. W. R. Blain, Albany, Ore. Extensible, jointed, support secured to ceiling for supporting cord of pendant lamp and providing horizontal adjustment. (See cut.)

1,148,437. Circuit-Breaker. H. M. Boal, Corry, Pa. Line-relay armature makes and then breaks local circuit when attracted.

1,148,438. Electric Coin-Controlled Lock. G. G. F. Boswell, Indianapolis, Ind. Electromagnetically controlled lock has circuit closed by coin.

1,148,439. Trolley-Wire Switch. F. H. Boyle, Champaign, Ill. Details of construction.

1,148,442. Train-Control System. A. Casale, Scranton, Pa. Automatic train-stopping means operated on block system.

1,148,450. Automatic Safety Stopping Device for Elevators. A. A. Fuller, assignor of one-half to C. M. McCrum, Birmingham, Ala. Control circuit of normal brake controlled by governor cable operating emergency brake to first apply normal brake.

1,148,452. Automatic Control for Musical Instruments. A. F. Hauss, Aurora, Ind., assignor of one-third each to E. F. Oberhelman and G. Lubrecht. Details of make-and-break type of control.

1,148,458. Substation Telephone. O. M. Leich, assignor to Cracraft-Leich Electric Co., Genoa, Ill. Switch hook first connects transmitter and auxiliary batteries in series to signal, transmitter battery alone being connected in limiting position of hook.

1,148,464. Controlling Device for Refrigerating Apparatus. G. J. Sayer, Chicago, Ill. Pump motor controlled by valve regulating the amount of cooling fluid.

1,148,465. Refrigerating System. G. J. Sayer. Several valve-driving motors controlled according to positions of valves individually and collectively.

1,148,481. Current-Indicator. J. W. Ryan, assignor of one-half to L. L. Rowland, Overbrook, Pa. "On" and "off" indicator.

1,148,484. Call-Box. P. A. P. Davis, Baltimore, Md. Structural details of impulse transmitter.

Reissue. 13,950. Lightning-Arrester. F. S. Chapman, assignor to National Electric Specialty Co., Toledo, O. Arrangement of electrodes, etc., in vacuum device.

Electrical Patents of August 3, 1915.

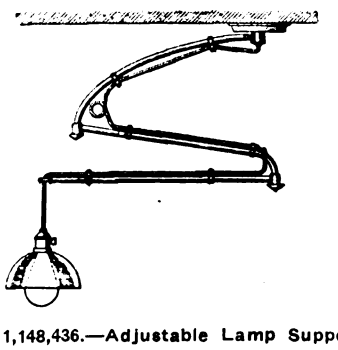
1,148,498. Insulated Joint. C. O. Burton, New Duluth, Minn. Insulating clamp for covering joint of line and branch wires.

1,148,521. Transmitter for Wireless Telegraphy. G. Marconi, assignor to Marconi Wireless Telegraph Co., New York, N. Y. Studs adapted to bridge spark gap mounted on rotary insulating disk which moves them through spark gap.

1,148,522. Process for Regenerating Electrolytes. O. C. Martin and F. Jaeger, Perth Amboy, N. J. Arsenic removed from sulfuric acid and copper sulfate electrolytic solutions.

1,148,523. Water-Gage for Boilers. W. S. Monroe and B. Schroeder, Chicago, Ill. Mounting of electric lamp for lighting gage glass.

1,148,538. Antitheft Device for Incandescent Lamps. J. Sachs, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Prevents unauthorized removal of lamp from socket.



No. 1,148,436.—Adjustable Lamp Support.

1,148,551. Dynamo-Mounting. W. I. Thomson, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Support and gearing of axle-driven generator.

1,148,564. Railway Switch and the Like. W. A. Austin, assignor to A. T. Austin, Omaha, Neb. Motor-operated switch point and means for moving it automatically if the switch parts are accidentally displaced.

1,148,592. Alternating-Current Motor. O. Knopfli, assignor to Maschinenfabrik Oerlikon, Oerlikon, near Zurich, Switzerland. Compensated repulsion motor.

1,148,602. Valve. J. McLear, Chicago, Ill. In a vacuum-producing device, valves are electromagnetically controlled by the degree of vacuum.

1,148,627. Sad-Iron. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Connections of heater with service wires are made inside hollow insulating handle.

1,148,628. Vapor Electric Apparatus. Y. Sakai, assignor to Westinghouse Electric & Mfg. Co. Terminal construction providing ventilating spaces about the terminals communicating with the atmosphere.

1,148,639. Electric Range. E. G. Van Wie, and R. W. Davenport, assignors to Detroit Stove Works, Detroit, Mich. Arrangement of independent heat units for stove top and oven.

1,148,650. Glare-Guard for Headlights. F. W. Beauchamp, Indianapolis, Ind. Opaque hood for securing to front of headlight.

1,148,656. Short-Circuiting and Retrieving Apparatus for Rheostats. L. Bradley, and H. L. Bradley, Milwaukee, Wis. Electromagnetically controlled compressible resistance.

1,148,661. Writing Implement. H. Dennis, assignor to S. Schmidt, Tracy, Cal. Penholder comprises battery and lamp illuminating pen.

1,148,662. Portable Electric Lamp. O. C. Dennis, Chicago, Ill. Comprises an electromagnet for magnetically attaching the lamp to a support. (See cut.)

1,148,665. Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Automatic.

1,148,675. Process of Pressing Garments. D. C. Hale, assignor to Hale Garment Machinery Co., Cincinnati, O. Machine has electrically heated presser head.

1,148,686 and 1,148,687. Diaphragm-Horn.

Digitized by Google

M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Details of motor-vibrated diaphragms in automobile horns.

1,148,692. Tachometer. P. V. Kolff and J. E. Hollyday, assignors to Electric Tachometer Co., Philadelphia, Pa. Electric system wherein one or more of plurality of indicators may be cut out and equivalent resistance inserted to maintain calibration.

1,148,693. Priming Device. M. G. Kopf, assignor to McCormick Mfg. Co., Dayton, O. For internal combustion engines, comprises electromagnetic pump for injecting fuel in cylinder.

1,148,696. Electrode for Arc Lamps. G. M. Little, assignor to Westinghouse Electric & Mfg. Co. Contains ferruginous, titaniferous and chromiferous materials, and boracic acid.

1,148,699. Terminal Box. A. C. McWilliams, assignor to George Cutter Co., South Bend, Ind. Structure of terminal block and cover having gates in block and corresponding knock-outs in cover.

1,148,700. Process of Smelting Iron Ore. F. J. Machalske, assignor to American Ferrolectride Corporation, Plattsburg, N. Y. A basic charge of iron ore, graphite and a basic flux is subjected to an electric current to reduce the same.

1,148,709. Combined Lighting and Igniting System. A. H. Neuland, assignor to Neuland Magneto Co., San Francisco, Cal. Current from magneto is alternately diverted into ignition and lighting circuits.

1,148,719. Electric Piano. H. K. Sandell, assignor to Mills Novelty Co., Chicago, Ill. Has solenoid-operated hammers.

1,148,750. Circuit-Closer. M. A. Button, Lamar, Mo. Particular inclosed switch operated by an exterior knob on the end of switch spindle.

1,148,773. Alarm Hand-Bag. G. P. Helmers, Baltimore, Md. Comprises battery and alarm controlled by opening of hand-bag.

1,148,774. Internal-Combustion Engine. E. R. Hewitt, and A. F. Masury, assignors to International Motor Co., New York, N. Y. Mounting of magneto.

1,148,781. Telephone Set. P. L. Jensen and E. S. Pridham, assignors to Commercial Wireless & Development Co., San Francisco, Cal. Details of set having an ear piece and mouth piece rigidly connected together with auxiliary extensible ear piece and flexible tubes connecting ear pieces with stationary sound box.

1,148,787. Calling Device. J. L. McQuarrie, assignor to Western Electric Co., New York, N. Y. Structure of finger holds for manipulating call box.

1,148,788. Power-Transmission System. W. Morrison, Des Moines, Iowa. Gas engine driven through dynamo-electric clutch, controls of clutch and gas supply being co-ordinated.

1,148,792. Self-Induction Coil for Duplex or Multiplex Telephone Connections. A. H. Olsson and H. B. M. Pleijel, Stockholm, Sweden. Comprises plurality of groups of coils with means for varying magnetic leakage between coils of a group.

1,148,798. Electrolytic Refining or Extracting Process. F. R. Pyne, and H. M. Green, assignors to United States Metals Refining Co., Chrome, N. J. For use with soluble anode; electrolyte containing different constituents is allowed to stratify and different strata drawn off to the desired degrees.

1,148,800. Current-Impulse Transmitter. J. G. Roberts, assignor to Western Electric Co. Particular structure of code impulse transmitting device.

1,148,808. Electrical Steam-Generator. W. I. Thomson, assignor to Safety Car Heating & Lighting Co. Newark, N. J. Electric heater is contained in protecting tube within a water-containing tube.

1,148,827. Wireless-Telephone Transmitter. W. Burstyn, Berlin, Germany. Device for influencing rapidly alternating current by sound comprising a diaphragm condenser with gaseous dielectric upon which electrostatic forces act, these forces being varied by sound waves.

1,148,839. Flash-Light. A. J. Harnack, Pittsburgh, Pa. Contact structure for pocket light.

1,148,843. Hydro-Carbon Motor. J. H. Hunt, assignor to Packard Motor Car Co., Detroit, Mich. Direct-current ignition system including positive and negative conductors leading to transformer apparatus, and interrupter and a resistance unit in each of the positive and negative conductors.

1,148,844. Tube-Coupling for Electrical Circuits. J. H. Jackson, South Kensington, London, England. Structure for securely holding the ends of conduit tubes in alignment.

1,148,876. Overhead Conductor Point for Electric Railways. K. VonKando, assignor to Westinghouse Machine Co., East Pittsburgh, Pa. Double overhead system with trolley-operated switches for connecting normally insulated sections at junction.

1,148,884. Gearing. V. G. Apple, assignor to Apple Electric Co., Dayton, O. Particular structure of inclosed dynamo-electric machine having speed-reducing gearing interposed between the armature and shaft.

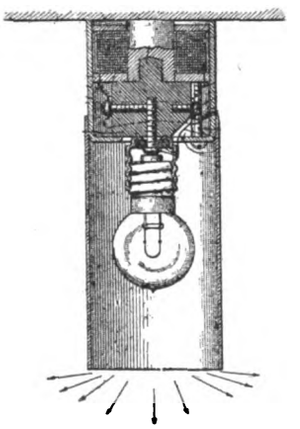
1,148,912. Substation Sender-Circuit. A. E. Lundell, assignor to Western Electric Co. For automatic telephone systems, signal circuit being controlled by switch hook and receiver being shunted during signal sending.

1,148,923. Telephone System. J. C. R. Palmer, assignor to Western Electric Co. A normally high-impedance receiving circuit and normally open transmitter circuit, the receiving circuit being in shunt of transmitter circuit when latter is closed.

1,148,931. Circuit-Closer. I. E. Rosenthal, Argenta, Ark. Heat-controlled device comprising metal box and spring contacts therein separated from box by fusible insulator.

1,148,936. Electro-Optical Cell. C. Stille, Zehlendorf-West, near Berlin, Germany. Arrangement of prisms and lenses to guide light to the front and rear sides of a light-sensitive electrode of an electrolytic cell.

1,148,941. Telephone Receiver. H. B. Wier, assignor to Western Electric Co. Particular structure for head instrument.



No. 1,148,662.—Portable Electric Lamp.

1,148,942. Headlight. R. F. Wilson, Denver, Colo. Lamp and sectional concave reflector are adjustable.

1,148,979. Means for the Collection of Fares in Public Conveyances. B. Masters, Christchurch, New Zealand. Coin-controlled, electrically operated fare indicators placed adjacent respective car seats.

1,148,986. Traffic Indicator. C. C. Prinz, Lexington, Ky. Electromagnetically operated automobile direction indicator.

1,148,990. Oil-Filtering or Purifying Device. M. C. Rogers, Weehawken, N. J. Magnetic blocks between non-magnetic blocks of greater height form separating bed over which oil flows.

1,148,997. Egg-Tester. A. L. Schooler, Cincinnati, Iowa. Arrangement of battery, light and switching means.

1,149,001. Combination Cutout for Engine Ignition Systems. J. C. Sims, Maynard, Mass. Requires certain "combination" of contact wheels and insulating disks to close circuit and has "tell-tale" to announce tampering.

1,149,003. Starting Box. M. Taigman, New York, N. Y. For ceiling suspension, and operable by depending rod or cord.

1,149,004. Lamp Shade. I. C. Terry, Buena Vista, Colo. Collapsible about lamp bulb.

1,149,017. Insulator. R. Balliet, West Hazleton, Pa. Has twisted slot for holding conductor.

1,149,018. Paper-Feed-Controlling Apparatus. T. J. Beregh, assignor to C. Francis, New York, N. Y. Motor driving support for roll of paper in printing press, has circuit controlled by sheet passing over guiding roll.

1,149,038. Electric Lamp. C. Ficq, Victoria, British Columbia, Canada. Incandescent lamp having filament arranged beneath reflecting base and inclosed by semi-circular globe.

1,149,042. Circuit-Closer for Speed-Indicators. J. Goldstein and L. Steiner, New York, N. Y. Particular structure of switch controlling indicator operated by fluid pressure according to speed.

1,149,054. Controller for Electric Generators. R. A. Hoppe, and T. E. Lee, assignors to North East Electric Co., Rochester, N. Y. Structure of two-armature, two-winding relay.

1,149,063. Terminal Connector. J. A. Jones, Indianapolis, Ind. Binding post having U-shaped recess and plug wedging wire

1,149,064. Electric-Furnace Abrasive and Method of Making the Same. H. T. Kalmus, assignor to Exolon Co., Cambridge, Mass. Manner of making a fused alumina abrasive from emery by reducing the impurities to a metallic state in arc furnace and removing the impurities.

1,149,079. Apparatus for Automatically Weighing Pulverized Material. W. Popow, St. Petersburg, Russia. Electromagnetically controlled.

1,149,096. Wire-Suspension Clamp. H. M. Somerville, Bluefield, W. Va. For supporting wire at a curve.

1,149,099. Massage Machine. L. J. Wahl, and E. W. Wahl, Sterling, Ill. Hand instrument having massage head vibrated by electromagnetic vibrator.

1,149,113. Voting Machine. W. C. Brumder, Milwaukee, Wis. Electrically operated and interlocked to prevent improper voting.

1,149,122. Apparatus for Determining Distance and Direction. P. W. Fuller, assignor to A. B. Praetsch, Boston, Mass. Range finder wherein ultra-violet rays reflected from object cause visual indication of distance and direction of object from light source.

1,149,123. Signaling Apparatus. P. W. Fuller, assignor to A. B. Praetsch. Modification of above.

1,149,140. Illuminating Means for Show-Cases. R. H. Hess, Los Angeles, Cal. Arrangement and construction of reflector and light bulb.

1,149,150. System of Control. H. A. Steen, assignor to Allis-Chalmbers Mfg. Co., Milwaukee, Wis. Automatic circuit controller comprising successively operated electromagnetic resistance switches controlled by time elements variable with current.

1,149,159. Electric Automatic Train Stop, Telephone, and Block-Signal System. W. J. Crabbe, Drum, and H. B. Rodehaver, East Auburn, Cal. Third-rail system including automatic operation of air brakes and including telephone connection between station operator and locomotive.

Patents Expired.

The following United States electrical patents expired on August 9, 1915:

608,614. Plate for Secondary Galvanic Batteries and Composition for Producing Same. C. Marscher, Berlin, Germany.

608,637. Supporting Clip for Overhead Electric Conductors. W. A. Bartley, Boston, Mass.

608,676. Circular Loom. J. Herold and C. Herold, Brum, Austria-Hungary.

608,685. Lightning Arrester. J. F. Kelly, Pittsfield, Mass.

608,711. Electric Motor. W. H. Powell, Erie, Pa.

608,714. Storage Battery. J. D. Rively, Pittsburgh, Pa.

608,721. Automatic Electric Regulator. R. Skeen, St. Louis, Mo.

608,723. Electric Arc Lamp. T. Spencer, Philadelphia, Pa.

608,768. Electrodynamic Apparatus for Operating Clipping, Brushing and Other Mechanisms. W. P. Freeman, New York, N. Y.

608,842. Electric Meter and Motor. H. P. Davis, Pittsburgh, and F. Conrad, Wilkinsburg, Pa.

608,846. Telegraph Repeater. H. P. Donnelly, Cincinnati, Ohio.

608,878. Switch for Varying Electrical Resistance. E. F. H. H. Lauckert, London, England.

608,895 and 608,896. Generator for Electrical Ignition. B. McInnerney, Omaha, Neb.

608,906. Insulation of Electric Wires. J. A. Poche, New Orleans, La.

608,911. Electric Cable. H. A. Reed, Newark, N. J.

608,928. Apparatus for Heating Air for Therapeutic or Other Purposes. W. Taylor, Edinburgh, Scotland.

608,932. Telegraphy. G. V. Trott, Chicago, Ill.

608,952. Electrical Cooking Apparatus. J. B. Cary, Baltimore, Md.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVII, No. 8. CHICAGO, SATURDAY, AUGUST 21, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.
608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Des Moines Gas Case.....311
Tendencies in Electric Sales Methods.....312
Testing Insulators.....313
Sludge in Transformer Oil.....313

DEPARTMENTS:
Commercial Practice.....319
Electrical Construction.....324
Public Service Commissions.....328
New Electrical and Mechanical Appliances.....339
Latest Approved Fittings.....345
Current Electrical News.....346
Record of Electrical Patents.....351

LEADING ARTICLES:
Electricity In Stone Quarries and Asphalt Plants.....315
Business Hints for Dealer and Contractor.—By G. D. Crain, Jr.....324
Some Characteristics of Direct-Current Motors.—By Harry N. Gilbert 325
Some Interesting and Important Law About Buying Goods. —By Elton J. Buckley.....335

BOOK REVIEWS 338

MISCELLANEOUS:
American Institute Directors Meet.....314
Central Stations of Southern Illinois Organize.....314
Engineers Advocate Department of Engineering and Public Works for New York.....314
Furnishing Electric Service in Louisville for $2.99.....319
Successful Lighting Installation for Public Tennis Court....320
Central Station Sells Electric Sign to Competing Gas Company 321
Central Station Adopts Attractive Emblem.....321
Central-Station Company Encourages Customers to Advertise for Business.....321
St. Louis Company Reduces Rates.....322
Electric Pump Wagons for Central Station.....322
One-Wire Farm Line in Clarinda.....323
L. R. Wallis.....323
New Rate Schedule at Sioux City.....323
Motors for Organ Blowers.....325
Louisville Contractors Discuss National Convention.....325
Among the Contractors.....327
Lighting of the Widener Memorial Library.....330
Unusual Lighting Effects at Night Pageant.....332
Boston Inspectors Visit Wire Factory.....334
Strength of Radio Signals.....335
Electrical Features of Boston Custom House Tower.....336
Interesting Facts About the Automobile Business.—By G. Brewer Griffin.....338

Copyright, 1915, by Electrical Review Publishing Company, Inc.

DES MOINES GAS CASE.

The opinion of the United States Supreme Court in the Des Moines Gas Company case, which is reviewed in this issue, is of considerable importance to all classes of utility corporations on account of some of the points involved which have to do with the valuation of utility properties for rate-making purposes. The case is one in which the operating company attempted to enjoin the enforcement of a rate fixed by a municipal ordinance on the ground that the insufficient return afforded upon the property of the company amounted to confiscation.

While all of the points in the dispute cannot be mentioned here, there are several which should not be passed over without emphasis. One of these refers to the paving over the gas mains which were laid in the city streets. Although the valuation which was made by the master in chancery, to whom the case was referred for a determination of the facts, was based upon the cost of reproduction, the master did not allow anything for the cost of this paving, and the Supreme Court upheld him in his view of the case. Since the pipes were laid before the paving was done, this item did not represent any actual investment on the part of the utility company. This attitude upon the part of the court strengthens the point of view that the cost of reproduction is not to be taken in the most literal sense in determining the value of a utility property, but rather is to be looked upon as the means of arriving at the value of that property and the amount of the investment which has been made.

The court indicates very definitely that no allowance is to be made for the value of good will in rate-making cases, thus showing that the change in the personnel of the court since the decision was rendered in the case of the Consolidated Gas Company has not resulted in any change of attitude in this respect. It is, perhaps, well to bear in mind that with respect to both of these items a different point of view might be taken in the case of a valuation for purchase, since both of these elements would in that case have a different bearing upon the value of the property than when the question involved is a determination of the investment which has been made and upon which a fair return must be allowed.

In considering going value, the court emphasizes the point which was made in the Cedar Rapids case, that former earnings may not be capitalized as representing an element of intangible value upon which the rates must continue to provide a return. What

Digitized by Google

bearing this attitude may have upon the Public Service Gas case, which has been appealed to the Supreme Court from the New Jersey state courts, can only be conjectured; but it would seem to indicate that a recognition of a franchise value based upon previous income may not be expected from the Supreme Court.

With respect to confiscation, it is evident that where the rate of return which is afforded by the revenues of the utility is not less than the legal rate of interest, the idea that any confiscation is involved will not be entertained. The moral to be drawn from this is that utility companies will fare better when they meet municipalities, commissions or the public with a conciliatory attitude and effect some agreement which is fairly satisfactory to both sides, rather than to go into court and contest the case upon the ground of confiscation. Commissions have generally shown a willingness to adjust rates upon a basis which allows a considerably higher return than the legal rate of interest, and the general public will usually acquiesce in the establishment of similar rates.

TENDENCIES IN ELECTRIC SALES METHODS.

Improvement in the sales methods of dealers in electrical appliances may be looked for in many quarters as the similarity between the marketing of electrical and other high-class manufactured products becomes appreciated more widely. To the great credit of the industry, the use of technical terms in this work is now largely avoidable. Potential customers are interested in the performance of equipment, its initial cost and the expense of operation, rather than in points of electrical design which excite the admiration of the engineer. It is sometimes difficult for a man or a woman with technical training to realize the point of view of the public in regard to apparatus. Thus, the factory owner wants a motor which can be thrown into service by a single motion of the operator's hand. He cares absolutely nothing about how this result is attained, and long-winded explanations of the design which permits the immediate connection of the motor to the mains at full voltage are likely to be wasted on the busy customer of this type. If he sends his engineer to inquire into a motor type, the furnishing of complete technical information is of course in order, but thousands of motors are sold yearly without any such analysis. Someone, of course, must be responsible for the technical success of the motor application, but in a great many cases, extended discussion of the engineering problem need not enter into the negotiations with the purchaser.

Five years ago the practice of preparing exhaustive reports on power problems was coming into vogue among central stations. This method was very successful, and led in many cases to the securing of business that probably could have been obtained in no other way. Today not a few companies are finding that precedent and results count for more in the gaining of this class of business than extended technical report work. The installation of the motor drive in a large local factory, perhaps with a reputation extending far beyond the immediate community, counts for more with a good many hard-headed business men than even specific guarantees of operating cost. Such men say, "If Nichols and Smith, with their capital and interests, their organization and national reputation, have concluded that the electric drive is the best thing for their plant, why it's good enough for us!" Working on this line, the central-station sales force determines to its own satisfaction that the electric drive will pay, and instead of preparing a report at a cost of perhaps several hundred dollars, simply writes a brief letter to the prospect confirming the results of its investigations and the deal is closed. In other words, not so much pioneer work is required in a good many cases as compared with a few years ago, and while the determination of the main facts in the problem from the engineering and commercial standpoints is as important as ever, less elaboration is needed in preparing and in presenting the data and conclusions.

Again, in the sale of electric cooking equipment, for instance, the customer wants to know the comparative effort of cooking on an electric range and on a gas stove, or the relative cost of service by fireless cooker and by coal range. Here the central-station solicitor needs to reinforce technical knowledge with practical ideas about the product in the hands of the average person, who wouldn't walk across the street to learn the meaning of a kilowatt-hour, but who will travel a half league in the street cars to find out the recipe and method of producing a golden-brown sponge cake as good as her neighbor's. Good salesmen are appreciative of the "home side" of electrical service; many use electricity themselves, and whenever possible, all employees of the department should be familiar through personal experience with the equipment handled by their company. Among the best solicitors, prospects are not driven to conclusions, but are insensibly led along toward the purchase and are always given the freedom of choice when possible as to equipment types, sizes, etc.

Far-sighted managers are realizing that they need to keep in close touch with the work of their sales staff among the public and that daily or weekly reports by no means tell the whole story. Thus in some companies we find executives locating their desks either in or directly adjoining the appliance exhibit. There is no doubt that closer supervision of sales effort is important in many instances. Progressive managers are paying more attention to the "approach" to the prospective customer, to the details of personal intercourse, promises of subordinates, as-

Digitized by Google

sumptions regarding working conditions when the equipment is installed, and to the ability of the staff to answer collateral inquiries. Better training of employees means a larger connected load and increased revenue, and it is a good sign that so much attention is now being paid to the so-called "little things" in electrical salesmanship.

SLUDGE IN TRANSFORMER OIL.

It has been shown rather definitely that the sludge which forms in oil-immersed transformers and switches is due to the oxidation of the constituents of the oil. This chemical action proceeds at a rate which is dependent upon the temperature and upon the amount of surface which is exposed to contact with the air. This at once suggests a design involving an airtight case entirely filled with oil, so far as the main compartment is concerned; an auxiliary relief chamber, separate and aside from the normal path of circulation, would take care of changes of volume occurring with change of temperature, and prevent excessive pressures from being produced. While this general idea has been applied in oil switches, where continuous heat dissipation is not a feature, it does not seem to have been applied to transformers, where the oil is in continuous circulation. An air space is almost invariably found at the top of transformer cases, altho the area of contact between air and oil has greatly different values in different models.

If a tight case completely filled with oil is not found practicable, it might at least be feasible with large transformers to fill the space above the oil with some inert gas, such as nitrogen, which would avoid the formation of sludge. A tight case is desirable in any event, for if there is transfer of air between outside and inside sweating is very likely to take place, and the condensed moisture not only lowers the insulating properties of the oil but expedites oxidation.

Probably the greatest disadvantage of sludge is its custom of clogging up the air ducts within the transformer windings, and thus preventing the normal circulation of oil which is essential to the proper dissipation of heat and the prevention of injurious temperatures at times of peak load. Of course a considerable portion of the sludge formed will be deposited in the bottom of the case, but enough usually clings to the windings to seriously interfere with the transfer of heat. The sludge does not usually affect the desirable qualities of the oil, and when it is filtered off the insulation resistance and electric strength will generally be found equal to that of the original specimen. When it is not, the presence of moisture or other foreign matter may reasonably be suspected.

In oil switches the action of the arc upon the oil is of the greatest importance. Arcs cause decomposition of the oil with the production of free carbon. The amount of carbon produced, other things being the same, seems to be greater at lower temperatures than at higher ones. Since the arc itself produces locally a very high temperature, the initial temperature of the oil is not a point of great importance.

TESTING INSULATORS.

Continuity of service over transmission and distribution lines becomes every year of more importance. The growth of load and the existence of contracts which penalize the power company for any failure to provide service, make the value of freedom from interruptions ever greater. The weakest point upon the line, and consequently the most usual source of interruptions to service, is usually found to be the porcelain insulator. This arises from the fact that insulators are designed to have but little electrical strength in excess of that actually required to prevent rupture or flashover, and consequently the factor of safety in this element of the equipment is not as high as in the general design of the mechanical parts. Moreover, insulators have generally been found to depreciate considerably in service and their reliability after several years of operation is not as great as at the time of original installation. This depreciation from the original condition of operation, combined with extensions of the system which place dependence upon larger and larger numbers of insulators, naturally leads to an increased frequency of insulator failures, and consequent interruptions to service.

Studies in porcelain manufacture and a greater experience with electrical porcelain which has been exposed to high-voltage line conditions, have led to considerable improvement in the quality of porcelain manufactured for this purpose; but large numbers of insulators of earlier manufacture are, of course, still in service. Failures of these insulators usually arise from mechanical defects. Slight cracks in the glaze or other imperfections which originally are not sufficient to cause breakdown may eventually lead to such a result. If routine tests can be made upon insulators in service, such weak members can be detected and eliminated before they give rise to serious trouble.

A policy of making regular tests of line insulators in service has consequently been adopted by a number of companies with very satisfactory results. While such tests usually involve some interruption to service, such interruption can be made at the time when it is least objectionable, which is decidedly preferable to letting the interruption or breakdown come at the time when chance or severe conditions may direct. The faulty insulators can easily be eliminated and replaced when their condition is once detected. As a method of test for this purpose, the application of a high-frequency, high-voltage test, such as can be made by the use of a Tesla transformer, seems to be the most effective and convenient. Portable apparatus is now available for carrying on such tests, which can be made without difficulty. Apparatus is, moreover, available at the present time by which insulators may be changed even upon a live line, after it is once determined that replacement is necessary. The possibilities of keeping high-tension lines in operation continuously has thus been greatly increased as compared with a few years ago.

Digitized by Google

American Institute Directors Meet.

The Board of Directors of the American Institute of Electrical Engineers held its first meeting of the administrative year which began on August 1, in New York City, on Tuesday, August 10.

President Carty announced his appointments on the various Institute committees for the administrative year beginning August 1, 1915. The chairmen of the committees appointed are as follows: Finance, J. Franklin Stevens, Philadelphia, Pa.; Library, Samuel Sheldon, Brooklyn, N. Y.; Meetings and Papers, L. T. Robinson, Schenectady, N. Y.; Editing, H. H. Norris, New York City; Board of Examiners, A. S. McAllister, New York City; Sections, H. A. Hornor, Philadelphia, Pa.; Standards, C. A. Adams, Cambridge, Mass.; Code, Farley Osgood, Newark, N. J.; Law, G. H. Stockbridge, New York City; Power Stations, C. F. Uebelacker, New York City; Transmission, P. H. Thomas, New York City; Railway, D. C. Jackson, Boston, Mass.; Protective Apparatus, E. E. F. Creighton, Schenectady, N. Y.; Electric Lighting, Clayton H. Sharp, New York City; Telegraphy and Telephony, G. M. Yorke, New York City; Industrial Power, David B. Rushmore, Schenectady, N. Y.; Use of Electricity in Marine Work, C. S. McDowell, New York City; Electrochemical, A. F. Ganz, Hoboken, N. J.; Electrophysics, John B. Whitehead, Baltimore, Md.; Records and Appraisals of Properties, Philander Betts, Newark, N. J.; Educational, V. Karapetoff, Ithaca, N. Y.; Public Policy Committee, Calvert Townley, New York City; Development of Water Powers, Calvert Townley, New York City; Patent, Ralph D. Mershon, New York City; Membership, W. A. Hall, Lynn, Mass.; Historical Museum, T. C. Martin, New York City; U. S. National Committee, International Electrotechnical Commission, C. O. Mailloux, New York City; Relations of Consulting Engineers, L. B. Stillwell, New York City; Code of Principles of Professional Conduct, George F. Sever, New York City; Hazards from Lightning, Elihu Thomson, Swampscott, Mass.; Reserve Corps of Engineers, Bion J. Arnold, Chicago, Ill.; Constitutional Revision, Bancroft Gherardi, New York City. Representatives were also appointed on various joint committees and other bodies.

The Board also confirmed the appointment by the President of the following members of the Edison Medal Committee for terms of five years each: Carl Hering, Harris J. Ryan and H. G. Scott.

The Board elected from its own membership the following members to serve upon the Edison Medal Committee for the term of two years, to fill the places of members whose terms had expired: B. A. Behrend, Paul M. Lincoln, and William McClellan. Farley Osgood was elected for the term of one year to fill a vacancy on the committee.

The Secretary reported that since the last meeting of the Board the Executive Committee had unanimously voted to increase the Institute's guarantee towards the expenses of the International Engineering Congress from $3,500 to $5,000, thereby placing the Institute upon the same financial basis in relation to the Congress as the American Society of Mechanical Engineers and the American Institute of Mining Engineers. The Institute's limited participation in the Congress had been due to the fact that at the time the original action was taken in June, 1912, the Institute had guaranteed the entire expenses of the International Electrical Congress, which has since been indefinitely postponed. The Board unanimously ratified the action.

The resignation of A. M. Hunt as one of the Institute's representatives upon the Committee of Management of the International Engineering Congress, due to his removal to the East, was accepted with regret, and a resolution expressing appreciation of his valuable services to the Institute while on the committee was adopted.

The increase from limited to full participation in the Congress entitles the Institute to the full complement of representatives upon the San Francisco Committee of Management; that is, an increase from two to four representatives, which with the resignation of Mr. Hunt, made necessary three additional appointments. President Carty appointed Harris J. Ryan, A. H. Babcock, and H. A. Lardner. These appointees, together with J. T. Whittlesey, previously appointed, complete the Institute's representation.

Upon recommendation of the Board of Examiners 48 applicants were elected to grade of Associate, 12 students were ordered enrolled, 5 members elected, 19 Associates transferred to grade of Member, 4 Members transferred to grade of Fellow.

Naval Radio Stations.

The United States Navy Department now has in operation a total of 47 wireless stations. Of these 30 are in continental United States and 17 in the island possessions, Alaska, Canal Zone, and foreign naval stations. Of these 47 stations 21 are open to commercial service, and the others are reserved exclusively for official naval business.

Central Stations of Southern Illinois Organize.

Representatives from sixteen central stations in southern Illinois met at Centralia on August 12 to effect an organization. This is intended merely as an auxiliary to the Illinois State Electrical Association, and not as a substitute therefor. The downstate men have never had much enthusiasm in the state meetings, and it is felt that an organization from a smaller section will be more beneficial.

At this meeting the following officers were elected: K. A. Steinhauser, Nashville, president; F. J. Higgins, Centralia, vice-president; Cale Gough, Sparta, treasurer. Another meeting is to be held in October, and subsequent meetings every six months thereafter. The organization will not be finally completed until the next meeting.

The day was given over to the preliminary organizing and to a discussion of the various problems which confront the central-station operator. Representatives from the General Electric Company, Westinghouse Electric and Manufacturing Company, Western Electric Company, Commercial Electric Company and Electric Appliance Company were there with a feast for the boys. The utilities represented were those at Albion, Centralia, Effingham, Farina, Chester, Coulterville, Christopher, Mt. Carmel, Mt. Vernon, Nashville, Murphysboro, Alto Pass, Collinsville and Sparta.

Engineers Advocate Department of Engineering and Public Works for New York.

Following the representations made in hearings, the committee of engineers, organized to present matters to the Constitutional Convention of New York State, has written the Committee on Governor and other State Officers urging that its recommendations, embodied in an amendment introduced by A. R. Latson, be adopted.

These recommendations provide for the abolishment of a number of existing departments and their consolidation into a department of engineering and public work, which would have charge of all public lands, state buildings, parks, roads, canals and of the conservation and development of the natural resources belonging to the state. The offices of state engineer and surveyor, commissioners of the land office and the canal board would be abolished, their duties being transferred to the new department.

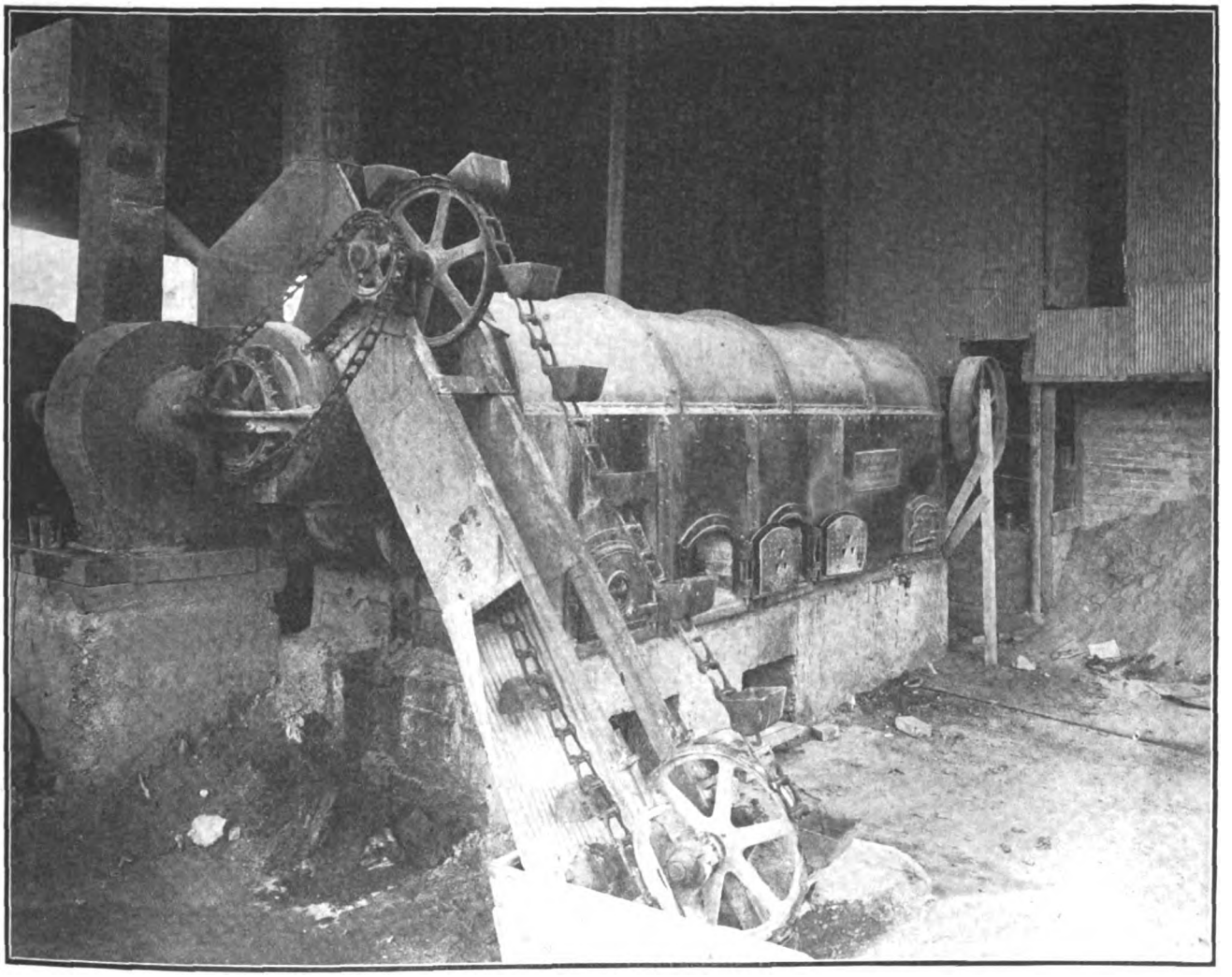
This plan would insure continuity and consistency of policy by the provision of three commissioners instead of a single head to administer the department.

Digitized by Google

Electricity in Stone Quarries and Asphalt Plants.

This article comments on the economies and advantages of electric motor drive for stone quarries and asphalt plants and describes in detail the motor equipment in four typical establishments in Auburn, N. Y., which purchase power from the local central station.

Electric drive is peculiarly adapted to stone-quarry and asphalt-plant machinery for several reasons. This class of work is more or less intermittent, depending a great deal on seasonable weather, as the products of such plants are mostly used for paving and construction work. Where steam plants are maintained for power purposes the salaries of engineers and firemen continue whether the plants are in operation or not, and there are always incidental expenses and depreciation to be considered. The remarkable saving secured by adopting electric drive is clearly shown in the case of one plant described in this article, which was formerly operated by steam power.



Sand Dryer With Motor-Driven Feed Mechanism.

The following descriptions relate to four stone quarries and an asphalt plant in the city of Auburn, N. Y. All of these plants use electric power purchased from the Empire Gas & Electric Company, which furnishes gas and electricity to a number of cities through central New York. This company uses Niagara Falls and Salmon River power and also operates two auxiliary, steam, generating stations.

There is a peculiar geological formation in the vicinity of Auburn where blue and gray limestone is found in great quantities. The gray limestone is used principally for building purposes, but the blue limestone is crushed to various sizes for construction work of all kinds. The power is delivered to the quarries at 2,300 volts from three-phase 25-cycle transmission lines where it is reduced to 220 volts for some of the motors, others using the primary voltage.

Before taking up the description of the various equipments it may be well to outline the general mechanical equipments of quarries and asphalt plants to give a better understanding of the electrical equipment. The general arrangement used in the typical plant is to place the motor, stone crusher and the countershafts in a room or excavation below the ground level. A bucket elevator extends from this room to the top of the stone house and is driven by a system of sprocket wheels and sprocket chains extending from the countershaft to about half the height of the elevator. A sprocket wheel is attached to the shaft projection at the upper end of the elevator and is connected to the driving gear of the screen by a sprocket chain. The motor is generally belted to the countershaft.

The sequence of operations is as follows: The stone is brought from the quarry in cars, or by conveyors,

Digitized by Google

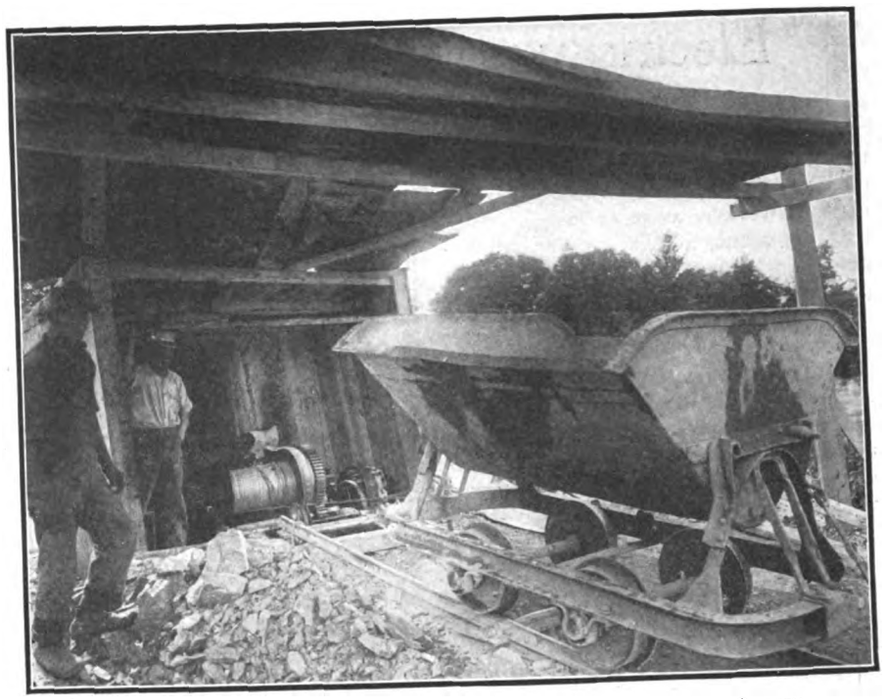
and is fed into the top of the crusher. The latter discharges into a trough which empties into the bucket elevator and the crushed stone is elevated and emptied into the screen. Here it drops through the various size screens in the rotary screen and descends by gravity to the storage bins. From the bins the stone is drawn out through chutes to wagons or cars. The screen usually is cylindrical in shape and is mounted so that it is at a slight angle with the horizontal plane. The stone is fed in at the high end and gradually works toward the lower end as the screen revolves, dropping through the different size meshes and holes, automatically assorting itself into the various sizes. Some screens provide for four sizes of crushed stone, others six. In the former case the grades range from the size of a pea up to about three inches, and in the latter from dust up to about three and one-half inches.

In the typical asphalt plant there are usually two general kinds of paving material prepared, the ordinary asphalt pavement, consisting of sand and asphalt and the Bithulectic pavement, composed of a mixture of sand, crushed stone and asphalt. The asphalt is melted in tanks placed above furnaces and is mechanically stirred by compressed air. The sand and stone is heated to a temperature of about 350 degrees Fahrenheit in rotary driers and elevated by a bucket elevator to a screen, similar to those used in the stone-crushing plants, where the material is deposited in storage bins. From the bins it is drawn into a self-weighing hopper and passes into an agitator where it is mixed with the melted asphalt and descends to the wagon waiting below.

It is general practice to locate the dryers, motor, and countershaft on the ground floor of the building, as well as the furnaces for heating the asphalt. The furnaces underneath the dryers operate by suction draft by means of fans belted to the countershaft. On the second floor are located the weighing hopper, asphalt tanks, agitator, and the conveyor for carrying the melted asphalt from the tanks to the agitator. The agitator consists of a number of interlocking paddles, the rotation of which mixes the ingredients.

Description of Plants.

The Auburn city quarry furnishes stone for macadamized streets, in four sizes, designated as Nos. 1, 2, 3 and 4, which range in size from that of a pea up to 3.5 inches. A Westinghouse 50-horsepower 220-volt motor furnishes power to the following group of machines: No. 5 Austin stone crusher with a capacity of 300 tons in 8 hours; bucket elevator with similar capacity extending from the crusher to the 36-inch screen at the top of the building, and the screen itself. The stone is brought from the quarry to the crusher by small cars manually operated.

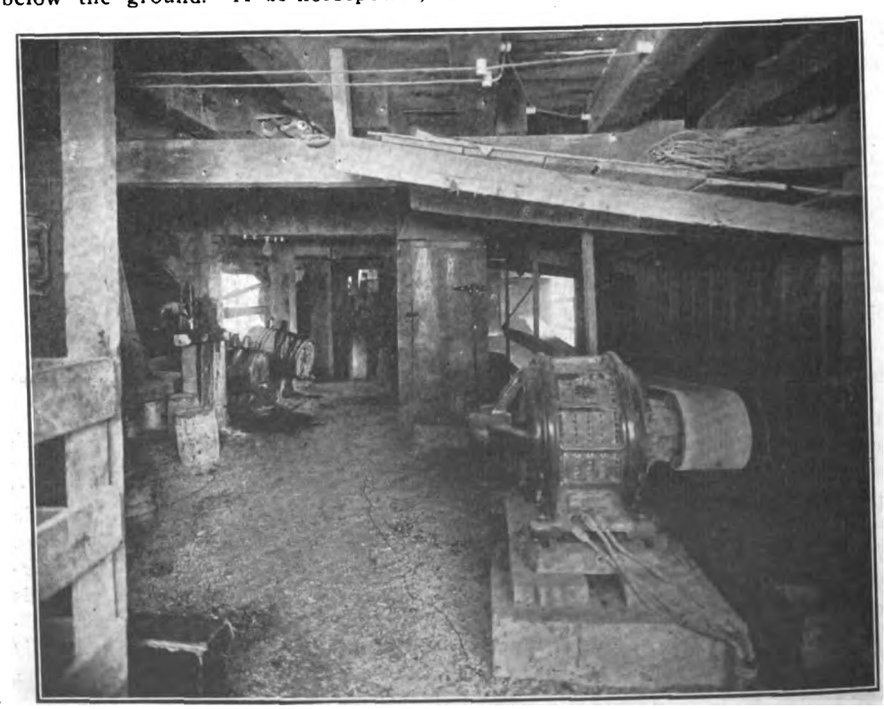


Five-Horsepower Motor Driving Hoist for Hauling Cars From Quarry.

Three transformers are installed at this quarry, set on double crossarms, one on either side of the pole and protected by a rain shield.

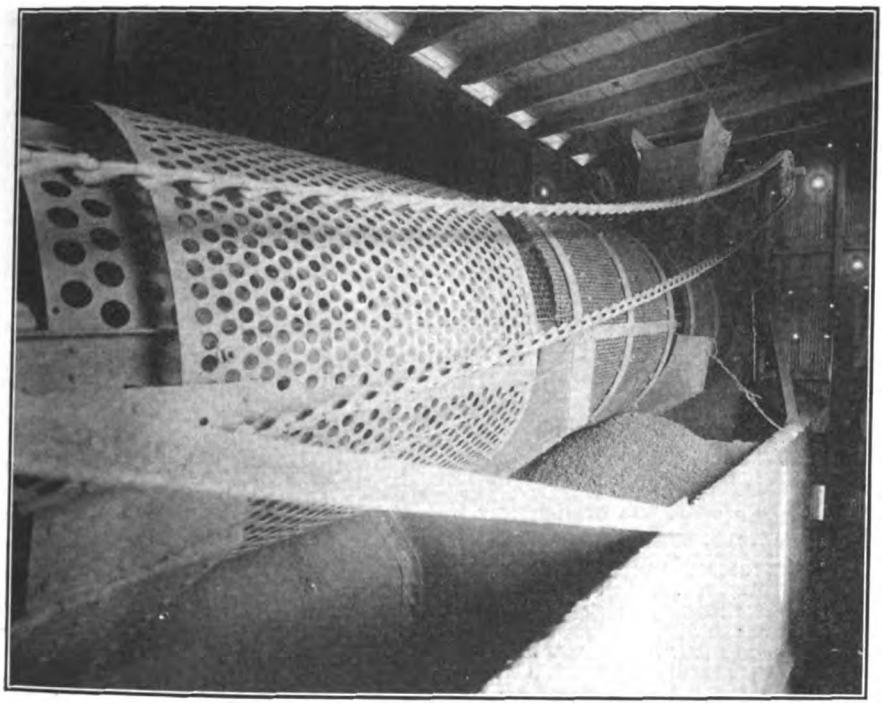
The G. B. Lewis quarry is similar in equipment to the city quarry with the exception that the stone is supplied to the crusher by a motor-driven jib hoist, controlled and operated by a drum hoist and cables. Here the stone crushing plant is located on a side hill so that the crusher is in the open under the loading platform instead of below the ground. A 25-horsepower, 220-volt General Electric motor operates a McCully stone crusher having a capacity of 175 tons in 10 hours; a bucket elevator having the same capacity and a 36-inch screen. Five sizes of stone are furnished by this plant, from dust up to 3.5 inches. The jib hoist is operated by a 10-horsepower General Electric induction motor operating at 220 volts. The hoist is rated at two tons and has a sweep of about 75 feet.

In some respects the business of the Rock Cut Stone Company, also of Auburn, is different from that of the other quarries. Most of the output is shipped from the city by means of a spur of the New York Central Railroad. All grades



Motor Belted to Two Stone Crushers and Auxiliary Apparatus.

Digitized by Google



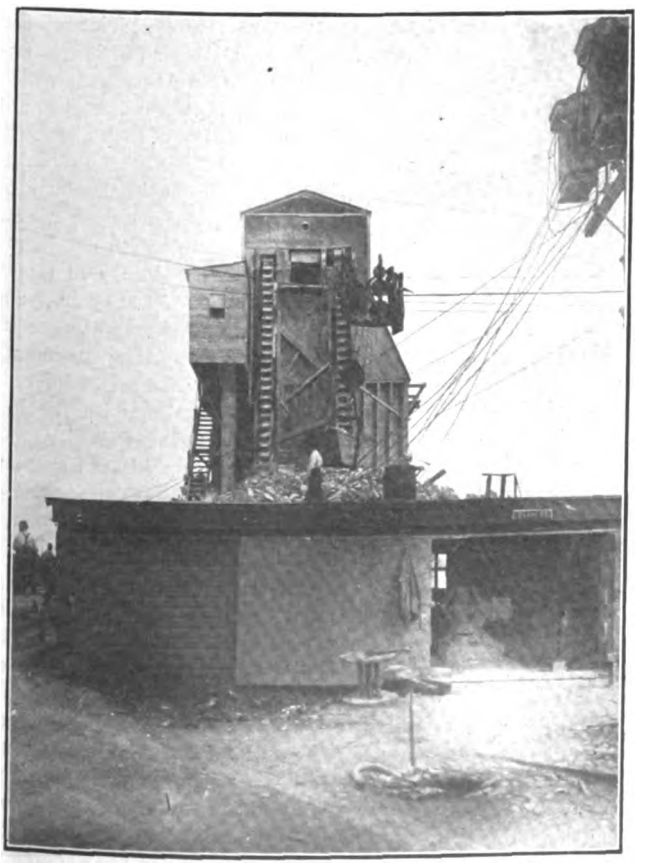
Motor-Driven Screen in Asphalt Plant.

of crushed stone are produced for general building construction, concrete, paving and railroad ballast. One of the features of the business is pulverized stone, which is used as a fertilizer. The quarry is located about 500 feet from the stone-crushing plant, and the stone is brought to the crushers by a Lidgerwood steam-driven hoist and carrier. All other machinery in the plant is motor driven.

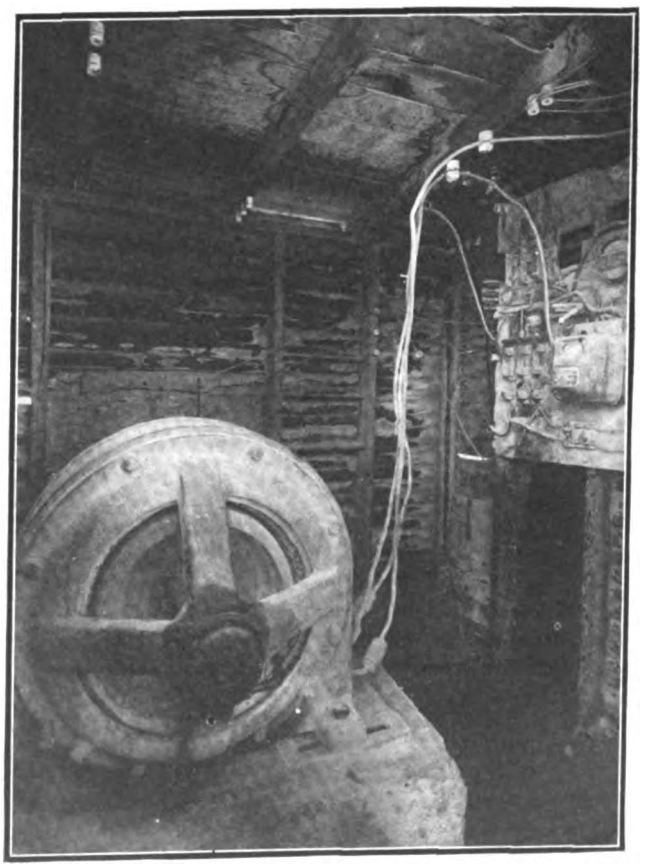
All of the stone is crushed by two Climax stone crushers with a capacity of 325 tons each in 10 hours, driven by a 50-horsepower 2,300-volt General Electric induction motor by means of belting and countershafts. This motor also operates a bucket elevator and two screens, a 36-inch and a 42-inch, respectively. Five sizes of crushed stone are produced, from dust to about 3.5 inches. The bucket elevator has a capacity of 325 tons in 10 hours. A second Climax bucket elevator of the same capacity and serving the other crusher is belt driven by a 20-horsepower 220-volt General Electric induction motor. The pulverized stone for fertilizer is prepared by a Jeffrey stone pulverizer belted to a 50-horsepower 2,300-volt General Electric induction motor. The pulverizer has a capacity of 10 tons per hour. A screw conveyor driven by a 10-horsepower 220-volt induction motor conveys the pulverized stone from the pulverizer to the storage bins. The dust from the screens is used for surfacing macadamized streets and in the place of sand for some purposes.

A unique feature of this company's equipment is the lighting system. This is an important feature, as the plant is at present operating 24 hours a day. Outside of the stone house on the conveyor end there is a 500-candlepower tungsten lamp provided with a white-enameled reflector. Three similar units of 400 candlepower are located in the screen loft, and three on the side of the building along the railroad siding. The quarry is illuminated by portable lights, consisting of 1,000-watt nitrogen-filled lamps with white-enameled reflectors mounted on standards. These outfits can be placed where needed and the flexible cable is carried on ordinary garden-hose reels.

Brayer Brothers are general contractors for municipal improvements,



Stone-Crushing Plant With Electrically Operated Bucket.



Motor for Driving Stone Crusher and Auxiliary Machines.

Digitized by Google

including asphalt pavements, sewers, electric subways, etc. Their plant includes a quarry, stone-crushing plant, and an asphalt plant. In the general arrangement the stone-crushing plant is similar to the Lewis and the city quarries. A 25-horsepower 220-volt Westinghouse induction motor operates the following group of machines: Climax stone crusher with a capacity of 280 tons in 10 hours; a bucket elevator of the same capacity and a 36-inch screen. Four sizes of crushed stone are produced at this plant.

When running full capacity for 10 hours a day the cost of current is $4.00 per day. The rate for current for the stone crushing plants is $25 per month, flat rate, plus two cents per kilowatt-hour, subject to a discount of 10 per cent for payment within 10 days.

At the asphalt plant of this firm, which is located near the quarry, a specialty is made of the Bithulectic pavement. The general arrangement of the plant is similar to that of the one previously described. Sand and six sizes of stone mixed with the melted asphalt constitute the ingredients. Six sizes of stone, ranging from dust to one inch are used. The object of using the various sizes is so that the fine stone fills in between the larger stone and when compressed by the roller a practically solid mass is formed.

There are three asphalt tanks for melting the asphalt, each having a capacity of 30 barrels. When the asphalt reaches a temperature of about 275 degrees Fahrenheit it is mechanically stirred or agitated with compressed air furnished by an Ingersoll-Sargent 8-inch by 14-inch single-acting air compressor belted to a 5-horsepower 220-volt induction motor. The asphalt is transferred from the tanks to the agitator by a self-weighing conveyor. The sand and stone are heated to 350 degrees Fahrenheit in two Hetherington & Bemer dryers, one left-hand drive and one right-hand drive.

The sand and stone are discharged into bucket elevator and carried to the screen loft where there is a screen similar to that used in the stone crushing plant. Here the sand and stone are separated into six different sizes and distributed to the bins. From the bins the material is drawn off through a self-weighing hopper and discharged into the agitator. All of this apparatus is group-driven by a Westinghouse 25-horsepower, 2,300-volt induction motor. The plant has a capacity of 195 cubic yards per day of 10 hours.

The asphalt plant was formely steam driven and the comparative cost between the steam and electric power shows a remarkable saving in favor of the latter. When operating to full capacity the cost for current for the asphalt plant is approximately $5.00 per day. The rate for current is $30.00 monthly flat, plus 1.5 cents per kilowatt-hour, subject to a discount of 10 per cent if paid within 10 days. The cost of steam power was as follows: Engineer, $3.00 per day; fireman, $2.00 per day; one ton of coal per day, $3.60 or a total of $8.60 per day. This figure does not include incidentals, depreciation or repairs, so that the net saving when operating full time is approximately $100 monthly. The asphalt plant operates under peculiar conditions, as during storms or inclement weather, asphalt cannot be laid and the plant must stand idle. When the steam plant was used the pay of the engineer and fireman continued, but with electric drive the cost for power ceases when the plant stops operation. The accompanying table gives the motor data for all of the plants.

QUARRY AND ASPHALT PLANT MOTOR DATA.
Three-Phase, 25 Cycles.

No.	Horsepower	Kind of Drive	Voltage	Application
				CITY QUARRY.
1	50	Group	220	No. 5 Austin stone crusher, 300 tons in 8 hours. Bucket elevator, 300 tons in 8 hours. 36-inch screen.
				G. B. LEWIS QUARRY.
1	25	Group	220	No. 3 McCully stone crusher, 175 tons in 8 hours. Bucket elevator, 175 tons in 8 hours. 36-inch screen.
1	10	Belt	220	Drum hoist operating jib hoist, two tons capacity.
				ROCK CUT STONE COMPANY QUARRY.
1	50	Group	2300	Two Climax stone crushers, 325 tons each in 10 hours. Climax bucket elevator, 325 tons in 10 hours. One 36-inch screen. One 42-inch screen.
1	20	Belt	220	Climax bucket conveyor, 325 tons in 10 hours.
1	50	Belt	2300	Jeffrey stone pulverizer, 10 tons an hour.
1	10	Belt	220	Screw conveyor, pulverizer to storage bins.
				BRAYER BROTHERS' QUARRY AND ASPHALT PLANT.
1	25	Group	220	Climax stone crusher, 280 tons 10 hours. Bucket elevator, 280 tons 10 hours. 36-inch screen.
1	3	Belt	220	Drum hoist for hauling cars from quarry.
1	25	Group	2300	Two Hetherington & Bemer sand dryers, 195 cubic yards in 10 hours. Three bucket elevators. One screen. Two Sturtevant fans. One agiator.
1	5	Belt	220	Ingersoll-Sargent 8 by 14-inch single-acting air compressor for stirring asphalt.

Note—The seeming irregularity in horsepower of motors for similar applications in one or two instances is for the purpose of providing for future extensions.

Utilities Affected by Flood-Prevention Activities.

The municipal light plant at Osborn, O., is to be permanently abandoned. The same holds true of the local telephone exchange. Further, the Ohio Electric Railway Company, which has served Osborn for many years, will tear up its tracks leading into that town, and will know it as a station no more.

The cause for all this lies in the fact that Osborn, with its 1,300 inhabitants, and a history dating back to 1850, is to be scrapped, or wiped from the map in its entirety, by the hand of man. Such ruthless act is a necessity of the Miami valley conservancy district plans, which are to protect the city of Dayton and surrounding points from a repetition of the great flood of 1913, which caused large sacrifice of life and the loss of millions of dollars in property.

The location of Osborn with respect to the proposed engineering enterprise is such that it would require an approximate outlay of over $1,000,000 to protect it from the increased danger to which the community would be subject by reason of the improvement. It was decided that it would be a cheaper and more satisfactory solution to buy the town outright. The sale has just been consummated with the people of Osborn through their municipal officials.

New Contract at Columbia.

Extensive improvements are to be made in the plant and service of the Columbia (Tenn.) Water & Light Company, according to an agreement which has been reached between the city and the utility company of which J. S. Robinson is secretary and superintendent. The agreement, in the form of a written contract, provides for a new street-lighting system, with 80 lamps instead of 60 as heretofore, and lamps for a White way of 60 poles, and the city is to renew the lighting contract with the company. Improvements at the power plant will be extensive, it is stated. In connection with the improved lighting service the city will get filtered water, rehabilitated system, etc.

"Made in Lockport" Windows.

The Lockport (N. Y.) Light, Heat & Power Company has been giving up its windows to a series of "Made in Lockport" displays, and each manufacturer of the city has been invited to exhibit his product as an educational feature for the benefit of the public. Manufacturers have responded gladly, and some very elaborate displays are being exhibited, attracting much attention and receiving considerable comment from the local newspapers.

Digitized by Google

Commercial Practice
Management, Rates, New Business

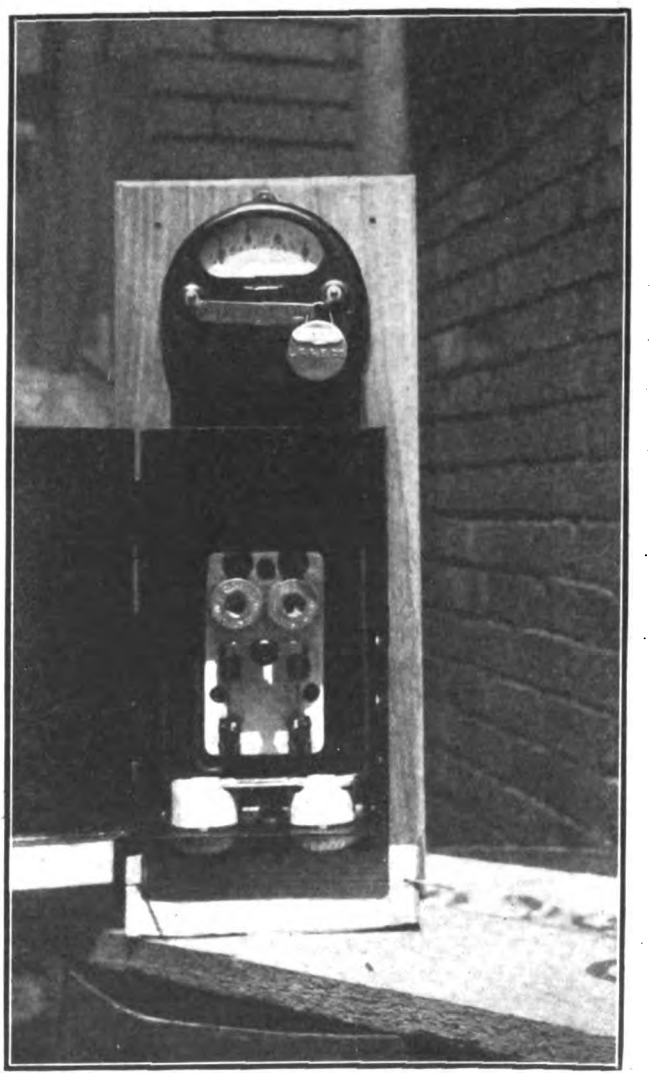
Furnishing Electric Service in Louisville for $2.99.

A panel board, complete with meter and switch connections, which can be installed in any house at a cost to the customer of $2.99, is announced by the Louisville Gas & Electric Company. It was perfected after two or three weeks of experiments with collections of meters, switches, conduits, switch boxes, etc., conducted by Robert Montgomery, manager of the commercial department of the company. He was endeavoring to develop a panel board of which the initial cost would be so small that it would appeal to a large number of possible users of electricity who cannot afford present installations.

The panel board is small, neat, and will serve not only as a temporary installation but will supply the basis for complete wiring later on for the whole of any house in which it is installed. That is the principle on which it is being put out, for the company, as well as the contractors who make the installations would actually lose money if operations went no further than mere installation of the panel board. The board goes out on the guarantee of an electricity bill of at least 50 cents a month.

It consists of a wooden panel about 20 inches long and 7.5 inches wide, beveled on the edges, on which is fastened, at the top, a General Electric meter, type I-14, and a standard steel entrance box, 4.5 inches deep and 6.5 by 10 inches in other dimensions, with the top punched out so that it will slip closely over the terminal box of the meter. The box is firmly fastened to the board beneath the meter, and the conduit inserted through a hole in the bottom of the box and bored through the panel, the end of the conduit being capped. Inside the box the porcelain switch is fastened, just below the conduit, the particular switch being a Bryant, 30 ampere, 125 volt. Two sockets are provided at the bottom of the box, being firmly attached. Five knockout holes are provided for on each side, and two at the bottom.

Inexpensive Panel Board Developed by Louisville Gas & Electric Company.



Panel Board with Door Opened.

Digitized by Google

The board will be handled in this manner: The customer who orders one installed signs a contract for the service. He binds himself to use at least 50 cents worth of current each month and pays the salesman $2.99 in cash. The commercial department in turn passes the contract on to the contractor who will install the service, pays him $2, retaining the 99 cents, and delivers him a panel board. Then the contractor makes the installation, attaching the panel board to an outside wall of the building and drilling through to the outside, thus conducting the conduit up to the eaves or to some point where the company can establish the service-wire connections, wires, etc., being ready to tie to. The panel-board sale provides for delivery of one 60-watt lamp and a 12-foot attachment cord, suitable for a fan, iron, percolator, etc.

By this deal the Gas & Electric Company loses exactly 19 cents on every board, though it may be figured that it is relieved of installation of the meter, which it is estimated would mean a cost of forty to fifty cents. The service connection cost, however, generally will run to more than the net returns from the installation in the way of current for a year, but, as has proved the case in other cities, with panel boards costing more money, it is virtually assured that this entering wedge will result in contracts to extend the wiring. On the other hand the contractor who makes the installation can pretty certainly be counted on to solicit for further extensions, or if he is handling appliances, will frequently be able to place a fan, an iron or some other appliance which will put him ahead even at the outset.

It is expected that these boards will frequently be installed in the rooms in which they are to be used and they will be painted a dull black, board and all, so as not to be too conspicuous. Consideration will also be given the probability of these original panels being used for extension of the service to all parts of the house. For this reason room has been left in the entrance box for a larger switch than the one which is now originally installed, though the capacity of this one will be sufficient for most houses. The armored cables or conduits could easily be run from the knock-out holes left on each side of the box into the wall or along it to a concealed conduit.

The first announcement of the new board was made by the Louisville company in the Sunday morning papers of June 20, large space being used. A drawing showing the device, with a combination of appliances, was featured in the center of the ad, while on each side the price was displayed. On one side the display read: "$2.99 puts electric service in your home," and the other: "$2.99, panel board complete with 60-watt Mazda lamp."

Then followed the statement of the proposition, pointing out the plan in detail and describing the lamp and attachment cord, the two sockets and suggesting the combinations available: lamp and fan; lamp and iron, percolator or any combination of any two electrical appliances. It was stated that it was made possible to make the proposition "in co-operation with the contractors and dealers of Louisville, basing the offer upon a justified anticipation of volume of sales." The panel board was referred to as the nucleus for complete electrical service and the following sentence was displayed in bold-faced type:

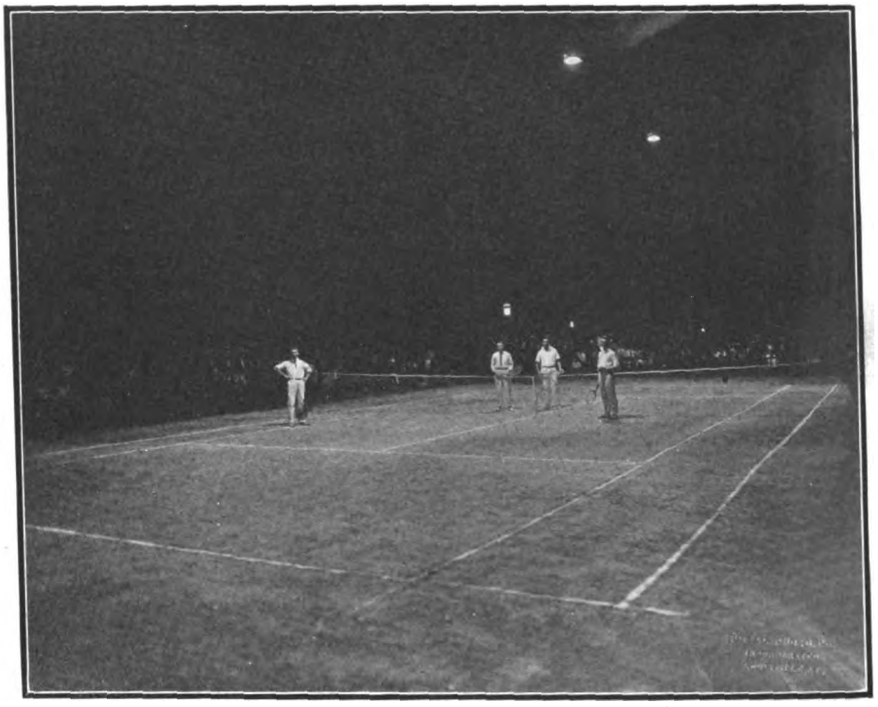
"Tenants whose landlords will not wire their homes may provide themselves with electric service by means of the panel board, moving the panel board when they move."

Much interest was taken in the proposition and the suggestion carried in the display ads that the commercial department of the company be called was very largely acted upon. The first 50 of the boards were made up in the company's own shops, the cut out in the tops of the boxes being accomplished with cold chisels. The order for the next 500 of the boxes provided that the holes be punched out. It may be noted that the plan of using the ordinary, standard form of boxes, permits the company to attach a name plate to the front of the box, the name of the company and the telephone number only appearing in brass against a black background.

Electrical men are free in expressing the opinion that it is exceedingly practicable and that it is an improvement on any other boards of the kind they are familiar with.

Successful Lighting Installation for Public Tennis Court.

What is said to be the first electrically lighted tennis court provided for and maintained by the city, and also the first court lighted by exclusively overhead lights, has just been thrown open to players in Louisville, Ky. This court is one of the several located in Central Park and the first night game, several of the city's best players participating, was played on the night of August 4. The cost of the installation and maintenance was borne by the Board of Park Commissioners, this being an experimental installation, which, if successful, will be followed, it is said, by as many as 20 others in the parks of the city.



Night View of Tennis Court.

Four 1,000-watt type C Mazda lamps, hung 30 feet above the court, on 28-foot centers, supply all the light. Each lamp is equipped with a B-33 1,000-watt Holophane reflector. The arrangement of the lamps puts the two interior lights about half way between the service line and the net, while the remaining lamps are suspended over points back of the base lines of the court. Two poles serve to carry the outfit, properly guyed and in such a way that the guy wires are back of the backstop nets. A double-pole, single-throw, fuse switch, 60 amperes, serves to control the current, which the Louisville central station supplies.

Digitized by Google

Prize Contest Stimulates Utility Salesmen.

The Malden Electric Company, Malden, Mass., is conducting a prize contest among its employees, to the end of securing 10,000 meter installations by January 1, 1916. On August 10 more than 8,700 meters were installed, the schedule laid out for each month being almost lived up to. On the wall of the company's office is a large dummy clock, laid out in monthly and weekly sections, to denote progress. The minute hand is set forward from time to time to show the actual meters installed on that date, while the hour hand indicates the number due to be installed to keep up with the schedule.

A prize is awarded the employee who secures the most successful prospects each month.

Central Station Sells Electric Sign to Competing Gas Company.

The accompanying illustration shows a unique side of the application of electricity for advertising purposes.

This electric sign was recently sold by the Wichita Falls (Tex.) Electric Company to the local gas company, which is a competing concern. The sign is equipped with a flasher which causes the letters G A S to be extinguished, at the same time lighting

Electric Sign Used by Gas Company.

other lamps which illuminate this square place on which is painted a large red gas meter. The effect produced is particularly good.

Other electric signs which may be seen in the illustration testify to the aggressiveness of the sales organization of the Wichita Falls Company.

Central Station Adopts Attractive Emblem.

"Service" grouped around "power" and "light" are the symbols displayed in an emblem recently adopted by the Texas Power & Light Company, Dallas.

The company has been using the slogan "Service First" for some time but has been using it in connection with a

New Emblem of Texas Utility.

five-point star and circle with the letters T. P. & L. inscribed in the inner part of the star.

When the new design, showing the State of Texas in silhouette with a motor and late type of electric lamp brought out in white and the words "Service First" conspicuously displayed, was first submitted, it met with immediate approval.

Besides displaying conspicuously the State of Texas the emblem brings out strongly the "Service First" feature which is the big idea behind this organization. This slogan by no means is intended to minimize the importance of the well known "Safety First" as is shown in a statement made by F. R. Slater, general superintendent of the company, in a recent issue of "Kilowatts," an employees' monthly house organ, which says "True service cannot be rendered unless due regard is paid to safety."

The new emblem will be prominently displayed in newspaper advertisements, on the company bills and letter heads and on the business cards of the employees.

Youngstown Places New Street-Lighting System in Service.

The new street-lighting system at Youngstown, O., was formally put into service on Wednesday, August 18.

The new installation consists of about 3.5 miles of underground wiring in the downtown district, through which current is supplied to 545 600-candlepower 20-ampere series Mazda C lamps, each operated through a separate series transformer which insulates the lamp standard from the high potential of the main circuit. There is an addition to the ornamental-standard system employed in the downtown section, 185 miles of overhead wiring in the residence district which supplies current to 3,200 100-candlepower 6.6-ampere series Mazda C lamps.

The entire system was installed by the Mahoning and Shenango Railway and Light Company, of Youngstown.

Central-Station Company Encourages Customers to Advertise for Business.

In order to create customer good will and incidentally increase the power consumption at various gins operated electrically, the Texas Power & Light Company is employing a unique method of advertising.

A letter calling attention to the advantages of electric operation was recently sent to all electric ginners in the company's territory, together with a press proof of the advertisement illustrated herewith. At the same time a copy of this letter and ad was sent to newspapers in the various districts, calling attention to the fact that this letter had been sent to electric gins and suggesting that they follow it up and try to get some advertising business.

It is expected that the idea will produce good results, because in the first place it shows the ginner that the company is trying to help him get more

Bring Your Cotton
TO
(Name of Your Gin Here)
ELECTRIC GIN
We have the most up-to-date ginning equipment and can assure customers
Quick Service
RAIN OR SHINE
Bring your next bale to our gin and let us show you our prompt service and good sample
(Name of Your Gin Here)

Advertisement Suggested by Central Station.

business. The friendly tip to the newspapers will no doubt cause good feeling, and the advertising when run will not only cause the company to sell more current but will also be an indirect appeal to steam gins to use electricity, and thus have "Quick Service" facilities.

Digitized by Google

St. Louis Company Reduces Rates.

In a half-page advertisement in all St. Louis papers of August 13, the Union Electric Light & Power Company announces substantial deductions in electricity rates for both lighting and power, effective September 15, 1915. The primary residence rate which is based on a specified kilowatt-hour consumption per active room has not been changed but a reduction has been made in the secondary rate, the charge now being three cents per kilowatt-hour for all use in excess of seven kilowatt-hours per month per active room.

The commercial lighting and power rates have been reduced and the following schedule will go into effect:

		Per kilowatt-hour
First	200 units use during month at	10 cents
Next	200 units use during month at	8 cents
Next	200 units use during month at	6 cents
Over	600 units use during month at	4 cents

In addition the monthly minimum will be reduced to $1.00 for both light and power. The foregoing rates will be reduced one-half cent per kilowatt-hour without lamp renewals.

The new exclusive power schedule will be as follows:

		Per kilowatt-hour
First	200 units use during month at	6 cents
Next	200 units use during month at	5 cents
Next	200 units use during month at	4 cents
Over	600 units use during month at	3 cents

The monthly minimum will be reduced from 75 cents to 50 cents per horsepower.

In connection with further reductions the company makes the following statements in its advertisement.

"The supplying of electricity to the entire population of a city such as St. Louis involves a very large investment and plant, each customer is also an element of not only investment cost, but service expense, in addition to the cost of operation to generate the electricity and its delivery—with the increased use and growth of the business, lower operating costs are made possible.

"The total number of residences in the City of St. Louis aggregate approximately 120,000, of which at the present time 33.33 per cent, or, in round figures, 40,000 use "Union Electric" service. In addition there are over 20,000 commercial and power customers.

"We tabulate below the growth in total number of patrons beginning with January 1, 1910, up to August 1, 1915:

On January 1, 1910—23,750 customers
On January 1, 1911—28,250 customers
On January 1, 1912—33,750 customers
On January 1, 1913—38,000 customers
On January 1, 1914—46,300 customers
On January 1, 1915—54,500 customers
On August 1, 1915—60,700 customers

"It is reasonable to expect in December, 1915, a total of 65,000 customers will be reached.

"A continued rapid growth will enable the company to make further reductions in its rates from time to time, and thus share its prosperity with its increasing number of patrons, and as the number of our customers increase we now offer the following further reductions in the primary rate:

When our total number of customers reaches 65,000 reduction to 9 cents per kilowatt-hour.
When our total number of customers reaches 70,000 reduction to 8.5 cents per kilowatt-hour.
When our total number of customers reaches 75,000 reduction to 8 cents per kilowatt-hour.

"It is difficult to forecast too far ahead with any degree of certainty, with the rapid advance in the art and improvements and efficiencies that are being constantly developed, to what extent even further reductions may prevail; large additional capital investment is continuously required to maintain a public utility such as the Union Electric, which must keep abreast of the times to render the best of service at the lowest possible rates.

"Many people are still using the older methods of lighting—some coal oil—these are obsolete and out of date. With the present high efficiency incandescent Mazda lamps, with free renewals, the low rates and monthly minimum of 50 cents, and no deposit required, electricity offers to the householder an economical luxury with the comfort and convenience which no other domestic service can bring.

"If your house is not wired we wire 'already built houses' at a low cost, and will divide the payments monthly with your electric light bill."

Electric Pump Wagons for Central Station.

The Boston Edison Company has in service two pump wagons for removing water from manholes in the underground distribution district of Boston. Each of these apparatus consists of a General Vehicle 2,000-pound wagon, with motored rotary pump installed in the panel body, both motor and wagon being driven from a 60-cell A6 Edison battery.

The practice is to make regular trips of inspection, as well as to perform emergency service required after periods of heavy rain. The pumping machinery performs work formerly done by hand pails, and has a capacity of 90 gallons a minute, whereas two men with pails could scarcely remove five gallons of water a minute.

The vehicles average about 20 miles of daily travel, in eight hours, cleaning out 15 to 20 manholes. During a year the crews of the two pumping wagons open about 15,000 manholes, 75 per cent of which require pumping out. The amount of water removed during 10 months of 1914 was 3,130,000 gallons. In one day one of the wagons removed 10,080 gallons from 13 manholes, the pump motor using 58 ampere-hours from the battery. The distance traversed was 16.6 miles and the total battery discharge was 164 ampere-hours, 106 ampere-hours being used for driving the vehicle. The average consumption of the vehicle motor is 4.7 ampere-hours per mile and for both pump and vehicle 5.7 ampere-hours per mile.

A typical daily record showed 13 manholes pumped out and 8 manholes inspected and tested. The 16.6 miles run consumed 2 hours 26 minutes, the pumping time was 1 hour 52 minutes, and lunch and delays consumed 4 hours 13 minutes.

Consumer Liable for Prepayment-Meter Funds.

The Supreme Court of Alabama has recently handed down an interesting decision covering the theft of money from a prepayment gas meter in the case of a consumer of the Birmingham Railway, Light & Power Company, the funds having been taken from the consumer's meter by a person other than an agent of the company. Through successive court actions and appeals the case reached the Supreme Court, which tribunal in its decision upholds the ruling of the Appellate Court, stating as follows:

We are aware of no rule of law which would render invalid and unenforceable an undertaking of a consumer of gas, supplied by prepayment-meter plan, to be responsible for the loss or theft of the money deposited in payment of it, while that money is in the agreed receptacle for it on his premises. By such an undertaking he merely insures the safety from violence or theft of the money deposited for gas as desired before it gets into the possession or under the control of the party entitled to it and while it is in the agreed place of deposit on the premises served through the meter of which the consumer makes use. The law does not forbid the assumption of such risk by the consumer of gas who contracts for such a method of service.

Electric Cooking in Western Canada.

It has been claimed that the city of Winnipeg, Canada, has more electric ranges in use than any other city of the world of the same size. There are in Winnipeg about three thousand stoves of all sizes, and there are eight apartment blocks containing from 8 to 38 apartments each, which are fully equipped with electric ranges.

Fort William has over four hundred ranges installed, Saskatoon two hundred and Edmonton one hundred. In the latter city there is also a bakery which uses electric heat. Calgary and Selkirk have each about fifty ranges, and the smaller towns in proportion.

The results which have been obtained

Digitized by Google

in the introduction of electric cooking in these cities has been largely due to demonstrations which have been generally carried on. Winnipeg has been especially active in this connection, and the exhibits at the annual Industrial expositions have had widespread results. The actual cooking and baking done by competent demonstrators upon such occasions has given the public a better idea of the possibilities of electric cooking than can be done verbally and such demonstrations have always been well attended.

One-Wire Farm Line at Clarinda.

The Lee Electric Company, Clarinda, Iowa, is operating a rural one-wire grounded-return line which is giving excellent satisfaction. It is a 2,200-volt line, three miles long and so far no trouble has been experienced from lightning disturbances or from telephone interference with grounded telephone lines, although the power line parallels a telephone line for its entire distance.

Rufus E. Lee, manager of the Clarinda company, refers to the line as follows: "The advantage in the line is that we simply extend one of our primary wires by going through two transformers, our idea being that if the scheme eventually works out we will install one-to-one transformers. In the meantime we simply use an ordinary standard 2,200-volt transformer, connected into the other transformer, grounding one side of the second transformer and then extending one line into the country on 25-foot poles with five-inch tops. When we reach the customer we step down directly to 110 or 220 volts as is desired."

This construction is said to be as inexpensive as the ordinary telephone line. Ground connections are made at the poles rather than on a customer's premises. A three-quarter inch pipe driven 12 feet into the ground is used in each case.

The farmers along this line advanced the money to build with the provision that they would be reimbursed at the rate of 50 per cent of their monthly bill after minimum charge has been deducted. In addition to the regular kilowatt-hour rate the company makes a service charge of 50 cents per month, a minimum charge of $1.00 per month and a meter charge of 25 cents per month. This fixed charge of $1.75 is deducted and 50 per cent of the remaining amount of each monthly bill is paid to each customer until the line is paid for by the company.

Business Men Secure White Way Fund.

In order to provide funds for construction of the "white way" system in the business section of Lexington, Ky., the Board of Commerce has appointed teams which will canvass the business men of the city for contributions to the fund.

SUCCESSFUL COMMERCIAL MANAGERS.

L. R. Wallis.

Recently much interest was created among central-station companies by the announcement of the Edison Electric Illuminating Company, of Boston, that a canvass would be made of its entire territory to determine what, if any, domestic appliances were in use by each of its thousands of customers. This vast undertaking is now nearing completion, and the company is in possession of a fund of useful data that will prove invaluable in securing additional business.

This is just one of the many original ideas which have been carried out by the sales department of the Boston

L. R. Wallis,
Superintendent Sales Department, Edison Electric Illuminating Company of Boston.

company under the management of L. R. Wallis, superintendent of sales. In addition to the high connected load per capita among residence customers the Boston Edison Company has an enviable reputation for its activities in other branches of central-station endeavor. It is one of the most prominent advocates of electric vehicles, and was a pioneer in co-operating financially and in other ways with electric-vehicle interests throughout New England to increase the use of battery vehicle. Recently the company, in conjunction with the manufacturers, inaugurated a battery-exchange system which promises to give great impetus to the electric in Boston.

In power sales work the company is second to none, and as a result of its activities a large percentage of the possible business is already connected, including many of the largest manufacturing establishments in the Boston territory.

Mr. Wallis first became identified with the electrical business in January of 1888, when he joined the staff of the Bernstein Electric Company.

In 1891 he became associated with the Buckeye Electric Company as New England representative of that concern. In 1892 he became connected with the central-station business as manager of the Citizens' Gas & Electric Light Company, of Wakefield, Stoneham and Reading, Mass. In 1894 after selling out the property to the town of Wakefield under municipal ownership—it being the first plant so conveyed in Massachusetts—he constructed the gas property at Laconia, N. H. In 1897 Mr. Wallis became treasurer and manager of the Woburn Light, Heat & Power Company, of Woburn, Stoneham and Winchester, Mass. In 1903 this property was sold to the Edison Electric Illuminating Company, of Boston, and after a few years of retirement from the electric business he became associated with the Edison Electric Illuminating Company of Boston as assistant to the general superintendent. In 1910 he became superintendent of the sales department, which position he now holds.

New Rate Schedule at Sioux City.

The Sioux City (Iowa) Gas & Electric Company has announced a reduction in electricity rates for lighting and power service, effective August 1. The new lighting rates are as follows:

					Per kilowatt-hour
First	50	units per month	at	9	cents
Next	50	units per month	at	8	cents
Next	100	units per month	at	6	cents
Next	300	units per month	at	5	cents
Next	1000	units per month	at	4	cents
Next	1500	units per month	at	3.5	cents
Next	3000	units per month	at	3	cents

These rates are net after deduction of one-half cent per kilowatt-hour for prompt payment. The minimum charge is $1.00 per month.

The new power rate schedule is as follows:

					Per kilowatt-hour
First	400	units per month	at	5	cents
Next	300	units per month	at	4	cents
Next	1300	units per month	at	3	cents
Next	1400	units per month	at	2.5	cents
Next	3400	units per month	at	2	cents

The minimum charge under this schedule is $2.00 per month.

Emergency, or break-down service is supplied at the regular rates, except that a minimum guarantee of $1.00 per month per kilowatt of capacity connected is required.

Co-incident with these reductions in rates the company announces that the present street lamps of 32 candlepower in use in accordance with the terms of a contract made by the city will be replaced by 60-candlepower units without additional charge to the city.

The utility company is at present engaged in rehabilitating its power plant.

Digitized by Google

Electrical Construction

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Keep Batteries Moving.

One of the troubles connected with the flash-lamp business, which isn't a trouble at all if the dealer uses a little common sense in connection with it, is handling the battery stock so as to keep it efficient. A good many retailers have complained that their customers return the batteries for adjustment because they have not received reasonable service out of them, and in most cases the dealers are inclined to blame it on the customer.

It very often happens, however, that the dealer himself is at fault, because he does not keep his batteries moving. In other words, he should sell his oldest batteries first, so that the possibility of deterioration, which is always going on in dry-cell batteries, will be minimized. Sometimes it is found that a dealer, largely from force of habit, will put his fresh stock of batteries at the front of the shelf, and sell from this, when as a matter of fact he should be putting the new goods at the back, and selling from the front, where the older stock has been placed.

This condition emphasizes the point that the dealer should keep only a small stock of batteries on hand, and should turn over his stock frequently. That is good business policy in any event, but it is especially desirable in connection with batteries, on account of the deterioration to which they are subject. One of the biggest jobbing houses in the Central West, which sells thousands of batteries a year for use in flash lamps, frequently bulletins its salesmen and dealers on this subject, emphasizing the idea that it is far better to have a small stock, and keep it moving, than to put in a big stock and run the risk of having customers bring back worn-out batteries and demand replacement.

Some of the battery manufacturers are now stamping the packages with the dates on which their guarantees expire, and this is hastening sales, by making the dealer use his oldest stock first. At the same time it is making it a good plan for jobbers to have goods delivered by wire and express arrangements, instead of laying in a big stock, delivered in the usual way by freight.

Another angle on the proposition is that since the most profitable part of the flash-lamp business is the replacement of batteries, it is important that the customer be satisfied with his battery service, else he will discontinue using the lamp. If the dealer will take care of this feature there will be no trouble about batteries going dead in short order, except in infrequent cases where a short-circuit has been introduced through some fault of the user.

Testing Electric Fans.

In spite of the fact that a great many dealers are convinced that the only thing which will sell a fan is the lowest price quoted in the market, the service feature is still an important one, and the dealer who is prepared to render service, or, better still, anticipate the requirements of his customers to an extent that makes service after the sale unnecessary, has the edge when it comes to competition.

Every fan which goes out of a store ought to be fully tested before it is delivered. In this way the dealer will be able to locate defects, if there are any, and thus avoid having to go to the trouble and expense of replacements. On the other hand, there are fans and fans, and many of them have individual peculiarities which need attention and study. For instance, some light oscillating fans will not start if tilted at an extreme angle. Where this is the case the customer should be given to understand that the fan must be standing on a level when it is started. Other fans require connection to be broken entirely in changing from one phase to another. If this is not done the fan stops. If the fan is tested before being sent out of the store, excessive noise, possibly due to lack of oil, trouble in the commutator, or whatnot, can be noted, and the fan put in good condition before being delivered.

The dealer who reads this may think that too much work and trouble are involved to justify the effort along the lines of testing for defects, but such a policy will pay in the satisfaction of customers, and in time saved after the fans have been put in service. You can't get away from making good the defects of the goods you sell, no matter how much you may want to do so; that is if you expect to stay in the business.

Automobile Lamp Sales.

Becoming "headquarters" for a certain article is largely the result of using publicity in connection with it.

A dealer in a certain large city has got a lot of business from garages, automobile owners and others connected with the motor-car business, simply because he has taken pains from time to time to advertise the fact that he carries a large and complete assortment of automobile lamps. At times he has put on a special sale of tungstens for autos, pricing them attractively so as to get the interest and attention of owners and others.

This effort has paid in the business which has been created directly, and it has also paid, because it has given the dealer a reputation along that line. Owners are often sent to the store by garage men who do not handle lamps and prefer that the purchase be made directly instead of handling it themselves.

Of course, bulbs for autos do not cost much, and the possible business may be limited, but the point is that any article that is featured is going to be sold, and that the dealer who is live enough to hook himself up with the present and potential demand for electrical specialties is going to be remembered when consumers are in the market for those particular goods.

Meetings of the Salesmen.

A successful electrical concern, which handles merchandise and contracting as well, has regular meetings of its force, the get-together affairs coming at least once a month, and sometimes oftener. Among other things it is the object of the organization to familiarize the force with the new goods that are put in stock. The theory of the head of the business is that if the salesmen are not interested in a line the customer's can't be expected to show any great amount of excitement over it; and, on the other hand, that the salesmen won't be interested unless their interest has been aroused by learning something about it.

Hence at these meetings every article which has been put in stock recently is discussed, and all the various selling points brought out. Discussion of the price, with reference to competition from other lines, is included, and when the subject is dismissed everyone present has a good grasp of the proposition, and is in a position to talk that article

Digitized by Google

effectively to anyone who may inquire about it. If the salesman of the manufacturer happens to be in town when the meeting is held he is invited to attend, and invariably fills the boys up with technical data about the proposition, as well as material which can be used in sales work.

In addition to discussing goods that are actually in stock the members of the organization bring up articles which have just been put on the market. The head of the house asks their opinion of new goods with a double purpose: first, to learn whether the salesmen have discovered any advance demand for the article, and, second, to give an opportunity to "post" them in advance of its being put in stock. One discussion of that sort early this year resulted in a certain popular-priced fan being put on sale, and the store has done well with it, in spite of weather conditions not being altogether favorable.

Money in Fan Sales?

Local conditions often determine the question of profits in the sale of fans. If there happens to be an aggressive dealer of the sort who puts volume before profits, the chances are that prices will be reduced to a point which will not permit the dealer to get out with a whole skin. On the other hand, if the members of the trade are sensible enough to realize that they have got to have a reasonable margin on which to do business, and that no volume, however large, will make up for lack of profit on individual sales, everybody will have a chance to make a little money, and even the dealer who handles only a few fans during the season will have an opportunity to put a few dollars on the right side of the ledger.

In a certain city, where the dealers know the situation well enough to have realized the folly of price-cutting, they have failed to make money this season for the first time in several years. Up to this year everybody has tried to maintain prices. Somebody apparently had an idea that it was possible to make a "killing" on fans, however, and bought in sufficient quantity to get an "extra special" inside price. Then he went out to sell fans when the season opened, and quoted a price which was, on an average, 20 per cent below the figures of last year. Others had to fall in line, with the result that profits have been a minus quantity. In fact, considering the cost of selling them, the dealers have all lost money on their fan sales, and more than one has been talking of dropping the business hereafter.

The fan trade is growing, and is the biggest electrical proposition on the boards in the summer time. The dealers who are handling them have got to use a little horse sense, however, and keep the prices at a profitable level, remembering that a cut price seldom creates business. The most it can do is to divert it from somebody else, and with everybody cutting the advantage is negatived.

Motors for Organ Bellows.

Among the current electrical construction permits which are appearing in Louisville, Ky., are numbers which note installations of electric motors in churches. Calvary Episcopal Church, Trinity Evangelical Church and others have been named in this connection. The electrification consists of connecting motors to the bellows of the pipe organs. Heretofore in Louisville, as elsewhere, the power for operating these organs, where it was not provided by the janitor, has been water power, the mechanism being connected to the city water system. This meant a great deal of waste, however, and required constant attention in cases when the weather was cold. The motor relieves the caretakers of the need of giving this attention, as to start the pump all that is necessary is for the organist to throw the switch. Two-horsepower, single-phase motors generally are installed by the Louisville contractors and most of the large churches are now equipped in that way.

Louisville Contractors Discuss National Convention.

Frank E. Good, electrical engineer for F. A. Clegg & Company, of Louisville, was speaker at the last regular meeting of the Louisville Electrical Clearing House, held on August 9 at the organization's headquarters in the Kentucky Actuarial Bureau suite. Mr. Good's address was in effect a report to these electrical contractors of the national convention at San Francisco, which he attended as delegate from the Kentucky Association. The greater part of his talk was given over to discussion in detail of the forthcoming changes in the national code. These he went into fully, showing in what particulars the new requirements would affect the local situation.

Leslie G. Ross, who for a number of years has been in charge of the sales and contract department of the Superior Water, Light & Power Company, Superior, Wis., has resigned that position and organized a company to do electrical wiring, repair work, etc., and maintain an electric shop with a full line of lamps, fixtures, motors, wiring supplies, and electric appliances of all kinds. The Superior Water, Light & Power Company will discontinue the wiring and supply business, and its unfinished contracts will be cared for by Mr. Ross. The new store will be located at 1205 Tower Avenue, Superior, Wis.

SOME CHARACTERISTICS OF DIRECT-CURRENT MOTORS.

By Harry N. Gilbert.

The direct-current motors in common use are either shunt, compound or series-wound.

Shunt-wound motors have only one kind of field winding. The field coils have quite a high resistance and are placed directly across the line voltage in parallel with the armature. The amount of current flowing in them, and, therefore, the strength of the field, depends only on the voltage and the resistance of the field coils. The strength of the field, is, therefore, practically constant, and will cause the motor to run at practically constant speed, as explained later.

Shunt-wound motors are used for driving line shafting and such machines as impose a fairly steady load on the motor. They are used in a large percentage of the applications. They should not be used where they are going to be subjected to sudden and frequent changes in load or sudden overloads.

Shunt-wound motors run at practically constant speed, irrespective of the load. They are, however, subject to variations in speed, due to the following causes:

(1) Variations in applied voltage.
(2) Variations in temperature of motor windings.
(3) Variations in amount of load.
(4) Variations in magnetic permeability of iron parts.

Variations in speed due to voltage are dependent upon the supply circuit and the size of the feeders from the generator to the motor. Feeders should be of such size as not to cause excessive line drop when the motor is fully loaded. The speed variation of a shunt motor for slight changes in voltage may be considered proportional to the change in voltage. An increase in voltage raises the speed, a decrease lowers the speed. A reduction in voltage tends to make the armature run slower. On the other hand, the field is weakened by a reduction in voltage, which would cause the armature to run faster. The speed obtained is, therefore, a resultant of these two opposing causes. The percentage of change in speed is in fact slightly less than the change in voltage.

Variations of voltage are beyond the control of the motor manufacturer, and a motor should be ordered to suit the voltage of the circuit to which it is to be applied. If the voltage variations are very great and frequent, as on a street-railway circuit, the motor should be designed with these variations in mind.

Digitized by Google

Variations in speed due to variations in temperature are caused by physical properties of the materials of which motors are made. The current carrying parts of motors (excepting, of course, the carbon brushes) are usually made of copper or copper alloys. The resistance of copper increases with increase of temperature. The resistance of annealed copper increases, roughly, 0.4 per cent for every degree centigrade rise in temperature above 20 degrees centigrade.

When a motor has been standing idle for about two hours, it has practically the same temperature as the room in which it is located. As the motor is run its temperature rises, until it reaches its working temperature. The speed will also vary as the temperature varies.

Standard practice permits 20 per cent increase of shunt-field resistance, which decreases the ampere-turns producing field flux by 20 per cent. This reduces the magnetic flux from 10 to 15 per cent, tending to increase the armature speed 10 to 15 per cent.

The conductors on the armature and all other conductors in series with it also increase in resistance. This causes a greater drop of voltage in the armature circuit, tending to make the armature run slower.

These two tendencies oppose each other, and the resultant change in the motor speed is determined by their comparative strengths. The slowing down effect of the armature is greater in small machines than in large ones. The same is also true of slow-speed motors, as compared with high-speed motors. This is due to the fact that small motors and slow-speed motors have a comparatively greater resistance than do large motors and high-speed motors. As an average the increase in speed from cold to hot is about 8 to 12 per cent. The speed increase for small and for slow-speed motors will be less; for large and for high-speed motors it will be greater than this. As a motor reaches its maximum temperature in two hours at the most, if run fully loaded, this is usually not objectionable.

Variations in speed, due to variations in load, are caused by the resistance of the armature conductors and the current-carrying parts in series with them. The current flowing through this resistance causes a voltage drop, which in turn causes the motor to slow down. The greater the current the greater the voltage drop, and the consequent reduction in speed. As explained above, small and also slow-speed motors have a comparatively high armature resistance, and will, therefore, have a greater percentage drop in speed from no load to full load. The average change in speed from no load to full load on a shunt motor is from 2 to 5 per cent.

Variation in speed due to magnetic permeability of iron or steel parts is caused by physical properties of those parts. A person not familiar with such matters would naturally assume that two motors made from the same drawings and wound exactly the same, would run at exactly the same speeds. Such, however, is not necessarily the case. If the steel or iron, from which the two motors are made does not possess the same magnetic properties the motors will not run at the same speeds. The motor manufacturer cannot govern this point entirely. He can, and practically all do, buy steel that has fairly uniform magnetic qualities. Steel made at different times, in accordance with the same specifications as to magnetic quality, will not vary enough to make serious differences in speeds of motors built from it.

The points brought out under these four headings might lead one to conclude that the speed of a motor cannot be very closely determined before it is built. This conclusion, however, would not be correct. Motor manufacturers guarantee that their motors will not vary from listed speeds more than 5 per cent in case of motors above one horsepower, and 10 per cent in cases of motors below one horsepower. The commonly accepted basis for speed rating of a motor is full-load speed of motor hot. Practically all motors when first tested at the factory come within the 5 or 10 per cent limit mentioned above. Those which do not come within this limit receive special attention, and are not shipped out, unless customer consents to the speed at which they do run. By making slight alterations in the windings they can easily be brought within these limits.

In case of a belted motor, belt speed is the important thing rather than armature speed. Motors which come outside these 5 or 10 per cent limits can often be made suitable by furnishing a special pulley. Where a customer has a large number of motors installed and keeps spare motors to replace damaged ones, furnishing a special pulley is sometimes objectionable. It is not done, therefore, without customer's consent.

Compound-wound motors have two field windings. One is the same as the winding of the shunt motor, and the other winding (the series winding) is in series with the armature. Its strength, therefore, depends upon the amount of current flowing through the armature, which in turn depends on the load. The total field strength, therefore, increases and decreases with increase and decrease of load. The proportion of the field strength furnished by the series winding can be as is desired to suit the load it is to drive. The ordinary standard compound motor is designed to furnish about 25 per cent of the field strength at full load. This can be made more or less to meet the requirements of the service.

Compound-wound motors are used where the starting load is very heavy, or where the load changes frequently, suddenly and violently, as in reciprocating pumps, rock crushers, punch presses, elevators, etc.

The four causes of speed variation discussed under shunt motors also affect compound motors in a similar manner. The speed of a compound motor varies much more with changes of load than does the speed of the shunt motor. The greater the proportion of the field strength furnished by the series field the greater will be the variation of speed from no load to full load. The motor, of course, runs faster at no load than at full load; it does not run away, however, at no load as does the series motor.

The series winding may carry all or only a certain percentage of the current entering the armature. The field strength, therefore, varies with the load; the heavier the load the stronger the field. A sudden increase of load causes more current to enter the armature. As this current, or a fixed percentage of it, goes through the series field it increases the field strength. The ability of the motor to produce torque or pull, other things being the same, depends on the field strength; the greater the field strength, the greater the pull. A compound motor, therefore, automatically takes care of sudden load changes.

Series-wound motors have only one field winding. It is in series with the armature and carries all or a fixed percentage of the current flowing through the armature. The strength of the field depends directly upon the load on the motor. A series motor gives a very heavy starting torque at a slow speed. As the driven machine starts up and requires less torque the motor speeds up automatically.

Series motors should be so arranged that they cannot lose their load, as their speed depends on the amount of load they carry. At no load they run at an excessively high speed, and may throw out the armature windings or segments in the commutator. For this reason they are usually geared or coupled directly to the machine being driven and seldom belted.

Series motors are used where the load is practically constant or where variation in speed with changes of load does not matter. They are used on centrifugal pumps, fans, certain kinds of hoists, street cars, etc. They are gen-

Digitized by Google

erally used in connection with a hand-operated speed regulator.

Series motors are subject to the same four causes of speed variation mentioned under shunt motors, but in some cases differently.

The speed of a series motor (keeping the same torque and current) varies slightly faster than the voltage, because both field windings and armature windings act to produce a change in the same direction, instead of in opposite directions, as in the case of a shunt motor.

The speed of a series motor is less hot than cold, which is just the opposite to a shunt motor. This is due to the fact that the armature and series field increase in resistance when heated up, thus giving a greater voltage drop in the motor, which makes it run slower.

The variations in the magnetic properties of the iron or steel have the same effect on the speed of series motors as on shunt and compound motors.

Shunt, compound and series motors can all be equipped with commutating poles. They are poles midway between the main poles of the motor. Their windings are in series with the armature and carry all or a fixed percentage of the current flowing through the armature. Their principal duty is to prevent sparking at the brushes and short-circuit currents in the armature coils when they are under commutation. Since these short-circuit currents pass through the brush as it spans the two commutator segments attached to the two ends of the coils, commutating poles, when properly designed, make the brushes and commutator run much cooler; or what is the same, permit of more load current being carried on the same size of brushes and commutator.

The speed of any motor having a shunt field can be increased by inserting resistance in series with the field winding. This cuts down the current flowing through the field winding, decreases the field strength, and, therefore, increases the speed of the armature. If this is done with the ordinary shunt motor without commutating poles, it will begin to spark at the brushes and give trouble before the speed has been increased very much. By using properly proportioned commutating poles and getting the proper relation between the ampere-turns on the commutating poles and the ampere-turns on the armature, the speed may be increased four to five times the normal without the faintest sign of sparking at the brushes. Commutating poles also make the speed of a motor more stable with variations in load.

The speed of a series motor can be varied by shunting part of the current around the series winding, thus weakening the field strength. This is used in some street-railway control systems. Commutating poles are necessary here for the same reasons they are necessary in shunt motors.

Great care must be taken to get the brushes in the proper position on the commutator when commutating poles are used, especially on motors with a wide speed range. If the brushes are not in the proper position the motor is liable to surge badly or the armature may run away. By surging is meant rapid periodic increase and decrease of the speed. The brushes of commutating-pole motors are very carefully set at the factories, and many companies lock them in position with a screw. They should never be moved except by some one who thoroughly understands setting brushes on commutating-pole machines.

The above are the more important characteristics of direct-current motors. They should be thoroughly understood by salesmen selling direct-current motors. The person using numbers of direct-current motors or having to take care of them, should also understand these characteristics. There are a good many other characteristics not mentioned here, that are of interest to designers and manufacturers only. The ones discussed have only been treated in a superficial manner without going into the technical explanation of all points. The aim was to make things plain to the ordinary user of motors.

Among the Contractors.

Amos L. Utz, formerly a member of the firm known as the Standard Electric Company, of St. Joseph, Mo., has sold his interest to other members of the firm, and has started in business alone at 918 Francis Street, St. Joseph, under the name of The Electric Shop. He will do a general construction business, carry a full line of fixtures and appliances and will also handle and repair motors. Mr. Utz is well and favorably known in St. Joseph.

J. F. Buchanan & Company, Philadelphia, Pa., has been awarded the contract for electrical work for the new Princeton (N. J.) University Dining Halls, which are estimated to cost $475,000.

The Carr & Schultz Electric Company, Trenton, N. J., has been awarded a contract for the electrical work in the new Cadwalader Heights Church, Trenton.

The Home Electric Company has been awarded the contract for installing the lighting fixtures and wiring the new Bernheim Building on Fourth Street, in Louisville, Ky.

The Standard Electric Company, Minneapolis, Minn., has begun the electrical wiring of the new residence of E. S. Woodworth, at 2222 Stevens Avenue. This residence will be fully equipped with all modern electrical conveniences and will have underground service through the garage.

This company has closed the contract for the electrical wiring of the Epworth Methodist Episcopal Church and is also engaged in the wiring of the R. E. Hawkins residence at 128 Clifton Avenue, and additional wiring in the Woman's Club of Minneapolis Building.

The county commissioners have let to Grimes and Thompson, of Piqua, O., the contract for the addition to the court-house heating and lighting plant at Troy.

The contract for the wiring of the new Rockwell and Riverview school buildings in Havana, Ill., has been awarded to the Commercial Electric Company, of that city.

The Electric Construction and Machinery Company, of Rock Island, Ill., is about to begin building a high-tension line from Dubuque, Iowa, to Dyersville, Iowa, a distance of 28 miles, and taking in the towns of Epworth, Farley and Peosta. Cedar or steel poles will be used.

The Dubuque Electric Company, of Dubuque, Iowa, has secured the contract for the complete electrification of St. Clair College,. Sinsinawa, Wis. 2,400 lights will be provided for and quite a number of motors will be used.

The J. W. Turner Improvement Company, of Des Moines, Iowa, has secured a contract, covering conduit extensions, to the Des Moines Electric Company's underground system. The Turner company has just completed a very fine underground installation in South Bend, Ind.

A. Engelhardt, 211 South Crystal Street, East Stroudsburg, Pa., has a contract for installing the electric light and power system in a $40,000 addition to the East Stroudsburg High School. He also has a contract for wiring for electric lights and telephones in addition to the Wallace Building in Stroudsburg, which is to be occupied by one of the Woolworth chain of stores. In addition to the above he has contracts for installing house-lighting plants in several summer homes in Pike and Monroe Counties.

The Maxwell Electric Company, a new firm of electrical contractors in Steubenville, O., has opened a shop at 121 North Fifth Street under the management of R. B. Maxwell, who was formerly with the Steuben Electric Company.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Los Angeles Gas and Electric Corporation has filed an application with the Railroad Commission for permission to increase rates for gas, holding that its present charge, as fixed by the City Council of Los Angeles is not remunerative. This case is taken before the Commission in accordance with the re-enacted Public Utilities Act, which enlarged the jurisdiction of the Commission, to include, after August 7, 1915, all privately owned public utilities within municipalities in the state.

DISTRICT OF COLUMBIA.

Stock and Bond Issues. In the last annual report of the Public Utilities Commission of the District of Columbia, the Commission took the position that, until the completion of the valuations of the property of public utilities, additional capitalization should be confined to the least amount possible without embarrassing the utilities in the proper performance of their functions.

The Commission has annuonced that it will not reconsider its decision to defer action on the request of the Potomac Electric Power Company for its approval of a bond issue of $415,000 until the completion of the valuation and investigation of the company's properties.

Notice was recently served on the Commission by the company that unless the bond issue was approved appeal would be made to the courts. Similar action was taken recently by the Washington Railway and Electric Company following the refusal of the Commission to approve a bond issue of $341,000.

GEORGIA.

Protection from Competition. It is alleged that private interests are seeking to provide competition to undermine the value of the Western and Atlantic Railroad, the state road, and an act has been passed by the state legislature and approved by the Governor prohibiting the issuance of a charter to any corporation which *would parallel the state road.*

INDIANA.

The Merchants Heat and Light Company has applied for permission to put in effect an "active-room" method of charging. The company, in its application, states that the socket method of charging, used in the schedule for residence lighting fixed by the Commission in its recent decision, is complicated and hard for the customer to understand, and that it discourages the use of lights and electrical conveniences. The proposed rate provides that all current used up to and including three kilowatt-hours an active room per month shall be charged at the rate of seven cents a kilowatt-hour and all current used over this amount shall be charged for at the rate of five cents a kilowatt-hour. The company does not ask that the socket rate be abandoned, but asks that the "active-room" method be approved as an additional plan for determining the rates.

The Commission has set September 2 as the date for the hearing on this request.

NEW JERSEY.

The New York Telephone Company has submitted to the Commission new message-rate schedules, effective September 1, in a number of municipalities in northern New Jersey.

The schedules are submitted with the aim of harmonizing, as far as differences in conditions will admit, the schedules in northern New Jersey with those in effect in New York City. The new schedules involve material decreases and the engineer of the utilities commission has recommended that they be substituted for the present schedules.

It is estimated that these reductions, together with the changes in interstate toll rates between Bayonne and New York City, filed on July 1 last, will make a saving to subscribers of $100,000 per year.

NEW YORK—Second District.

New York Telephone Company. The Commission has decided the case of the Board of Supervisors of Orleans County and the Trustees of the Village of Albion against the New York Telephone Company. In 1911 the company increased its rate for two-party business lines from $24 to $30 per annum and for four-party residence service from $12 to $15 per annum. The petitioners asked for an investigation to determine the reasonableness of the increases.

Complete inventories and valuation data were filed by the company and checked by the engineers, and the decision of the Commission discusses at length the facts and figures submitted as evidence.

The Commission finds that if proper amounts were set aside to cover the various items of expense, including depreciation, the company, even under the increased rates, not only failed to earn a reasonable return on its investment in the Albion local area, but was actually incurring a deficit. It was further pointed out that the bulk of the company's business was over the two-party business and four-party residence and rural lines, so that only by increases in these rates could the company hope to increase its revenue. The increases are approved by the Commission.

The Long Island Lighting Company was authorized to take over the Babylon Electric Light Company. The Long Island company is permitted to issue $175,000 of its 5% 25-year first-mortgage gold bonds at not less than 87.5 to net $153,125, and $125,000 capital stock at par. The proceeds of these issues amounting to $278,125 is to be used to acquire all the property, rights and assets, including franchises, and subject to liabilities of the Babylon company. The Babylon company will thereupon dissolve and cancel its outstanding stock of $75,000.

INTERSTATE COMMERCE COMMISSION.

The 1915 Western Rate-Advance Case, which has been before the Commission for some time, was decided July 30. Instead of advancing rates generally by a uniform percentage, as was done in the Five Per Cent case, the roads in the present case selected particular commodities and proposed specified increases in the rates thereon, basing their claims for additional revenue on the downward tendency of net earnings and the contention that the commodities involved do not bear their fair share of costs of transportation. The increases were granted in some cases and refused in others, the advanced rates approved representing a comparatively small portion of the amount sought.

The Commission voted five to two,

Digitized by Google

Commissioners Daniels and Harlan dissenting from the majority opinion. Commissioner Daniels, in his dissent, declares that the "carriers have in general sustained the burden of proof cast upon them by the statute, and are of right entitled to increases in rates productive of revenue far in excess of what they are accorded in this decision," and he held that "just and reasonable increased rates should be permitted not grudgingly, but with such fair measure of allowance as will indicate that the transportation industry is entitled, in the interest of the public, to earnings sufficient to provide a service commensurate with public needs."

Commissioner Harlan's dissent was brief, merely holding that, aside from the financial condition of the railroads, he was convinced that the increases they asked were just and reasonable.

SUPREME COURT.

Des Moines Gas Company Case. In an opinion written by Justice Day, the United States Supreme Court has dismissed the appeal taken from the ordinance of the city of Des Moines fixing the rates of the Des Moines Gas Company. The suit was begun in the District Court of the United States for the Southern District of Iowa by the appellant company to enjoin the enforcement of the provisions of a certain ordinance of the city of Des Moines fixing the rate to be charged for gas at 90 cents per thousand cubic feet, the rate to be effective from January 1, 1911. A temporary injunction was granted and the case was referred to a special master in chancery to report on findings of fact and conclusions of law. The District Court confirmed the report of the master and dismissed the appeal "with prejudice," and added: "At any time on and after three years from this date complainant, its successor or assigns may, on motion, reinstate this case with all the pleadings and evidence now on file, with the same and like effect as though filed for such subsequent hearing. And each party may then file such additional pleadings and take and file such additional evidence as to each party may be deemed advisable."

The Supreme Court says: "While we agree with the court below that it was right to confirm the master's report and dismiss the bill, we think, in view of the fact that the attack upon the rates was made before the ordinance went into effect, and before actual application of the rates could demonstrate whether they were remunerative or not, that the court should have followed the recommendation of the master and dismissed the bill without prejudice. We think this is particularly so, in view of the fact that ordinarily time alone can satisfactorily demonstrate in a case like this whether or not the rates established will prove so unremunerative as to be confiscatory in the sense in which that term has been defined in rate-making cases." The decree of the lower court is affirmed with the modification that the case be dismissed "without prejudice." The particular exceptions to the master's report which were brought before the Supreme Court concerned the manner of dealing with going value and the cost of paving over mains. In the master's report the property was valued on the basis of reproduction cost new, less depreciation. The cost of reproduction of paving over mains estimated at $140,000 and going value estimated at $300,000 were not included in the final figure. If these items were included the valuation of the plant would be such that a fair return could not be made under the rates fixed by the ordinance and the company would be entitled to a decree in its favor. Therefore, the action of the Supreme Court in passing upon the decree of the lower court depended upon the consideration of these two points.

Paving Over Mains.—In regard to the estimate of the cost of reproducing paving over mains where such cost had not been borne by the company, the Supreme Court says: "As to the item of $140,000 which, it is contended, should be added to the valuation because of the fact that the master valued the property on the basis of the cost of reproduction new, less depreciation, and it would be necessary in such reproduction to take up and replace pavements on streets which were unpaved when the gas mains were laid, in order to replace the mains, we are of opinion that the court below correctly disposed of this question. These pavements were already in place. It may be conceded that they would require removal at the time when it became necessary to reproduce the plant in this respect. The master reached the conclusion that the life of the mains would not be enhanced by the necessity of removing the pavements, and that the company had no right of property in the pavements thus dealt with, and that there was neither justice nor equity in requiring the people who had been at the expense of paving the streets to pay an additional sum for gas because the plant, when put in, would have to be at the expense of taking up and replacing the pavements in building the same. He held that such added value was wholly theoretical, when no benefit was derived therefrom. We find no error in this disposition of the question."

Going Value.—The court reviews the findings regarding going value in the master's report. It appears that he was at first disposed to allow $300,000 for going value, stating that in his judgment the plant "is worth that much more than a plant would be that had to develop its business."

"I think a purchaser would be willing to add this amount for its developed business, and that a seller would not be willing to sell unless he got that much more than its physical value, but I could not give the mental process by which this conclusion is reached any more than a jury could do so, under like circumstances, but it is nevertheless my judgment under all the evidence in the case." The master says that the element of good will is not to be included in the going value of a public utility.

"But there is a great difference even in a monopoly which has a business already developed and one that must develop it. The plant of complainant has all its parts working in harmony, performing their several functions in producing and conveying the gas to its customers. These several parts are not only in place, but have been brought to a harmonious operation throughout. Even the employees of the concern are familiar with their duties and experienced in performing them. But without business no matter how perfect it may be, it would be unprofitable. It is ready, however, for business and has the business to transact. It was a small concern at the start in 1864, but its books show that it has had a steady growth for many years in the past, and everything indicates that it will continue in the future. There is great difference between such a plant and one whose business must be developed. All a purchaser of such a plant would have to do would be to take charge of the plant, 'touch the button,' and he is making money from the start. There is no element of uncertainty connected with it. He can retain its experienced employees as a rule, should he so desire, at the same wages. There is no question that such a plant has a 'going value' because it is a money maker from the start.

"The only difficulty is to determine how much its 'going value' is worth. No interest during its construction is allowed, nor anything that is included in the 'overhead charges,' which are part of the physical value. But simply the fact that it has a developed business that will make money for its owner, with reasonable rates allowed for the product which it manufactures and sells."

The Supreme Court says: "That 'good will,' in the sense in which that term is generally used as indicating

Digitized by Google

that element of value which inheres in the fixed and favorable consideration of customers, arising from an established and well known and well conducted business, has no place in the fixing of valuation for the purpose of rate-making of public service corporations of this character, was established in Willcox v. Consolidated Gas Company, 212 U. S. 19, 52." . . .

"That there is an element of value in an assembled and established plant, doing business and earning money, over one not thus advanced, is self-evident. This element of value is a property right, and should be considered in determining the value of the property, upon which the owner has a right to make a fair return when the same is privately owned although dedicated to public use. Each case must be controlled by its own circumstances, and the actual question here is: In view of the facts found, and the method of valuation used by him, did the master sufficiently include this element in determining the value of the property of this company for rate-making purposes?

"Included in going value as usually reckoned is the investment necessary to organizing and establishing the business which is not embraced in the value of its actual physical property. In this case, what may be called the inception cost of the enterprise entering into the establishing of a going concern had long since been incurred. The present company and its predecessors had long carried on business in the City of Des Moines, under other ordinances, and at higher rates than the ordinance in question established. For aught that appears in this record, these expenses may have been already compensated in rates charged and collected under former ordinances. As we have said, every presumption is in favor of the legitimate exercise of the rate-making power, and it is not to be presumed, without proof, that a company is under the necessity of making up losses and expenditures incidental to the experimental stage of its business."

Discussion of going value by the court in Knoxville v. Knoxville Water Company (212 U. S. 1), Cedar Rapids Gaslight Company v. Cedar Rapids (223 U. S. 655), Cedar Rapids Water Company v. Cedar Rapids (118 Iowa 234), and Willcox v. Consolidated Gas Company (212 U. S. 19), are reviewed, and the court concludes that "As pointed out in the Cedar Rapids case, if return is to be regarded beyond that compensation which a public service corporation is entitled to earn upon the fair value of its property, the right to regulate is of no moment, and income to which the corporation is not entitled would become the basis of valuation in determining the rights of the public. When, as here, a long established and successful plant of this character is valued for rate-making purposes, and the value of the property fixed as the master certifies upon the basis of a plant in successful operation, and overhead charges have been allowed for the items and in the sums already stated, it cannot be said, in view of the facts in this case, that the element of going value has not been given the consideration it deserves and the appellant's contention in this behalf is not sustained."

Rate of Return.—The master found that on the value of the plant in actual and successful operation the rates would yield a return of, at least, six per cent. The Supreme Court says: "Nor do we think there was error in refusing an injunction upon the conclusion reached that a return of six per cent per annum on the valuation would not be confiscatory. This is especially true in view of the fact that the ordinance was attacked before there was opportunity to test its results by actual experience. It is true the master reported that in his opinion the company ought to earn eight per cent, but he also found that in his judgment gas could be producer for 60 cents per thousand, and the actual effect of the 90-cent rate on an economically managed plant had not had the test of experience."

Arkansas Coal in 1914.

The Geological Survey reports a production of 1,836,540 tons of coal in Arkansas for 1914, with a value at the mines conservatively estimated at $3,158,000.

Lighting of the Widener Memorial Library.

The Harry Elkins Widener Memorial Library at Harvard University, which was dedicated in June, was built as a memorial to that member of the Class of 1907, who was lost in the Titanic disaster. It cost about $2,500,000 and is by far the finest building of the University.

The type and arrangement of lighting fixtures were the result of careful study on the part of the architect, in consultation with experts of the Lord Electric Company's New York office. The result is a highly ornamental and artistic arrangement, with abundant illumination where it is required, for reading and study. The ornamental lighting fixtures were furnished and installed by the Sterling Bronze Company, New York, and the ceiling lighting in the main reading hall and the lighting of the 10-story stockroom were installed by the Lord Electric Company, Boston. The fixtures are all of special design.

Main Reading Hall, Widener Library.

A high porch formed by the massive columns at the main entrance is lighted by eleven 100-watt Mazda lamps installed in opal balls at the ceiling. The entrance lobby has three bronze lanterns of severely plain design, each containing six 60-watt Mazda units, and the main entrance hall is lighted by 18 white alabaster ceiling bowls, one in the center of each bay formed by two lines of white marble columns. Each bowl contains three 60-watt Mazdas.

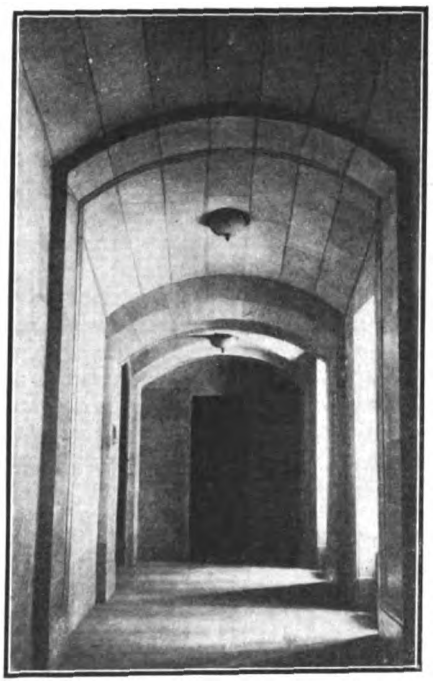
Ground-floor corridors leading from this hall are finished in handsome marbles and are lighted in each groin

Digitized by Google

by buff alabaster ceiling bowls each containing three 60-watt tungsten units. The buff bowls impart a golden glow to the corridor interiors, which is very effective.

Over the main staircase, and also in the main hall at the head of the stairs, is installed a handsome 24-light bronze chandelier weighing 600 pounds and carrying candle lamps consisting of an Edison socket with enameled-metal "candle" surmounted by a 60-watt tungsten round frosted lamp. In the memorial hall beyond is another bronze chandelier weighing about 900 pounds, equipped with 24 lamps of the same pattern. Each of the chandeliers is suspended on a heavy bronze chain.

The main reading hall is about 50 by 150 feet, and contains 22 oak study tables, each of which carries two solid bronze table lamps 30 inches high, containing three 40-watt Mazda units closely shielded in a cylindrical shade. The wires connecting the lamps are



Corridor Lighting.

Bronze Lanterns in Lobby.

carried through junction boxes beneath the table surface, connected through one-half-inch galvanized-iron conduit which runs to a junction at one end of the table, whence a section of one-half-inch brass conduit connects with a screw plate set in the floor at the base of the table support. The galvanized conduit is secured between the table frame and the under side of the top, and the lamp standard is secured by an insulated locknut and a brass nut which is manipulated through the junction box below. The librarian's desks are similarly equipped.

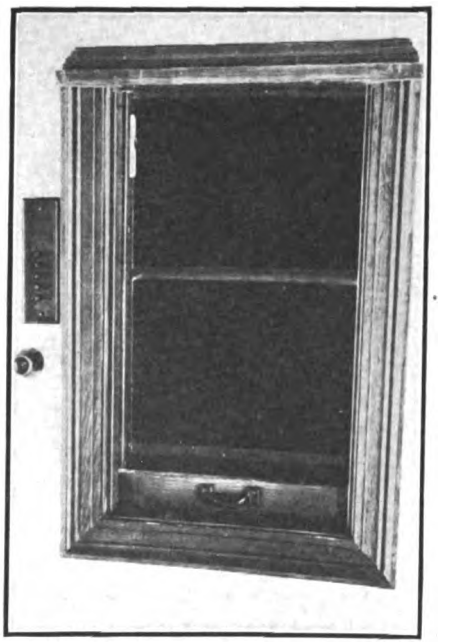
Above the cornice of the main hall are installed I. P. Frink cove reflectors with 600 40-watt clear Mazda lamps, the light being reflected upwards on the white round-arched ceiling. This installation is continuous in the cornice along the four walls of the hall.

The same system of table lighting as that employed in the main reading hall is common to the reference room and the special reading room, at either end of the main hall, and to the periodical room adjoining.

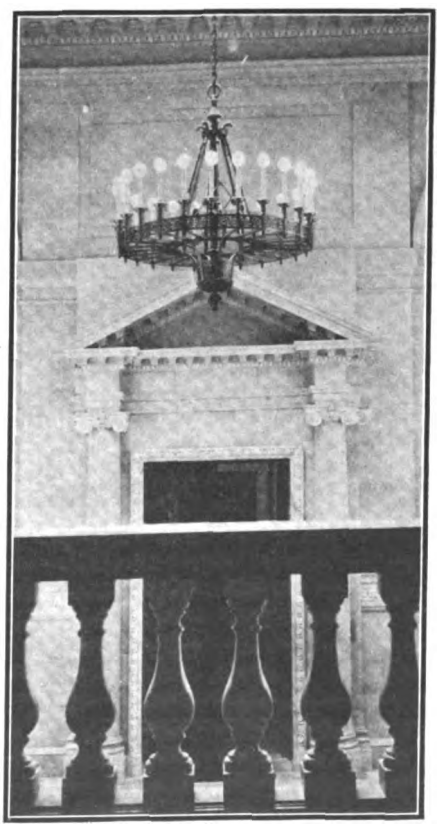
The lighting of the open bookcases which line the walls of these rooms is provided by O'Brien bronze reflectors, containing 40-watt Rayline tube lamps, set at about 45 degrees from perpendicular, about 10 inches in front of the face of the cases. The reflectors are adjustable on their supporting brackets by means of thumb screws and are set for a six-foot range of lighting over the whole surface of the several shelves of books reaching to within 10 inches of the floor. The tube lights are almost continuous, there being a space of only three inches between the units. The lamps are controlled by double push-buttons on flexible cords, the buttons being painted red and black, to denote lighted and extinguished.

In each of the special reading rooms there are five 8-light bronze chandeliers with 60-watt bowl-frosted Mazda lamps. The chandeliers are suspended by chains about 10 feet below the ceiling and 12 feet above the floor, and provide abundant general lighting for the rooms.

In the study rooms on the third floor, 100-watt and 60-watt Mazda



Book Elevator.



One of the Bronze Chandeliers.

bowl-frosted lamps in Doric shades are installed close to the ceiling, providing abundant general lighting for the whole room, which is about 10 feet high. The units are spaced on 10 and 12-foot centers. Over the corridors and lesser staircases are nine-inch opal balls containing two 60-watt units, installed at the ceiling.

The lighting of the stack rooms represents the most advanced practice. On either end of every alternate stack are two three-way switches in a single panel, controlling the lights in the aisles on either side. The units are 25-watt clear-glass Mazdas. The arrangement allows the attendant to switch on the required lights and extinguish them from either switch after the desired book has been found.

The wires for the stack-room lights are carried up the hollow metal stack

Digitized by Google

frame to the switch box, and thence in the frame to the top of the stack, where a junction box is located which is connected to conduit leading through holes drilled in the steel floor beams.

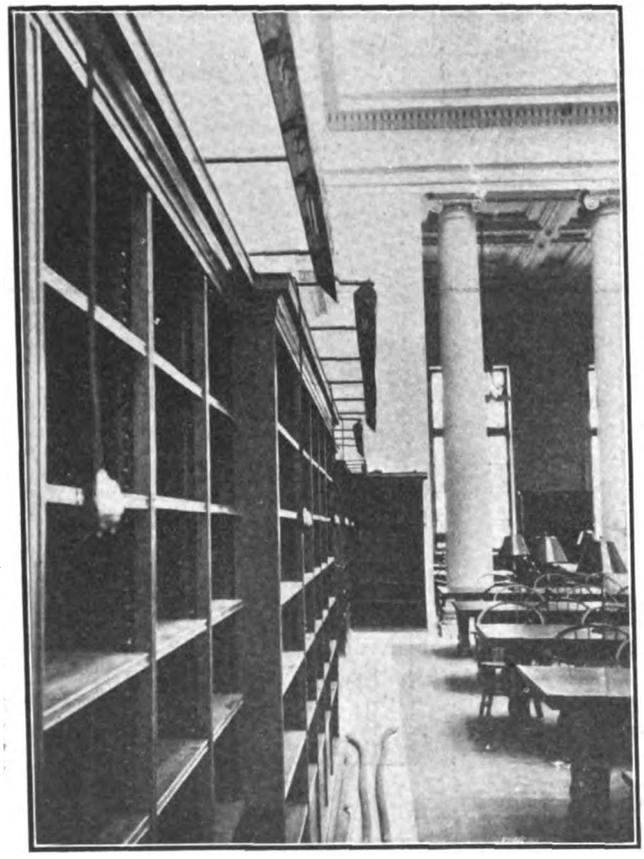
On the ground floor of the library is located the Government History Room, which is lighted by means of 15 five-light bronze chandeliers each carrying 40-watt Mazda bowl-frosted units in handsome etched alabaster shades. There are bronze table lamps of the same pattern as those in the reading rooms above. Store rooms for books, adjacent to the history room, are provided with 25-watt Mazda lamps installed in a manner similar to those in the stack room and controlled from double-switch panels at one end of each alternate stack, nearest the entrance to the room.

For the control of lights on the main floor, three lighting cabinets are installed in a closet leading off the main reading room. These consist of gray marble panels and steel-lined oak doors and frame, and contain switches and fuses for 74 circuits connecting lamps in the reading rooms and reference rooms. Cabinets of similar design control lighting circuits of the other floors.

The library contains six electrically operated passenger elevators of F. S. Payne Company manufacture. One, of 2,500 pounds capacity, is for the use of the public, with an operator in attendance. The others are automatic elevators, of 1,800 and 1,200 pounds capacity. They are designed to carry trucks containing books, as well as the attendants. In addition, two Payne book elevators, each with two shelves, are installed, for automatic operation between the several floors by selective push-button control.

Energy for the library light and power supply is from the Cambridge Electric Light Company and is furnished to a transformer vault at the north end of the building, where the ultimate equipment will be of between 100 and 150 kilowatts capacity for lighting, and about the same amount for power. Motors to be installed for the ventilating-heating and vacuum-cleaner systems, in addition to those in service on elevators, will bring the aggregate to about 250 horsepower. Energy enters from the central station's ducts at 2,300 volts, and is utilized for power at 550 volts, three-phase, 60 cycles, and for lighting on a 220/110-volt three-wire system. Throughout the library the conduit is embedded in floors, walls and ceilings, which are of reinforced concrete faced with marbles or frescoes.

Henry Lutz, of New York, was in charge of the installation for the Sterling Bronze Company. The architect was Horace Trumbauer, of Philadelphia.



Tube Lighting of Book Cases in Reading Room.

Installation in Stock Room of Widener Library.

Unusual Lighting Effects at Night Pageant.

The first use of the newly developed General Electric incandescent searchlight and floodlighting projector for the illumination of outdoor performances was in connection with the pageant at Lexington, Mass., June 21, 22, and 23. This was one of the most ambitious historical presentations ever attempted, the performers, numbering about 1,000, being in charge of Lionel Belmore, of the Vitagraph Company of America.

The grounds selected consisted of a central level field with sloping turf hill for audience seats, a hill opposite for spectacular groupings, and a grove and a pond at the right of the stage, the latter for water events. The Lexington "belfry," church and antique houses were reproduced in wood and papier mache, in natural size. The front of the "stage" was 180 feet wide.

The "curtain" was of novel construction, being a wall of steam emitted from perforations in lengths of 2-inch pipe supplied from a dismantled locomotive boiler. Just back of the curtain were the footlights, which consisted of three lines of colored incandescent lamps—blue, pink and amber dipped, installed on a 10-inch board laid upon cleated supports erected in the trench containing the steam pipes. There were four circuits comprising 800 25-watt units. The lamps were

Digitized by Google

controlled by a Cutler-Hammer dimmer, each plate handling 25 amperes.

At the back of the grandstand was erected a lighting bridge from which the pageant lighting was directed. Here were installed, on a covered platform about 10 feet above the floor of the grandstand, eight 20-inch incandescent searchlights, each containing a 750-watt, 1,500-candlepower focusing type C Mazda headlight lamp. Each of these lamps develops a beam candlepower approximating 1,000,000. The units were arranged on two shelves with four searchlights each, and were grouped at such angles that the light would be diffused as widely as possible, and operate in conjunction with ten groups of Form L-1 floodlighting projectors mounted in various parts of the field, in groups of two to 10 units each. The plan achieved was to produce a general flood-light effect on the scenes, preserving shadow values but not producing spotlight effects. This called for coördinated operation of the several groups of projectors in varying combinations as the subjects demanded.

To better produce sunlight and evening effects, a gelatine color medium was provided in front of each group of lights. These consisted of a framework about 8 by 4 feet, one-third of the surface consisting of blue, the next of blue and amber in triangular sections, and the last of amber gelatine sheets, the frame being supported in such a manner as to be drawn back and forward by hand as ordered by the lighting director, and at a speed as directed by that official from his station on the lighting bridge. The color frames for the searchlights on the bridge were raised or lowered on hinges.

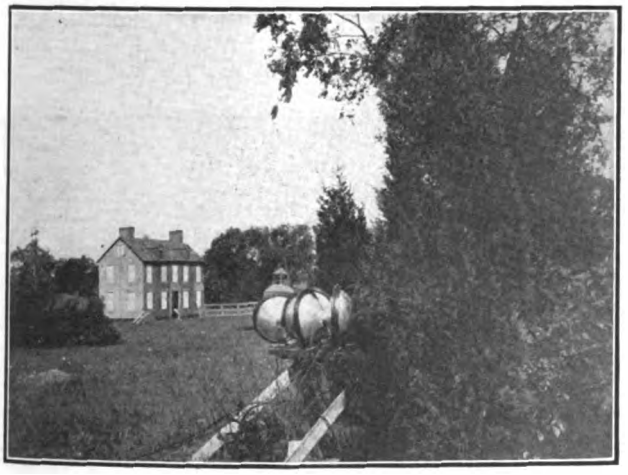
A field switch-house was located at the left end of the steam curtain. Here were installed the dimmers for both the footlights and the floodlights, the apparatus for the latter being a 100-ampere Cutler-Hammer unit. To keep the switch-house ventilated and comfortable for the operators, a 16-inch ventilating fan was installed in the open window.

The stage director's position was on the left of the field. His directions were issued to the lighting director, and by him to the floodlight operators, through a linemen's telephone set with 20 stations, furnished by courtesy of the New England Telephone & Telegraph Company. All instruments being in circuit at once, all the operators were constantly kept posted as to the next move.

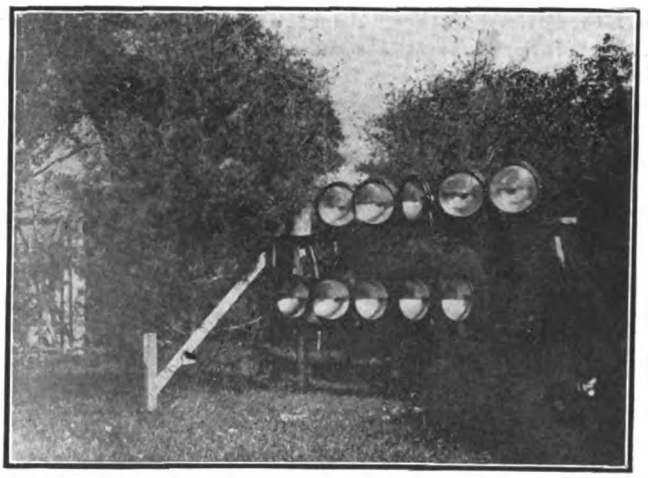
The projector groups were installed in various positions about the field. Each group was arranged on a shelf about five feet from the ground and screened by shrubbery or pine boughs set in the earth. Each of these units contained a 500-watt type C Mazda lamp developing 404,000 candlepower at the beam. By means of the focussing device, the beam can be spread from 6 to 18 degrees. For far distances the narrow spread was used, and for nearer distances the wider spread. A maximum lighting of 1,000 feet distance was effected, this being a tree at the far end of the pond referred to. The water scenes were illuminated by three projector groups, one on either side and one at the near end of the pond, the units numbering 10 in all.

Each group of performers in the dramas bore a number, and an announcer board, lighted by 25-watt Mazda lamps, erected at the back of the grandstand, called the appropriate group to the stage at the proper time.

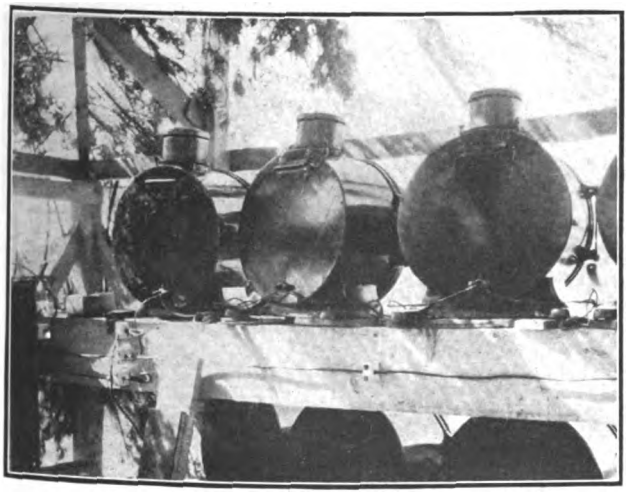
The results achieved in this noteworthy historical pageant, which commemorated the centennial of peace be-



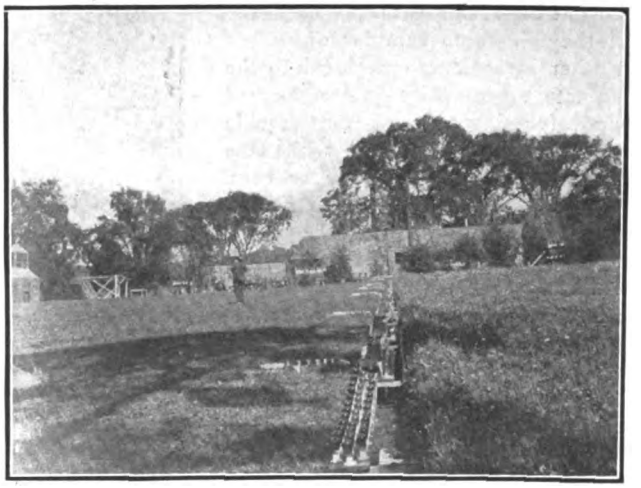
Projectors in Lexington Pageant.



Projectors Mounted Behind Screen of Shrubbery.



Searchlights Mounted in Lighting Bridge.



Footlights Back of Steam Curtain.

Digitized by Google

tween the United States and Great Britain, reflected great credit on its originators and performers, and was an achievement in electrical art. The use of the floodlight projector, already demonstrated in sign lighting and the exterior illumination of buildings, was proven to be of the highest artistic value for performances of this kind.

The lighting director was Theodore C. Browne, the electrician of the Harvard Dramatic Club and of the theater at Harvard University where dramatic productions are tried out. Associated with him were ten Harvard electrical-course seniors.

L. C. Porter, of the Edison Lamp Works of the General Electric Company, Harrison, N. J., furnished expert advice during installing the apparatus and producing the pageant. The lights were operated on 110/220-volt energy from the Boston Edison Company's lighting service.

Boston Inspectors Visit Wire Factory.

The wire inspectors of the City of Boston were invited by the proprietor of the Bay State Insulated Wire & Cable Company to visit the factory at Hyde Park, Mass., on the afternoons of June 23 and 25. They came in two sections, one on each day, and were taken out in touring cars.

In the mill-room samples of rubber and other ingredients entering into the manufacture of wire were passed around for inspection. Considerable time was spent here, and while the visitors looked over the mills, refiners, washers, and vacuum dryers, Mr. McNamee explained with much detail the particular function which each was performing at that time. Particularly clear was his description and explanation of the theory of washing and drying of rubber by the vacuum system. But the chief interest of the party centered on a batch of new-code compound that was being mixed on the mill, during which operation the proprietor pointed out the various ingredients of the mixture, and the purpose for which each was incorporated therein. Samples of the warm uncured compound were then distributed for comparison with the same in later stages of the process.

Passing on into the insulating room, the visitors observed the rubber being forced on the wire through tubing machines, admired the dexterity of the operatives, saw the pans of wire loaded in to the vulcanizers to be cured and finally watched the cured product unwound and measured from the pans on to the reels. Here very briefly was explained the theory of vulcanization, and by a comparison of the uncured sample with those which were now at hand, the wonderful effect of the action of the sulphur upon the rubber was shown. The strength and elastic qualities of the rubber elicited many favorable comments.

The wire was now followed into the braiding rooms, where amid much clatter and din one saw all sorts of wire, from the smallest cord to a cable 650,000 centimeters in size, being covered with a cotton braid. Attention was called to the high-speed braiders located in this department, and Mr. McNamee spent much time in pointing out how the theory upon which these operated differed from that of the common textile braiders. Not the least impressive exhibit on this floor consisted of the winding machines where the cotton was wound at 1,200 revolutions per minute into packages for insertion into the braiding machines. Then, too, many of the inspectors being familiar with the Bay State mark "a black thread parallel to wire under the braid," expressed a desire to see this inserted, and were amazed at the simplicity of the process.

Next were visited, in turn, the weather-proofing and finishing room, the coiling room, and the packing room, where the wire began to assume the form in which it is seen in the market. The latter department contained probably the most interesting object in the factory, a coil-wrapping machine, which took the party by storm. Everyone expressed wonder at the neatness and speed with which it wrapped up the packages of wire.

Passing into the testing room the party inspected the high-tension and resistance apparatus, and watched the same in operation. Mr. McNamee here outlined to them the requirements and the system of inspection of the Underwriters' Laboratories. They were shown the record book and told in what way the factory record of a coil could be obtained by the use of the numbered stamps. This room being one of the quietest in the factory, a good opportunity was afforded for answering questions, which the guests availed themselves of, and had all their queries answered to their entire satisfaction.

The tour of the factory terminated in the stranding department, where all sizes of cables were in process of construction. Here were in operation huge machines capable of twisting 127 strands, also one twisting together 17 strands for a complete cable; other vertical machines for making smaller cables from seven wires and so on. Here, too, could be seen the machines for making flexible strand cords, and also those for wrapping a layer of cotton around these fine strands of copper.

Group of Boston Inspectors at Wire Factory.

Now, having for upwards of two hours been regaled with so many interesting sights, and having been mentally satiated by the clear explanations of the host, the guests passed into the shipping rooms, where the physical man was cheered and ministered to. After a very pleasant half-hour spent in this manner, the men trooped out to the front steps of the factory, and had their pictures taken.

Increase in Indiana Oil Production.

The petroleum output of Indiana in 1914 showed an increase for the first time since 1904, final returns to the United States Geological Survey crediting the State with 1,335,456 barrels, representing an increase of nearly 40 per cent over the output for the year of 1913.

Digitized by Google

SOME INTERESTING AND IMPORTANT LAW ABOUT BUYING GOODS.[1]

By Elton J. Buckley.

Touching the question of buying goods, and closing contracts for them, and so on, the following letter will be of interest:

New York, N. Y.

Please tell us whether we are bound in the following case. If we are we will have to change our whole method of buying from outside parties:

Considerable of our goods are purchased from outside concerns, chiefly in Chicago, Ill., and Omaha, Neb., and the negotiations are by mail. The houses in question do not have a New York agent. About a week ago we received a letter from one of these houses, located in Chicago, offering a quantity of merchandise for late August shipment at a certain price. The market in this line has been strong for several months, and at the time we received the offer, prices were high. We decided at once to buy, and within a few hours mailed a letter accepting the offer and placing the order. About an hour after this we received a tip from a reliable source that the market would break the following day. Our informant mentioned the price to which the market would drop, which made our order, just placed, look like a very bad buy. Accordingly, we wired the Chicago house to disregard our letter of even date. The market did break the next day and the Chicago house now seeks to hold us to the order. They duly received our letter of acceptance and say they will ship the goods late August. Have they any right to do that?

Respectfully yours,

Morgan & Barnes.

They have a perfect right to hold you to the order, and you are undoubtedly bound by it. The reason is that while an offer can always be withdrawn before acceptance, it can never be withdrawn without the other party's consent, *after* acceptance. The offer in your case was under the law accepted the minute you posted your letter. The mail was regarded as the seller's messenger, not yours, and when you committed your letter of acceptance to the mail, it was as if you gave it personally to a representative of the Chicago house.

The fact that your wire doubtless reached the Chicago house before your letter did, makes no difference. The thing was done the minute you *mailed* your letter.

As a matter of fact, it would have been a binding contract even had your letter of acceptance never reached its destination, or reached it after long delay. I remember a case in which A wrote to B making an offer of some goods, and telling him to reply by letter. B did reply by letter, accepting the offer, but the letter went astray and did not get to A until two days after it should have. Meanwhile A waited until time to receive B's answer, and not hearing from him, sold the goods to another buyer. The market had advanced and B sued A for damages for failure to deliver. A of course defended on the ground that he had every right and reason to sell the goods, but the court decided otherwise, and held that a contract existed from the minute B posted his letter. I confess I have never quite seen the justice of this, especially in cases where a letter of acceptance goes astray, for it seems like holding A, in the above stated case, for instance, to something that he couldn't possibly know anything about. However, it is the well-settled law.

As soon as there is an acceptance, there is a contract, but there must without doubt have been an acceptance. As I have explained, there is no question about a flat letter of acceptance, but there may be some doubt when acceptance depends on acts rather than words. I should say that a contract can be accepted by acts.

There was a case in which a firm that wanted to buy goods wrote to a man who made the particular thing wanted as follows: "Upon an agreement to furnish such and such, you can begin shipment in two weeks from date." The seller thought the buyer would take it for granted that he would furnish the goods inquired about, so he did not reply. He merely went out at once and bought the raw material to fill the order. The next day the order was countermanded. The seller tried to hold the buyer to it, but the court said "no, you never accepted the order."

Let me explain a little more in detail the legal principle that lies behind many of these cases. When A offers goods by mail to B, he chooses the mail as his, A's, messenger, and the mail waits for B's reply. If B replies by mail, accepting, there is legal acceptance and contract when the letter is mailed. But it must be the chosen messenger who gets the answer; otherwise there is no acceptance. For instance, A offers goods to B by mail, stipulating "if you want these reply by wire only, sometime to-morrow, the 8th." If B replies by letter instead of wire, and A has sold the goods before the letter is received, B has no remedy, for he took a chance by using his own messenger instead of A's.

What is sauce for the goose is sauce for the gander—after the letter of acceptance is posted, the other party cannot withdraw either, even though he posts or wires his withdrawal before the letter of acceptance reaches him.

[1] Copyright, 1915, by Elton J. Buckley.

Strength of Radio Signals.

"Investigations of Quantitative Radio Receivers" was the subject of a graduation thesis presented by Horatio Wellington Lamson at the Massachusetts Institute of Technology.

The strength of wireless signals received from a distant station varies considerably from time to time. It is generally conceded that conditions of the upper atmosphere have much to do with these variations. A study of the relations between these phenomena should afford valuable meterological information.

There are two principal methods of measuring radio signals; one, the audibility method, which is accomplished by the use of a variable shunt resistance, the value of the shunt giving a measure of the strength of the signals; and the other, by the use of a d'Arsonval galvanometer, which gives more delicate measurements.

In practice, the sensitiveness of the detector varies and necessitates the standardizing of the measuring instrument. There are two methods of doing this; one, by using a small, highly sensitive thermal junction composed of very fine platinum wire against tellurium, placed in the aerial circuit, which was excited by a miniature buzzer transmitter. The junction can be calibrated as a thermo-ammeter and an absolute measure of the received energy obtained.

The other method consists in applying small 60-cycle potentials across the detector and measuring with the d'Arsonval the amount of rectified current produced. The calibration curve obtained shows at once that the rectified current and applied voltage are not proportional.

The author found that with a highly damped galvanometer it was possible satisfactorily to measure ordinary intermittent signals; the integrated effect of continuous steady transmission is remarkably constant and represents 45 or 50 per cent of the effect which would be produced were the energy to be received continuously instead of in the intermittent impulses of radio signals. It was found that a day of rainfall caused the signals from a station to be 1.8 times as strong on the following as on the preceding evening.

Few actual measurements of signals have yet been made, but the study revealed great possibilities in meterological and in radio fields.

Digitized by Google

Electrical Features of Boston Custom House Tower.

The Custom House Tower, in Boston, Mass., which has been formally opened, is of unique construction, it being a 30-story structure erected on the existing granite Custom House. The tower is 494 feet high above street level, with two basements, and rests on reinforced concrete foundations 100 feet deep. The main shaft, devoted to business purposes, is 65 by 70 feet. The original Custom House was completed in 1847.

The electrical features are of interest. Beginning at the top, where some large beacon lights are likely to be installed in the near future, the great clock has some unusual features, in that it is lighted from chambers back of the dials, the reflected light shining through glazed openings in the 8-inch concrete wall through Arabic numerals designating the hours, and fashioned in sheet copper. All the figures are in a vertical position.

The dials are 21 feet in diameter, the clock minute hand being about 9 feet long, and the figures are about 3 feet high. The illuminating chamber to each dial is entered from the twenty-third floor, and is 2 feet 4 inches wide, the circumference conforming to the surface of the dials. Iron ladders in the circular chamber walls, and an iron gallery across it, give access to the lamps, of which there are 70 in each chamber of 100 watts. The lamps are installed on 0.5-inch gas elbows from box connections on 0.75-inch conduit attached to the inner side of the outer wall. There are 12 circuits that supply the illuminating units and another supplying 12 and 15 100-watt lamps installed in the back of the clock hands. The interior of the chamber is painted a clear white, and the lamps are so located as not to be seen from the outside through the apertures forming the numerals.

A clock panel cabinet containing switches and fuses for 60 circuits is located on the twenty-third floor. In common with all the cabinets in the building, the frame and doors are of furniture steel painted to simulate mahogany.

The clock will be electrically operated from a master clock, from which a motor, located behind each of the four dials, will receive its impulse every minute and turn the hands forward, one minute at a time.

The hands are of wood, with metallic plating, and will be illuminated by a row of white incandescent lamps on the face of each hand (instead of back of hands, as originally planned) with a ruby light on the tip end of the hour hand and a green light on the tip of the minute hand.

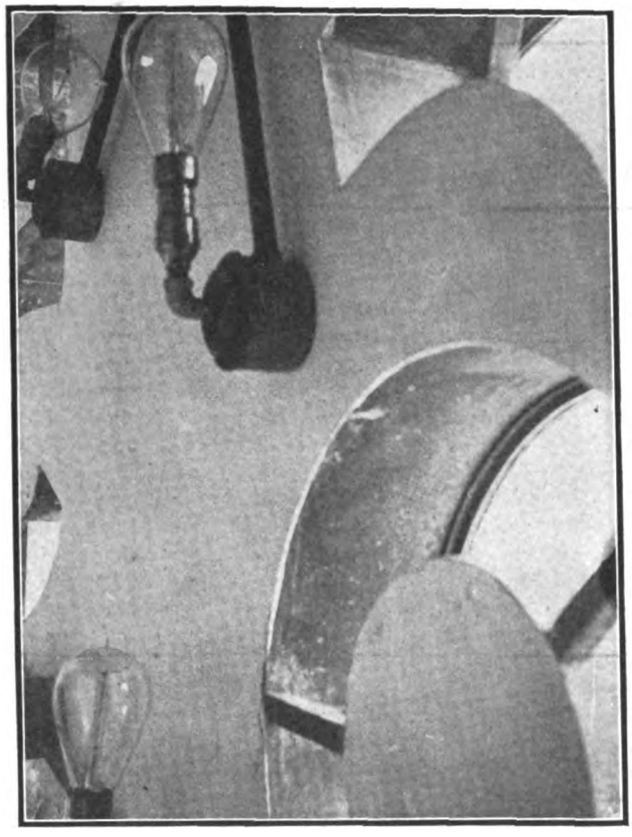
A three-inch conduit connects the top of the wire shaft at the eighteenth floor with the clock cabinet, and a half-way supporting box is provided at the twentieth floor to support the weight of the cables.

From the eighteenth floor to the sub-basement is a terra cotta tile shaft 4 by 5 feet, which accommodates the plumbing and water pipes and the electric light and power and telephone cables. The electric cables are exposed, and are provided with insulated turnbuckles at the seventeenth-floor ceiling.

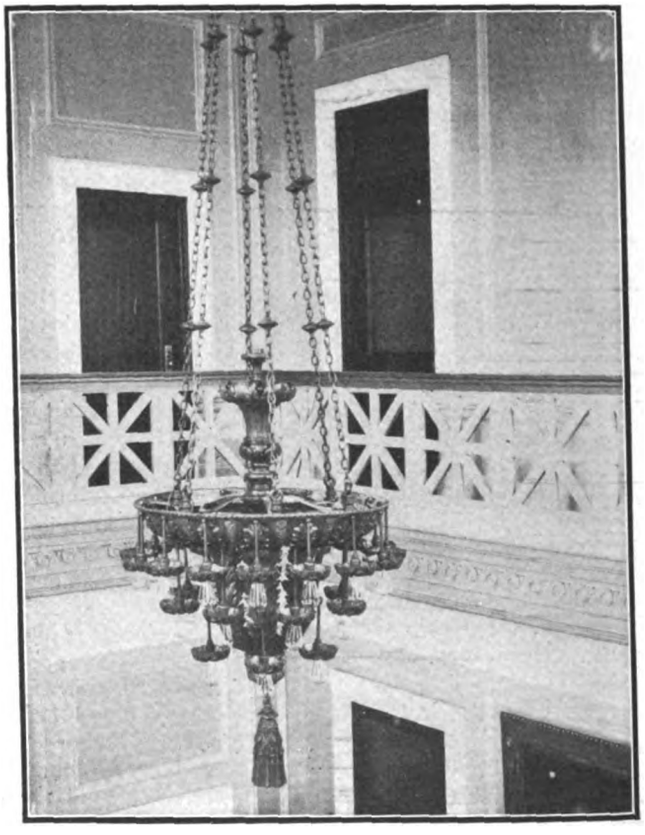
A lighting cabinet for each floor is located on the service stairway landing. Junction boxes are at the seventeenth and eighth floors, in the wire shaft, each serving the several floors below.

Four A B See elevators operate between the ground floor and the eighteenth, and one between the eighteenth and the twenty-fifth. The 25-horsepower motor and operating mechanism for the upper elevator is on the twenty-sixth floor, and here is the elevator signal-control apparatus which is operated through a motor-generator providing 10-volt energy.

The motors operating the four lower elevators are of 45 horsepower each and with the machinery are located on the nineteenth floor, which is given over to machinery. Here are located two tanks which provide water supply to the floors below. Water is pumped to the tanks by two Smith-Vaile triplex pumps in the sub-basement, each chain-driven by a 20-horsepower Triumph motor. A float switch on the tanks gives automatic control over the



Mode of Lighting Numerals on Clock Tower.



Bronze Chandelier in Collector's Office.

Digitized by Google

motors, and a push-button switch, on the control panel near the motors, is also provided.

On the twenty-eighth floor is another tank, to supply the floors below to the nineteenth. This is supplied by a Deane pump driven by a five-horsepower Sprague motor, which is controlled by a float switch in one float chamber, and in another is a mechanism which operates an annunciator in the basement, indicating high and low-water levels.

An "Invincible" vacuum system, manufactured by the Electric Renovator Company, Pittsburgh, Pa., is installed, the compressor being in the sub-basement and driven by direct connection by a General Electric variable-speed motor with a maximum speed of 3,500 revolutions per minute and rated at 15 horsepower on open continuous service.

For Lamson pneumatic service a Connersville compressor with 10 cubic feet displacement per revolution is operated by an eight-horsepower Diehl motor, its starting control being a snapswitch at each station of the tube-service.

A sump pump below the sub-basement floor is operated by a two-horsepower Triumph motor controlled by a float.

The lighting of the building is worthy of note. Under the central dome are 66 60-watt Mazda half-frosted lamps set in plaster rosettes under a cornice. These units are controlled by two sets of switches which give alternate lighting, through two solenoid switches on the third-floor lighting cabinet and operated by momentary-contact remote-control switches in the first-floor lighting cabinet.

Under the gallery above the first floor are 12 groups of four 40-watt Mazda lamps in ground-glass bowls pendent on short bronze chains which bring the lamp groups about 18 inches below the ceiling.

The lighting of the hallways is with 60-watt Mazdas without shades, installed close to the ceiling. In the offices generally, bronze chain pendent fixtures with translucent balls containing single 60 or 100-watt lamps prevail.

The auditor's room is provided with indirect lighting, which consists of two handsome bronze electroliers about 4 feet 6 inches in diameter, about 12 feet below the ceiling, containing 26 15-watt Mazda lamps, and 12 electroliers of similar pattern about 2 feet 6 inches in diameter, about 8 feet below the ceiling; and under a gallery which divides the height of the room, are 10 similar electroliers about 2 feet below the ceiling. The latter contain 12 and 15 15-watt lamps each.

Indirect Lighting Fixtures in Auditor's Room.

The collector's room is provided with a combination of direct and indirect lighting, the principal fixture being a 4.5-foot central chandelier carrying a cluster of 28 15-watt lamps in inverted position, and six 100-watt Mazdas installed on the upper side of the electrolier, giving indirect lighting. Hooded desk lamps are also provided.

The main switchboard is in the sub-basement and contains six switches on two panels, for lighting service, and twelve switches, on two panels, for power service. All switches are of the double-pole type and were supplied, together with the board, by the Taunton-New Bedford Copper Company, Boston. Circuit-breakers operated by an emergency switch in the basement corridor are installed on the incoming mains, which provide 220-volt direct current for the motors and 110/220 volts for the lighting. The energy supply is from the Edison Electric Illuminating Company of Boston.

The interior wiring was by Edwin C. Lewis, Inc., of Boston, Mass., and the fixtures were furnished by E. F. Caldwell & Company, New York.

A Scottish Hospital Installation.

At the Royal Hospital for Sick Children at Glasgow, Scotland, a very complete electrical equipment is installed. All the machines in the laundry—washing machines, hydro-extractors, ironing and finishing machines—are electrical and a large drying room is served with an electric hoist. Some of the machines have motors direct-coupled and others are belt driven. The premises are illuminated by 2000 metal-filament lamps. Thirteen electric elevators, electrically driven ventilating fans, and a thirty-station intercommunication telephone system, as well as thirty electrically operated and controlled clocks, form part of the general installation. Electro-surgical, Röntgen ray, high-frequency, and other special electrical apparatus are installed.

The supply is obtained from the Glasgow Corporation, being brought in duplicate cables to each of two main switchboards in the basement of the building, duplication being used to provide against interruption. The operating theaters are also served in duplicate with local control.

The general illumination of the wards is obtained by central pendants, the lamps being screened from the bed positions. One pendant in each ward is of inverted type for night use. Beside each bed are local brackets and portable hand lamps. The corridors, passages, and stairways have ceiling fittings of inverted cone shape on the bottom to which the lamp is fitted. These cones are treated as part of the ceiling and painted to match.

In the operating theaters light from an external source is employed for the operating tables. Arc-lamp projectors are installed in an adjoining chamber, the beam of light being projected through a glazed aperture in the wall and on to the operating table by means of adjustable mirrors. The general illumination of the operating theaters is effected by special sunk fittings with flush glazed bronze covers. These frames fit into position by their own weight, and have no fixing studs or screws, but they are watertight.

James E. Sayers and James Caldwell, Glasgow, acted as consulting engineers.

Digitized by Google

INTERESTING FACTS ABOUT THE AUTOMOBILE BUSINESS.

By G. Brewer Griffin.

As is well known, most of the automobile manufacturing companies have a production season of about eight to ten months on each series of cars, and through the past several months of general business depression their business has kept nearly normal—and at this writing is abnormal, as the supply is hardly keeping pace with the demand.

The following figures might be of interest.

Total number of cars manufactured to which electrical starting and lighting equipments are applied	261,860
Total number of all cars produced in the United States the last calendar year	611,695*
Approximate total value at dealers' prices	$380,000,000*
Approximate average dealers' value per car	$621.50*
*Including Ford cars, 350,000	$136,500,000
Total value of the electrical equipment	$ 10,354,570

There has been a great deal of talk among uninformed people as to the instability of the automobile manufacturing business and of the drain on the resources of the people that the purchase and use of an automobile represents.

Disregarding for the moment the operating expense and upkeep which the individual assumes, let us consider how many different classes of business the automobile industry, of such an enormous volume as above mentioned, helps to maintain, ignoring altogether the truck production of the country which comes outside the consideration, as the purchase and use of commercial vehicles need no brief of defense.

It means that there has been consumed on new cars alone for 1915. conservatively estimated, approximately

670,000	tons of fabricated steel.
4,020	tons of aluminum and alloy.
2,141	tons manufactured brass.
1,068	tons of curled hair.
2,050	tons of moss.
67,232	hides (one-third hide per car).
3,280,000	square yards imitation leather, (8 yards per car).
$917,542	in upholstering fittings, such as cord, tape, buttons, snaps and similar trimmings
6,560,000	yards burlap, etc.
11,405,250	yards of top materials and linings, (value approximately, $2,447,780).
7,950	tons manufactured cotton, used in the carcass of automobile tires (on new cars only).
300,000	pounds sheet celluloid.
9,338	tons rubber and compound.
2,446,780	pairs of hinges.
2,446,780	door-catch fittings.
489,356	square yards carpet for tonneau.
642,908	square yards linoleum for running boards and toe boards.
8,450,850	board feet manufactured hickory and other woods for floors, top bows, wheels, body frames, running boards, etc.

All these materials have to be and are largely fabricated by manufacturers who supply the automobile concerns, and a few moments' reflection will show the enormous army of workers employed in this field.

In the starting, lighting and ignition industry alone are employed to-day between nine and ten thousand people, and when we stop to consider the other materials that are used by them in making their part of the car—such as lead, in the storage batteries; iron oxide, rubber, aluminum and copper wire, magnalium, platinum, etc.—one will soon see how many different branches of industry are affected by the automobile business. And we have not begun to consider the millions of gallons of gasoline that are being distilled or the great quantities of lubricating oils and greases, paint and varnish, putty, etc.—all of which has given employment to producers and manufacturers, their salesmen, dealers and others. And it all helps the banks, as the money passes through their hands several times from purchaser to manufacturer.

The prices of automobiles were never so low and never was so much attempted for the money as today. The investment is not much for a comfortable, roomy car that operates well and stands up reasonably well in service.

BOOK REVIEWS.

"Shrapnel and Other War Materials." New York: McGraw Hill Book Company, Incorporated. Cloth, 92 pages (8½x11½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.50.

This is a compilation of articles which have appeared in the *American Machinist*, during the current year. The treatment of the subject is from the standpoint of the shop man, and the various articles take up not only the manufacture of shrapnel and other materials, but a description of what these articles of ammunition are and how they are used. Special machinery for manufacturing shells, cartridge cases, and various other parts is described. The book will be of interest to all of those wishing information on the mechanical sides of these manufacturing processes.

"Practical Mechanics and Allied Subjects." By Joseph L. Hale. New York: McGraw Hill Book Company, Incorporated. Cloth, 228 pages (4½x7 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This is a companion book to "Practical Applied Mathematics," which was recently reviewed in these columns. The book is intended for use in the railroad shop apprentice schools which are being conducted by the Pennsylvania Railroad and should be well suited to the needs of vocational, trade and corporation schools as well as to certain classes in the regular public schools. In the form of instruction sheets these chapters have been tried out in the school work and have been found to meet the needs of this class of students. The book is divided into 20 chapters. The simple physical conceptions are first taken up, with applications to screws, levers, and other mechanical devices, such as gearing, with which the student will come in contact in the shop. One chapter is devoted to electricity, some of the simple relations of the latter subject being explained, with a special reference to power and energy. One chapter is devoted to logarithms. The final chapter is devoted to strength of materials and will give the student a good idea of the nature of stress and strain, elastic limit, the elements of strength, etc. The book is well printed and seems well fitted to serve its purposes.

"Directions for Designing, Making and Repjairing High-Pressure Transformers." By F. E. Austin. Montpelier, Vt.: The Capital City Press. Paper, 46 pages (4½x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for 50 cents.

After some introductory matter of an explanatory nature, this booklet points out the elements of design of a transformer and gives directions for practically applying this design in the construction of an actual transformer. An elementary knowledge of electrical relations is a prerequisite to an understanding of the various steps involved, as the material is put in rather concise form. A student of the subject should, however, have no difficulty in completing an experimental transformer by following the directions given. An estimate of the cost is included.

"How to Make a Transformer for Low Pressures." By F. E. Austin. Northfield, Vt.: Northfield Publishing Company. Paper, 14 pages (4½x7 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for 25 cents.

This booklet is even more brief than the one above referred to by the same author and is confined entirely to practical directions for construction. The author states that many transformers have been successfully built by following the directions given and the performance of these transformers has been remarkably good. The book is a suitable one to put in the hands of the young man or boy who is interested in electrical experiments for the purpose of instructive amusement.

The total production of coal in Ohio in 1914 was 18,843,115 short tons, having a value at the mines of $21,250,642. In view of the fact that practically all the Ohio miners were on strike and the mines idle from April to July, the production fell off heavily—nearly 50 per cent as compared with 1913.

Digitized by Google

New Electrical and Mechanical Appliances

Replacing Insulators Upon Live Lines.

A patented set of tools has been developed by the Cronin Electrical Appliance Company, Wapakoneta, O., for handling live high-voltage wires and making replacements of insulators and cross-arms upon such lines without interruption of service. The tools which are used in this work are shown in Fig. 1. These tools are mounted upon the ends of wooden rods, which provide insulation so that it is possible for linemen to carry on the work without danger. The hook shown in the left of this figure is used for untying tie wires, while that shown in the hand of the lineman to the right is used in holding

Fig. 1.—Tools for Handling High-Voltage Wires.

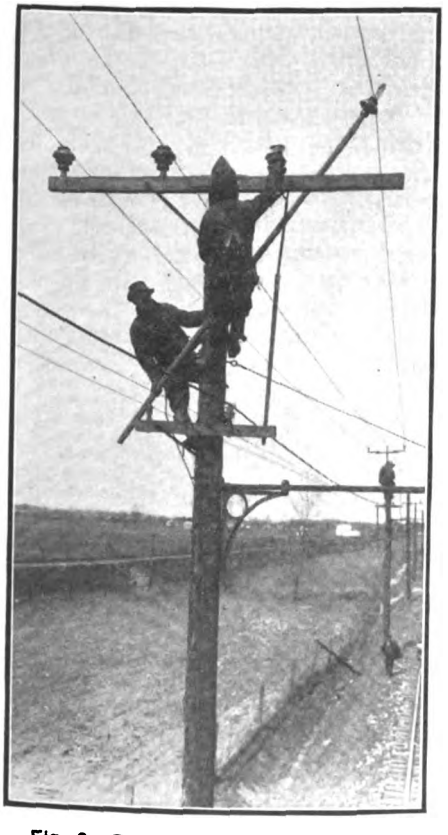


Fig. 2.—Removing Broken Insulator.

the line away from the insulator while the assistant replaces the latter. This is so constructed that it is almost impossible for the line to escape from the tool and come in contact with the lineman. This tool is shown in use in Fig. 2.

When it is necessary to replace a cross-arm all of the insulators on this cross-arm are untied from the line wires and the line wires are lifted above the regular position and out of danger of contact, as shown in Fig. 3. The cross-arm can then be removed and replaced, whereupon the line wires are lowered into position and tied to the new insulators.

These tools have been used by the Western Ohio Railroad Company for over two years with most excellent results and without any interruptions to service. Business has been obtained and retained, which could not be held unless 24-hour service was supplied. It has been found, too, that it is cheaper to make repairs in the daytime with a live line than to send out a crew of men at night for this purpose, even with the current cut off.

Electrolytic Iron.

From a recent issue of the *Revue de Metallurgie,* it appears that La Société Le Fer, of Grenoble, has attained some striking results in the production on a commercial scale of electrolytic iron. The metal is deposited on a rotating cathode, the electrolyte being a neutral solution of ferrous salts which is circulated over iron turnings in order to maintain this neutrality. At regular intervals also, additions are made to the solution of oxide of iron, which acts as a depolarizer and prevents hydrogen collecting on the cathode to a deleterious degree. The current density used is 1,000 amperes per square meter.

The deposit obtained is excellent from a chemical standpoint. The deposited metal contains 0.004 per cent of carbon, 0.007 per cent of silicon, 0.006 per cent of sulphur and 0.008 per cent of phosphorus. In its unannealed condition the iron is very hard and brittle, but on annealing for two hours at a temperature of 900 degrees Centigrade, it shows normal microstructure and is extraordinarily tough under mechanical tests.

The process is proposed for the manufacture of very thin tubing, and, in some preliminary work, tubes uniform in thickness and four meters long have

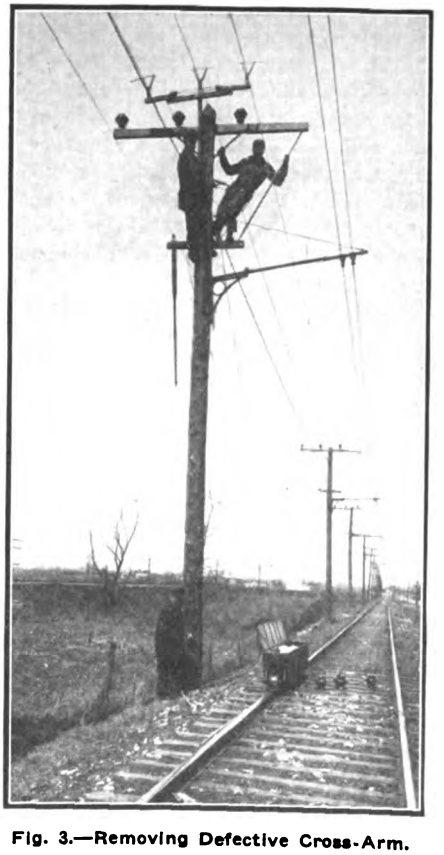


Fig. 3.—Removing Defective Cross-Arm.

been produced in gauges ranging from 0.1 to 6 millimeters. Plates have also been produced which, in view of the extraordinary toughness of the material, are excellently adapted for stampings.

The magnetic properties of the deposited metal make it exceptionally suitable for the construction of transformers and other electrical appliances.

Digitized by Google

Globe Electric Ranges.

Realizing that electricity is revolutionizing household economy and that electric cooking in particular is no longer in the experimental stage, the Globe Stove & Range Company, Kokomo, Ind., has developed and placed on the market a line of high-class electric ranges for domestic use. In the design and construction of these appliances is incorporated an experience of over 36 years in the manufacture of stoves and ranges for practically all fuels, especially wood, soft and hard coal, and gas. This extended experience, together with the policy of producing goods to meet the most exacting requirements, has been the secret of the excellent reputation possessed by the Globe products.

Fig. 1.—Compact Electric Range.

Prominent among the features kept in mind in designing the new Globe electric ranges were the following: reliability, wholesomeness, simplicity, safety, economy in operation, accessibility of all parts and general practicability. All of these are features for which there has been a growing demand in the modern home. The accompanying illustrations give an inadequate idea of the sanitary attractiveness of these ranges, which are built almost entirely of steel, highly polished and doubly nickeled on the edges and with the larger surfaces of white porcelain enamel. This high finish, together with the simplicity and sturdiness of outline, makes all parts of the range easily kept clean and bright. The ranges are mounted on easy rolling casters to permit moving away from the wall for cleaning back of and under the range. A heavy flexible cable connects the range from the back to a special wall outlet; if desired, however, the casters can be removed and the range rigidly connected through iron conduit.

Three styles or classes of these are now available ranging in price from high to medium to low. Only the high priced line is shown in the illustrations. The range shown in Fig. 1 is the most compact. It has four hot plates on top controlled by individual snap switches located directly under the edges at the sides. The oven is arranged for baking, roasting and broiling and has its upper and lower units controlled by switches directly below the oven. Here also is a main switch for the entire stove and, if desired, an automatic adjustable thermostatic switch, shown to the left of the master switch in Fig. 1, by means of which the oven temperature can be set and kept at any point. The oven door has a thermometer in the center.

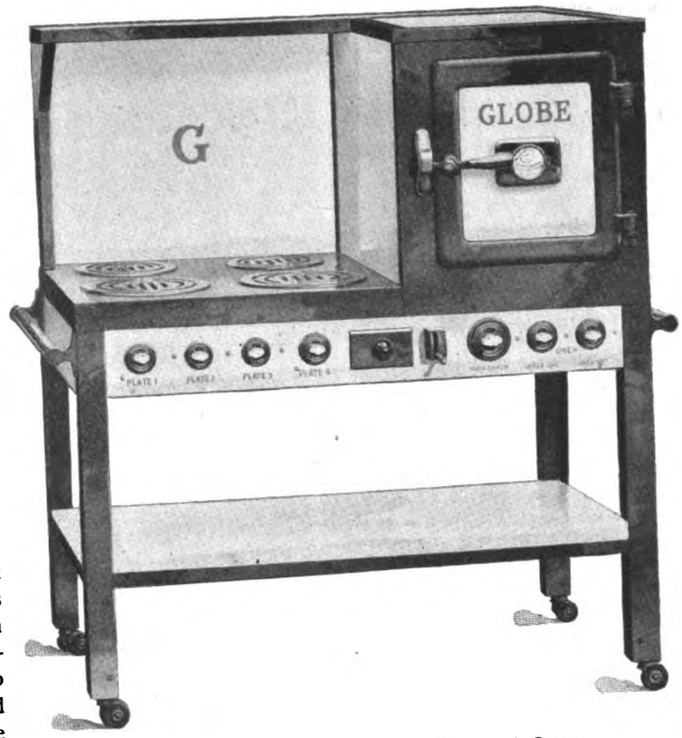


Fig. 2.—Electric Range With Elevated Oven.

Fig. 2 shows a Globe electric range in a form that has become popular with many housewives. On the apron directly below the top plates are the switches controlling these four hot plates, then there is a red pilot lamp to indicate when any of the various units is still "on," then a thermostatic oven-temperature-regulating switch, the main switch, and the switches for the upper and lower units of the oven. The oven is practically like that of the range shown in Fig. 1.

The range shown in Fig. 3 has its right-hand oven of practically the same size as those already referred to; the left-hand oven is much larger, however. The control panel is at the back on top and includes not only the individual switches for the four top plates and the upper and lower units of the two ovens, but also a main switch, a thermostatic regulator, a pilot lamp, and two receptacles at the ends for connecting portable appliances.

Fig. 3.—Globe Range With Two Ovens.

Digitized by Google

Each switch is clearly marked and the position of each corresponding plate is also stamped on the top surface to avoid confusion; this is also true in the other ranges.

An important feature of all of the heating units is that they are removable for inspection, cleaning or renewal. Fig. 3 shows how the top units can be easily lifted out for this purpose; the upper and lower oven units can be pulled out readily, as shown in the right-hand oven. Each unit is connected to its circuit by plugging terminals, so that no binding screws have to be loosened or wire connections broken. The top plate units are of the glowing type mounted in an insulating and heat-reflecting body. The smaller of these plates have one heat taking 770 watts; the larger units have three heats taking 1,100 watts maximum.

The manufacturers claim a double efficiency for their heating unit, due to its peculiar construction. The resistance wires are laid in grooved porcelain. Over this porcelain a metal plate is clamped, slotted to correspond with the grooves in the porcelain. A vessel placed on top of this unit, therefore, receives the radiated heat from the glowing wires, and in addition, the heat stored or collected in the metal top plate. It is their claim that their heating unit is a combination of the inclosed and open types of units now on the market.

All of the oven units are arranged for three heats. In the smaller ovens these units take 1,000 watts maximum on top and bottom. The large oven at left in Fig. 3 has a 1,000-watt unit on top and a 2,000-watt unit on the bottom. The bottom units are mounted in metal plates to distribute the heat uniformly. The upper units are of open-grid type with the heating element supported by porcelain bushings that are cast right into the transverse bars. These upper units are specially serviceable for broiling.

Each oven is built on the heat-storage or fireless-cooker principle, that is, the walls, top, bottom and door are several inches thick and filled with Kieselguhr, which is a mineral substance noted for its heat-insulating qualities. Around the edges of the doors are asbestos joints arranged in stepped fashion like the door of a safe. The door hinges and handle are strong, easily operated and keep the door very tight when closed. Thus no heat is wasted and the kitchen remains cool on the hottest days.

The total connected load of the largest range is 8.5 kilowatts, but it is very seldom that all units are in full operation. In the design of these ranges it was felt desirable to provide liberal current capacity in all of the units, so that cooking and baking operations could be carried on with as much dispatch as on a coal or gas range and with more thoroughness. With a little experience, however, it is found that electrical energy consumption can be kept down to a reasonable figure that makes the use of the range by no means prohibitive.

The commercial work of the electrical department of the Globe Stove & Range Company is in charge of P. L. Miles, who has opened a Chicago office in the Edison Building.

A Motion-Picture Problem Solved.

Living in the atmosphere of active competition from rival attractions, the modern motion-picture theater manager has long since realized that to draw the crowd to his house he must make it attractive. Not only must he have a well ventilated auditorium, up-to-date lighting and advertising, an attractive lobby and, of course, good pictures but he also must furnish a projecting light that will show the film to the best advantage.

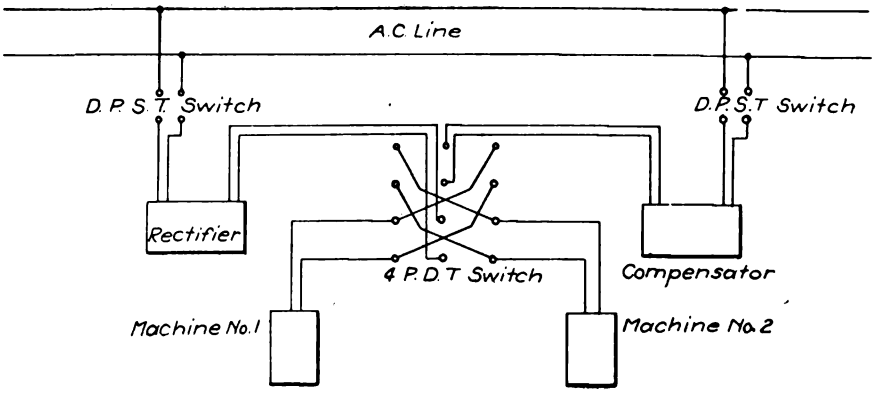
The outside attractions will bring the patron to the house, but if the pictures and their presentation do not leave a pleasant impression he is not likely to return. Where alternating current is used for projection work it is practically impossible to secure a satisfactory picture because of the unsteadiness and noise of the arc and the low intensity of the light. This has been overcome, however, by the use of a mercury rectifier or other converter for changing the supply into direct current, which gives a clear steady white light especially adapted for projection purposes. Alternating current, in addition to the noise, low intensity and flicker, is said frequently to produce eye strain that is not only objectionable but often so serious in its consequences that several states have formulated laws against its use for motion pictures.

The critical and exacting public of today has demanded that there be no appreciable interval of waiting between the end of one reel and the beginning of the next. The operators have promptly responded to this demand by furnishing two machines, keeping one "loaded" while the other is operating.

Where the size of the theater and equipment only justifies the use of a single rectifier, the problem of making one reel blend into the other would seem to be without a solution. It has, however, been happily solved by some Philadelphia operators with a very ingenious but simple arrangement.

The only equipment used in obtaining this solution consists of a four-pole double throw-switch, a Westinghouse rectifier for motion-picture work, and a compensator or economy coil, such as is generally found in a theater using alternating current. By means of this scheme, which it will be noted involves the use of practically no additional apparatus to that already available, a change can be made from one reel to another without its being detected by the patrons.

The scheme will be easily understood by referring to the accompanying diagram. The operator, we will say, is showing the first reel of a feature film on machine No. 1 fed from the rectifier, the four-pole switch being thrown to the left. About one minute before the end of the reel is reached, he throws the switch to the right, starting the arc on machine No. 2 through the rectifier, while machine No. 1 is transferred to the alternating-current circuit through the compensator, and the reel is completed in this manner. This gives the carbons on No. 2 time to burn to their proper brilliancy, ready for beginning the second reel.



Throw-Over Arrangement for Operating Two Motion-Picture Machines.

The process is repeated towards the end of the second reel on No. 2 machine. The procedure may be reversed if desired, that is, starting No. 2 machine on the alternating current and later throwing on the direct current. However, the first-mentioned method will be found more satisfactory as it takes a few seconds for the direct current to burn the carbons properly while the alternating current causes the carbons to sputter under all conditions but less when they are already heated by the direct current.

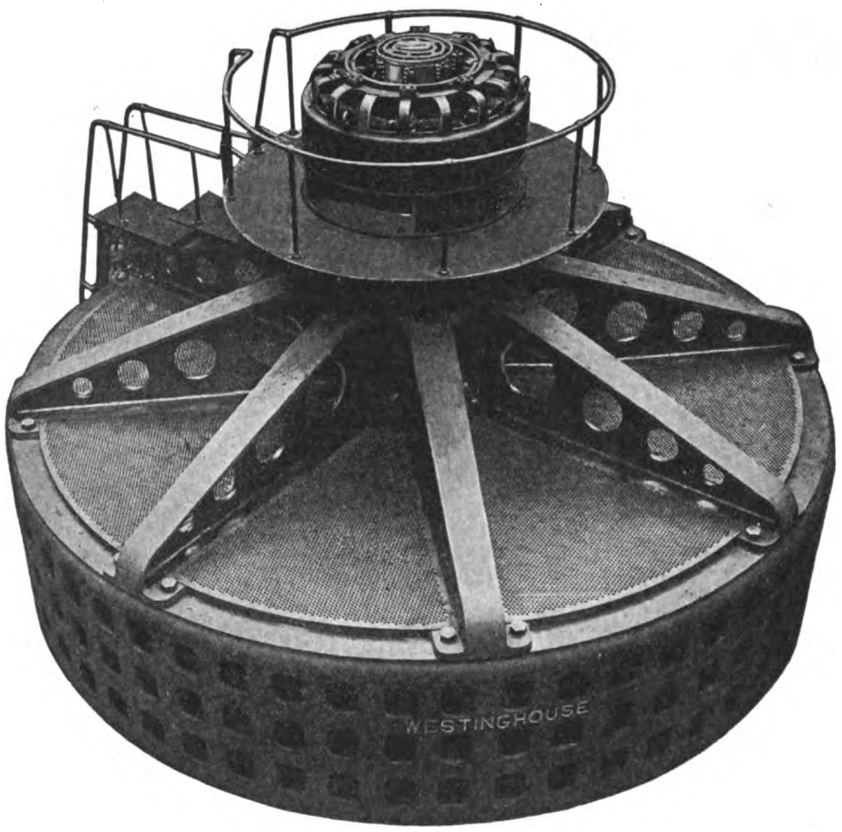
The output of petroleum in Louisiana in 1914, which amounted to 14,309,435 barrels, exceeded the output in 1913 by 1,810,607 barrels, or over 14 per cent.

Digitized by Google

Direct-Connected Exciters.

A single great reservoir of power, to be drawn upon as required, was once believed by power-plant designers to be the ultimate development of the central station. Carrying out this idea, all of the generators were to be connected to one busbar and would be excited from a central direct-current system. However, as central stations were built in increasing capacities, the necessity for subdivision on account of excessive short-circuit currents became manifest.

The present tendency is to lay out the station as a number of independent units, so that trouble on part of the system will not cause a shutdown of feeders and apparatus other than those directly affected. Especially is this trend noticeable in the case of hydroelectric plants where the power is used over a wide territory and must be delivered over long transmission lines which are particularly liable to trouble. To render each generator unit independent, many engineers, among them P. M. Lincoln, president of the American Institute of Electrical Engineers, now favor the use of individual exciters, each connected to its own generator.



Individual Exciter Mounted on Top of Large Vertical-Shaft Water-Wheel Generator.

The Westinghouse Electric & Manufacturing Company has perfected a line of exciters especially adapted for such service. The chief point urged against direct connection is that trouble in the exciter necessitates shutting down the generating unit unless leads are provided for exciting the generator from some other exciter unit. Hence reliability is the primary requirement in exciters designed for direct connection. Westinghouse designers have fully recognized this fact, and these exciters are characterized by rugged mechanical details and great overload capacity.

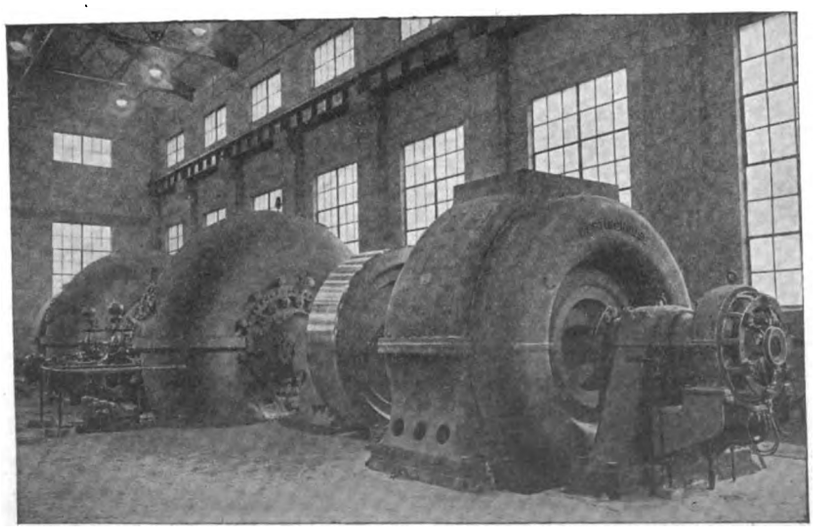
While these exciters are generally built specially for the particular generator to which they are to be attached, in the details of their design and construction they are similar to the standard Westinghouse engine and belt-driven direct-current generators.

Several methods of mounting the exciter are employed. In the case of a vertical generator the exciter is carried by the thrust-bearing bracket. With a horizontal generator, the exciter frame may be mounted on an extension of the generator bed plate, on a bracket attached to the bearing pedestal, or on a separate base.

The use of the direct-connected exciter has the following advantages. Each generator is dependent upon only its individual exciter, the number of plant auxiliaries is reduced, rheostat losses tend to be less, belts and belting troubles are eliminated, and a neat and compact appearance is secured.

The cost of the direct-connected exciter varies somewhat with the type of main generator with which it is to be used. This is due to the varying amount of excitation required by the alternator, which depends materially on its operating speed. A slow-speed unit will require more excitation than a higher-speed machine of otherwise similar characteristics, and the slower the exciter runs, the more expensive it will be. For this reason, direct-connected exciters for engine-driven sets or slow-speed water wheels make a more expensive layout than where the higher-speed water wheels, belted, or turbo-driven generator is employed.

In addition to the advantages of greater freedom from trouble, etc., it is frequently true that an outfit of direct-connected exciters will be cheaper than any other arrangement. This is particularly the case in hydroelectric plants where other arrangements, affording equal independence, entail a much greater first cost.



Direct-Connected Exciter Mounted at End of Horizontal Shaft in Hydroelectric Plant.

Bituminous-Coal Production in Pennsylvania.

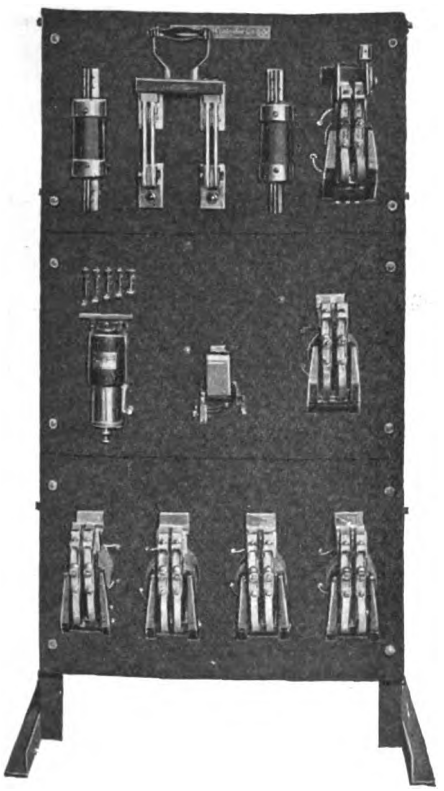
Pennsylvania produced 147,983,294 tons of bituminous coal in 1914, according to figures made public by the United States Geological Survey, the value of the ouput being $159,006,296.

Digitized by Google

New Automatic Motor Starter.

The Industrial Controller Company, Milwaukee, Wis., has recently put on the market a new automatic controller which has been termed the type G. M. In this automatic starter the various steps of resistance are cut out by separate magnetic switches, these switches being controlled by a master solenoid which closes the control circuit of the various switches in their proper sequence. As the magnetic switches close quickly and positively, the arcing on the contacts is reduced to a minimum.

The motor circuit is opened and closed by the first magnetic switch, which is fitted with a powerful blowout. All switches have removable contact tips on the stationary and movable contacts and copper brushes are used to carry the current. The design of the switches is such that the magnet coil and all wearing parts can



Automatic Motor Starter.

be removed from the front of the panel.

The master switch is similar to the Industrial Controller type E automatic starter and consists of a completely inclosed solenoid, below which is mounted an air dashpot of the vacuum type which governs the time of acceleration. Above the solenoid are a number of resiliently mounted contacts, which are successively engaged by a contact bar as the solenoid is drawn upward. Each of these contact fingers controls a magnetic switch, which in turn controls one step of resistance. The time of acceleration can be varied over a wide range by adjusting the air-inlet valve at the bottom of the dashpot.

This type of control system is extremely simple, and eliminates all interlock switches in connection with the magnetic switches governing the starting resistance.

New Appleton Unilet Fittings.

Since the line of Unilet boxes and fittings was brought out a few years ago by the Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill., there have been frequent additions which have greatly extended the adaptability of these fittings to special situations and made them usable with many devices made by other manufacturers.

The accompanying illustrations show some further recent additions to the Unilet line. Fig. 1 shows a new cord rosette especially designed for use with one-half-inch rectangular Unilets. In Fig. 2 is shown a new attachment-plug receptacle for the same size and type of Unilets; this receptacle takes the standard Hubbell caps. A new one-piece receptacle for use with octagonal Unilets 2.75 inches in diameter is shown

Fig. 1.—Rosette.

Fig. 2.—Receptacle.

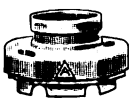


Fig. 3.—Receptacle.

Fig. 4.—Cover for Switchbox.

Fig. 5.—Adapter for Ceiling Box.

in Fig. 3. The new cover illustrated in Fig. 4 is designed for switch Unilets in which the new Hubbell duplex receptacle is installed.

A new ceiling-box adapter is shown in Fig. 5. This is very useful in places where an ordinary ceiling box without ears has been installed and it is desired to use a cover over the box. The adapter can be readily applied and holds the cover securely by means of two screws.

Although California oil has to a large extent displaced the use of coal as a fuel in the Pacific Coast States, two California mines reported an output of coal in 1914.

Wireless Station for Carnegie Institute.

At a cost of $1,500 the Carnegie Institute of Technology, Pittsburgh, Pa., is installing in the tower of Machinery Hall a radio plant which it is said will be the most powerful in that part of the country. The plant will have a wide range of places with which it may communicate, the western boundary being Honolulu and the eastern Germany. Communication will also be established with other technical schools in the country which have radio equipment.

The station is being installed for the use of the student radio club, an organization of electrical students. The equipment of the new station consists of a 10-kilowatt motor-generator set of the latest type, and an audion detector.

Neuco Electric Cooking Appliances.

A line of electric cooking appliances has been put on the market by the National Electric Utilities Corporation, 357

Fig. 1.—Household Range No. 901.

West Thirty-sixth Street, New York City. This equipment has been built especially to stand continuous hard usage. The bodies are of heavy cold-rolled steel, double-walled throughout and heavily insulated for heat. The outer casings are black-enameled by a process which makes the steel rust-proof and polishing is unnecessary. The inside linings are of baked aluminum finish. They are clean, white and sanitary. Nickeled trimmings are used for the exterior finish.

Fig. 1 shows the electric household range. This is equipped with four cast-iron hot plates upon the cooking top, which is 31 inches from the floor. Each

Digitized by Google

plate is 8.75 by 10.25 inches in size, and each is controlled by a separate three-heat switch. There are also separate switches for the oven, which is below the hot plates, and for the elevated broiling oven, which is seen at the top. Extension shelves are provided at each side. The maximum consumption of this unit is 500 watts for each hot plate, 1,320 watts for the large baking oven, and 2,200 watts for the broiling oven. The floor space occupied is 35 by 26.5 inches and the total height is 64 inches.

Another type of electric household range is shown in Fig. 2. This type has no broiler, but is equipped with six hot plates. It is 33.25 inches high. The large oven consumes 1,457 watts. When desired this unit can be equipped with an additional broiler heat unit in the top of the oven.

Another type of household range is like that shown in Fig. 2, with the addition of an upper oven smaller than that shown and also a broiler. The small oven consumes 825 watts. This range is especially designed for the requirements of large families.

Fig. 3 shows an individual bake oven mounted on a skeleton stand. This is supplied either with or without lower shelf.

Fig. 4 illustrates the double electric hotel broiler, which is designed for restaurants, hotels and public institutions where double service requires a separate fish broiler. The company also makes other types of ovens, plate warmers, electric steam tables and ranges.

Fig. 3.—Electric Bake Oven.

Both hot plates and broilers are equipped with a radiant type of heat unit. They fit in flush with the top or cooking surface, and the element is entirely inclosed, thus protecting them from short-circuit in case liquids are spilled upon them. The heat unit is designed on scientific principles, is of simple construction and sufficiently strong so as not to warp or break down under intense heat. Special reflectors are used to concentrate the heat at the point where it is needed. These reflectors are made of white porcelain.

The heating unit consists of a heavy iron frame with a number of transverse iron supports or cross bars so arranged as to allow for contraction or expansion. The cross bars have seats for holding insulators in the shape of a pulley through which the coiled resistance wire is strung. There is little opportunity for a short-circuit. If for any reason the heating unit should become damaged it can be easily replaced or repaired.

Fig. 2.—Household Range No. 888.

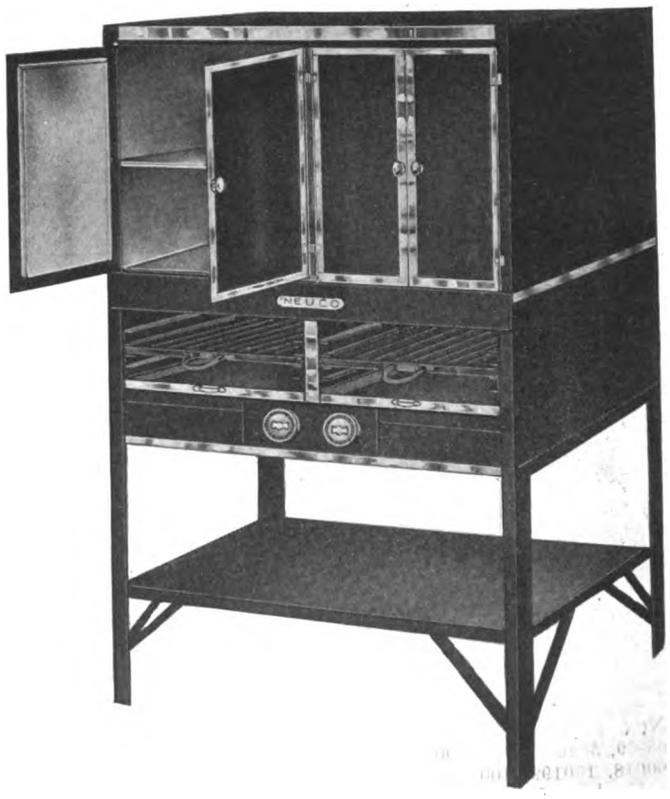


Fig. 4.—Double Hotel Broiler.

Roebling's New Factory Nearing Completion.

Several months ago the lower works of the John A. Roebling's Sons Company, Trenton, N. J., were destroyed by fire. These works had been used in the manufacture of insulated wire and cable. Reconstruction was begun at once, and new fireproof buildings of the most modern type will be completed in a few months. These buildings are of reinforced concrete and brick, are specially designed and comprise the last word in wire-manufacturing structures. They will furnish when completed about ten acres of floor space. While the fire was a very disastrous one, the Roebling's by good planning and operating night and day, that part of these works that were not destroyed, have been able to take care of their large business.

The United States is the greatest paper-producing country in the world by a very wide margin. In 1909 the total value of the products of the American paper mills was nearly $270,000,000 and, if the rate of increase recorded for a half-dozen years previous to 1909 has held good since, the present annual production is well over $300,000,000. That total is nearly three times the value of the product of the next great producing country —Germany.

Digitized by Google

Latest Approved Fittings

CONDUIT OUTLET BUSHINGS.—The Sterling Foundry and Machine Company, 55 Hartford Street, Newark, N. J.

"Sterling" armored cable connector for use with standard outlet boxes with knockouts for one-half-inch conduit and consisting of a cast-iron sleeve with a thread and locknut for attaching to the box. and a clamping screw for securing the cable.

Listed July 6, 1915.

FITTINGS FOR CONDUIT BOXES, Covers.—Steel City Electric Company, 1207 Columbus Avenue, Pittsburgh, Pa.

Stamped steel conduit boxes with single metal-bushed hole for pendent of reinforced flexible cord.

Catalog Nos. AD, AF, BD, BF, CD, CF.

Listed May 24, 1915.

OUTLET BUSHINGS.—The Adapti Manufacturing Company, 919 West Street, Cleveland, O.

Connector bushings of malleable iron or pressed steel, for connecting armored cable or flexible conduit at outlets.

Listed June 8, 1915.

RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. Flush type.

Junior, 6 amperes, 250 volts, 12 amperes, 125 volts, catalog No. 509.

Listed July 13, 1915.

RECEPTACLES, Standard. — The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E, metal-shell receptacles.

Keyless, 660 watts, 600 volts, for use on metal ceilings, catalog Nos. 78 and 85.

Also connection block for two-way metal bases for metal molding, catalog No. 405.

Listed August 5, 1915.

RECEPTACLES, Standard.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

Paiste brass-shell receptacles.

Key, 250 watts, 250 volts, catalog Nos. 5437-46-55-64-73-82-91, 5545-51-57-63-69, 5626-35-44, 5800, 5845, 9184, 50753, 60018, 100199, 100205.

Keyless, 660 watts, 250 volts, catalog Nos. 5438-47-56-65-74-83-92, 5546-52-58-64-70, 5627-36-45, 5801, 5846, 9185, 50717-18-55, 60019-20, 100200, 100206.

Pull, 250 watts, 250 volts, catalog Nos. 5439-48-57-66-75-84-93, 5575-78-81-84-87, 5632-41-50, 5802, 5847.

Also all of the above types with shadeholders attached.

Listed July 5, 1915.

SOCKETS, Standard. Insulating Links For.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Detachable insulating link for socket and receptacle chains, catalog No. 513.

When used on pull-chain sockets or receptacles in manner intended, this insulating link is judged to afford a person operating socket added protection against shock from circuits of voltages of not over 600 volts.

Listed July 23, 1915.

SWITCHES, Pendant Snap.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts, catalog Nos. 6601, 6602, 6603, 6701, 6702, 6703.

Listed July 13, 1915.

SWITCHES, Surface Snap.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E. (With porcelain covers.)

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6260 and 6261.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 6280 and 6282.

Double-pole, 10 amperes, 250 volts, catalog Nos. 6284 and 6286.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 6288 and 6289.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6290 and 6291.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6292 and 6294.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6296 and 6298.

Also above types with lock attachment.

Listed July 12, 1915.

SWITCHES, Surface Snap.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E. (With metal covers.)

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6100-6103 inclusive, 6108-09, 6200-6203 inclusive, 6212-13, 6246-47, 6350 and 6351.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 6204-6207 inclusive.

Single-pole, 10 amperes, 250 volts, 20 amperes, 125 volts, catalog Nos. 6115-18 inclusive.

Double-pole, 5 amperes, 250 volts, catalog Nos. 6208-6211 inclusive, 6352 and 6353.

Double-pole, 10 amperes, 250 volts, catalog Nos. 6215-19 inclusive.

Double-pole, 20 amperes, 250 volts, catalog Nos. 6120-23 inclusive.

Three-way, 1 ampere, 250 volts, 3 amperes, 125 volts, catalog Nos. 6223, 6224, 6227-28.

Three-way, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6225, 6226, 6354.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 6229, 6230.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6231 and 6232.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6233-6236 inclusive.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 6237-6240 inclusive.

Also above types with lock attachments.

Listed July 13, 1915.

SWITCHES, Surface Snap.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. (With metal covers.)

Double-pole, 5 amperes, 250 volts, catalog Nos. 2617-18.

Three-point, 3 amperes, 125 volts, 1 ampere, 250 volts, catalog No. 2615.

Also above types with lock attachment.

Listed July 16, 1915.

WATER STERILIZER. — Electric Water Sterilizer Company, Scottdale, Pa.

This equipment comprises an electrode box containing metal plates, in connection with a direct-current circuit, between and around which the water passes; a coagulation chamber; two filter tanks and a water-controlled switch.

Catalog Nos. 0 to 4 inclusive.

Listed July 7, 1915.

WIRES, Miscellaneous.—General Electric Company, Schenectady, N. Y.

Varnished-cambric slow-burning wire, consisting of a No. 12 B. & S. gauge conductor covered with varnished cambric and having an outer braid painted with fire-resisting compound.

Standard for use only on low-potential instrument and pilot-light circuits on switchboards.

Listed July 8, 1915.

WIRES, Rubber-Covered.—Hardman Tire & Rubber Company, Belleville, N. J.

Marking: Three yellow threads woven parallel in braid.

Rubber-cobered wires shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed July 15, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

PORTLAND, ME.—The Southwestern Ice and Power Company has been incorporated, to do a lighting, heat, ice and power business. John H. Pierce is president.

RANGLEY, ME. — The Oquossoc Light and Power Company has been incorporated with a capital stock of $50,000. The incorporators are F. B. Colby, F. S. McKenzie, J. A. Russell, R. H. Ellis.

RUTLAND, VT. — Arrangements have been made for the consolidation of the Hortonia Power Company, Rutland, and the Gaysville Electric Light and Power Company, of Bethel. It is understood that extensive reconstruction and new developments will be under way in the near future.

SHELBURNE FALLS, MASS.—The Power Construction Company, affiliated with the New England Power Company, has bought the plant and water power of the National Metal Edge Box Company at Readsboro, Vt., with a view to the further hydroelectric development of the Deerfield River. There are now five water generating stations on the Deerfield, which are operated by the New England Power Company. W.

BATAVIA, N. Y.—The City Council has decided to make arrangements for enlarging the electric light and power plant. Address Councilman Clough, chairman.

NEWARK, N. J.—The Board of Freeholders is arranging for an appropriation of $10,000 for additional electric lighting equipment at the county penitentiary. A.

BURLINGTON, N. J.—The Common Council has approved plans for the installation of an electrically-operated pumping plant for the water system, replacing the present steam-driven station. W. E. Temple, Philadelphia, is electrical engineer for the work A.

WINCHESTER, VA.—Julian F. Ward, mayor of Winchester, has requested the Common Council to investigate the matter of the city owning and operating its own electric lighting plant.

RALEIGH, N. C.—The city of Raleigh will install a white way system on eleven blocks in the business district, using seventy or eighty one-light standards. Address city electrician.

NORTH CENTRAL STATES.

BATAVIA, O.—The local municipal lighting plant will be abandoned, under a contract entered into by the village with the Cincinnati, Georgetown and Portsmouth Traction Company, which will sell current at wholesale to the village at three cents per kilowatt-hour, the rate charged to users being eight cents. The company will do some work in connection with the change. L.

HAMILTON, O.—New cluster street lights will be installed on the west side of town during the repair work on Main Street, in order to enable the installation of the conduits without tearing up the street. Contracts have not yet been let. L.

NORTHFIELD, O.—A municipal electric lighting plant will be built here. An election will be held September 20 to vote on the question of issuing $12,000 for the purpose of buying the necessary material.

URBANA, O.—The Federal Light and Power Company, of Boston, owners of the Urbana light plant are planning to spend $130,000 on their plant. Of this amount $18,000 will be spent in equipping the local station. Address W. P. Hurd.

HUNTINGTON, IND.—The light committee of the Commercial Association has made arrangements for the sale of $4,000 in city bonds and the city will advertise for bids on ornamental posts. The board will ask for bids on separate prices of the posts and for bids on the whole job.

SHOALS, IND.—It has been decided to erect a combined water and lighting plant, and contracts have been ordered prepared by the Town Council.

KANKAKEE, ILL.—Members of the board of supervisors are investigating the matter of installing an electric light plant to supply light to the court house and jail. Supervisors Parker, Taylor and Hennessy are members of the committee having the matter in charge.

OWOSSO, MICH.—The Owosso Improvement Association is behind a proposition to install a boulevard system of electric lighting.

SOUTH HAVEN, MICH.—Plans are being considered for the extension of the ornamental lighting system, now installed in the business district, to Monroe Park, on the north side of the city. The present posts in that section are iron, but estimates on concrete posts are being secured for the new system. Address mayor.

RICHMOND, WIS.—The village has voted to install an ornamental lighting system. Address mayor.

STURGEON BAY, WIS.—The sum of $6,000 in bonds was voted for electric lights, and for building a municipal plant. Address Board of Local Improvements.

HALLOCK, MINN.—An electric light system will be installed here. Address city clerk.

ARLINGTON, IOWA.—A franchise has been granted to C. Miller & Sons, of Clermont, for the construction and operation of an electric lighting plant.

CLARION, IOWA.—The Farmers' Mutual Light and Power Company, of Wright County has been organized with a capital stock of $10,000 by W. E. McGowan, president, John McCutcheon, Fritz Clausen and others, for the purpose of manufacturing power and light for the homes of the stockholders in Wright and Humboldt Counties.

IOWA FALLS, IOWA.—The Iowa Falls Heat, Light and Power Company has been sold to Dean Harland Smith and others.

MARATHON, IOWA.—An election will be held here sometime in September to vote on the question of bonding the town for $12,000 for the erection of a municipal lighting plant. Address city clerk.

GALLATIN, MO.—A meeting will be called by the business men of the city to decide the matter of a light and water plant. Address A. C. Stiles, consulting engineer, Kansas City, Mo.

JOPLIN, MO.—Proposed immediate extension of the power line of the Empire District Electric Company into the mining fields of southeastern Kansas will open opportunities for use of current by the industries and communities on the line. The extension will reach Baxter Springs, Kans., and southward. M.

MAGNET, NEB.—P. J. Sandberg is planning to purchase supplies and material for an electric and water plant.

ELDORADO, KANS.—Permission to construct an electric transmission line on the highways of Sedgwick county was granted the Kansas Gas and Electric Company by the county commissioners. The Eldorado Power plant was purchased recently by the Kansas Gas and Electric Company and it plans to furnish power and light for Eldorado through the line to be built across the two counties.

HUTCHINSON, KANS.—Plans are already under way for the erection of addition to electric light plant, another electric unit, combined generator and turbine for the already large plant of the United Water, Gas and Electric Company in this city. Address Manager J. F. Springfield.

NETAWAKA, KANS.—About $10,000 will be expended for municipal lighting. Address city clerk.

SOUTH CENTRAL STATES.

LANCASTER, KY.—A municipal electric lighting plant to cost $15,000 is contemplated by the city. The Mayor is directing the project.

JACKSONVILLE, ALA.—The Alabama Power Company has closed franchises and contracts for the lighting of Jacksonville, including the state normal school.

KUSA, OKLA.—Kusa Light and Power Company, has been granted a state

Digitized by Google

charter, with a capital stock of $10,000, with these incorporators: George E. Nicholson, Kansas City; Frank C. Nicholson, Iola, Kas., and John F. Goshorn, Henryetta, Okla. Kusa is a newly laid out townsite, a prospective industrial center.

MUSKOGEE, OKLA.—W. J. Cook and Homer Needles, of Muskogee, have submitted to the city a proposition for erecting a dam and power plant in the Illinois River at a point 28 miles east of Muskogee where it is claimed 5,000 horsepower can be generated at a cost of $250,000.

STRANG, OKLA.—The Grand River Power and Electric Company, of which H. C. Holderman, Strang, Okla., is president, has submitted a proposition to New York financiers to build and equip a hydroelectric plant with a dam across the Grand River at a point between Strang and Adair, Okla., 75 miles from Muskogee, to furnish cities in the State with power. It is estimated that 20,000 horsepower can be generated by a $1,000,000 plant. The cost of transmission to consuming points would be in addition to the primary cost of dam and plant.

WIRT, OKLA.—W. E. Gupton has about completed arrangements for installing an electric lighting plant in this city.

DEVINE, TEX.—The Devine Light, Power and Ice Company, which was recently organized here with a capital stock of $35,000, will build an electric light and power plant. J. W. Fullerton is interested. D.

SPUR, TEX.—The Citizens' Gin and Power Company will build an electric light plant here. C. D. Copeland is interested. D.

WESTERN STATES.

GREAT FALLS, MONT.—According to reports the City Council recently adopted a resolution creating a lighting district, which comprises Third and Fourth Avenues North, wherein an up-to-date lighting system will be placed at an early date. O.

HYSHAM, MONT.—The Town Council recently retained the Billings Engineering and Contracting Company, of Billings, Mont., as consulting engineers for the laying out and construction of a complete lighting system. According to the reports, plans will be prepared at once, and the work of installation rushed to an early completion. O.

LIBBY, MONT.—It is reported that Kirby & Reynolds, of Sheridan, Mont., owners of the Libby Electric Light and Water Company, will make extensive improvements to the local establishment and distribution system at an early date. O.

POLSON, MONT. — A municipal electric light plant will be installed in this city. Address the city clerk.

ROUNDUP, MONT.—According to officials of the Roundup Coal Mining Company, here, which owns and operates the local light and power plant, a new 200-kilowatt, 2300-volt lighting generator, and two additional boilers, to supply steam for the generator, will immediately be installed in the local plant. It is also reported that the City Council will install a new lighting system, and that the Roundup Coal Mining Company will supply current for the new system. O.

ALBION, IDAHO.—On August 23, this city will vote on the proposition of issuing bonds in the sum of $8,000, for the purpose of constructing a municipal power plant and electric lighting system. Andrew Lounsbury is chairman of the village board.

ST. ANTHONY, IDAHO.—It was erroneously reported in the issue of July 31, that the city was considering the construction of a municipal lighting plant. The facts in the case are that the council at a meeting in June instructed the city attorney to confer with the Utah Power and Light Company, which operates the St. Anthony water works system in connection with the lighting and power business, regarding the possible acquisition by the municipality of the water works system. There has been no talk of construction of a municipal lighting plant, nor has a committee been appointed to confer with the company regarding the purchase of the lighting plant. No extensions will be made to the lighting plant, nor additions to the distributing system made by the municipality.

HOLBROOK, ARIZ.—T. M. Quebedeaux and K. H. Meyers have been granted a light and power franchise.

PHOENIX, ARIZ.—Plans and estimates for a new electrical district, north and east of this city, prepared by Engineer Elliott, have been approved by the county board of supervisors, and action will be taken to call a bond election. The proposed system calls for 75 miles of line.

GLENDALE, CAL.—The board of trustees has adopted a resolution ordering the installation of appliances for electric lighting on Brand Avenue, from First Street to the northerly boundary line of Glendale.

REDWOOD CITY, CAL.—The city trustees have under consideration a proposed system of electroliers for the principal streets of the city.

RIVERSIDE, CAL.—In compliance with a petition received from the residents of Coachella, the board of supervisors has called an election for September 4, to vote on the formation of a lighting district.

WILLIAMS, CAL.—The citizens of Arbuckle at a recent election voted to organize a lighting district.

CANYON CITY, ORE.—The Prairie City Light and Power Company, of Prairie City, according to R. C. Reece, will extend its power transmission lines into the John Doe Valley, to furnish current for dredging operations, which are in progress there. The new business obtained by the company necessitate the construction of an 800 horsepower plant, which will furnish light and power in the valley.

COLFAX, WASH.—September 2 has been set by Whitman County Commissioners as a date for hearing on the application of the Steptoe Light and Power Company for a franchise to construct, maintain and operate transmission lines for electric lighting and power purposes in the town of Steptoe. The application for the franchise was filed by E. N. Woodin, of Colfax, and covers a period of fifty years. O.

OLYMPIA, WASH.—The Council, it is reported, has about decided to grant an electric lighting franchise to Wilbur B. Foshay, of Portland, Ore., giving him a contract for supplying current for street lighting, and to operate pumps of the water department. The franchise under consideration also proposes to give the right to sell electric current in the down-town districts, and in the residence districts, where the proposed pole lines, carrying the power from the generating plant to the substation, will extend. The franchise provides that the city of Olympia can take over the properties after a stipulated period, which will give the investors a chance to realize on their investment. The only restriction is that the city must be supplied with current first. This field is now covered by the Olympia Light and Power Company. O.

SEATTLE, WASH. — The City Council, H. W. Carroll, clerk, has been asked by the secretary of the Building Owners and Managers' Association, to provide in the 1916 budget for placing wires, carrying electrical current, owned, operated and maintained by Seattle municipal lighting plant, underground. The competing corporation, the Puget Sound Traction, Light and Power Company, has complied with this ordinance, and the city of Seattle, no doubt, will also follow this example.

TACOMA, WASH. — A resolution calling for the installation on South E Street, from Fourth Street to Twenty-seventh Street, of an ornamental lighting system, specifying four iron standards at street intersections of the streets, to be included in the Lighting District, has been adopted by the City Council. O.

NEW INCORPORATIONS.

SYRACUSE, N. Y.—The Mohawk Electrical Supply Company increases its capital from $25,000 to $50,000. All new capital has been subscribed for and paid in.

PHOENIX, ARIZ.—The Grand Canyon Power and Development Company has been incorporated with a capital stock of $150,000, by James R. Girard and Pamelia B. Girard.

KUSA, OKLA.—The Kusa Water and Light Company has been incorporated with a capital stock of $10,000, by George E. Nicholson, John S. Goshorn and Frank C. Nicholson.

ANNISTON, ALA.—The Jacksonville Light and Power Company has been organized by Thomas W. Martin, of Birmingham, W. R. Lloyd and Wiley Alford. The company is capitalized at $10,000.

CLEVELAND, O.—The Balzer Electric Company has been incorporated with a capital of $30,000. The incorporators are J. Balzer, Harvey A. Balzer, David Eleiss, Charles D. Curr and Mayme Dewitt.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed here for the Jensen-Pridham Electric Company of California, with a capital stock of $1,500,000, by P. L. Jensen, E. S. Pridham, W. A. Breen and Thomas Martin.

EVANSVILLE, IND.—The Electric Testing and Engineering Company has been established to deal in electrical appliances and supplies. The company is capitalized at $10,000. Incor-

Digitized by Google

porators: R. R. Winklepleck and C. W. Wolfe, of Evansville; C. W. Schlemmer, of Cannelton, and G. H. Hauser, of Indianapolis.

FINANCIAL NOTES.

The reorganization plan of the Kansas City Railway and Light Company and its subsidiaries, the Metropolitan Street Railway and the Kansas City Electric Light Company, has been completed. A meeting, at which all of the parties interested in the reorganization were represented, was held in Chicago, and the new plan is now awaiting approval by the Federal Court at Kansas City. An allowance of $28,700,000 for indebtedness is provided for in the plan, to be borne by two new companies, one taking over the street railway lines and the other the lighting properties. About $5,000,000 of this indebtedness will be taken care of by the lighting properties, and an issue of approximately $8,000,000 5.5 per cent three-year notes, an open first five-per-cent mortgage under which $10,000,000 bonds shall be issued, and $5,700,000 bonds under a second mortgage, will be made by the railway company. The plan also provides for a board of readjustment managers, composed of Kuhn, Loeb & Company, Blair & Company, Lee, Higginson & Company. H. L. Stewart and N. W. Halsey & Company.

Dividends.

	Term.	Rate.	Payable.
American Rys.	Q	1 %	Sept. 10
American Pr. & Lt. com.	Q	1 %	Sept. 1
Blackstone Val. Gas & Elec. com.	Q	$2	Sept. 1
Cent. Ark. Ry. & Lt. Corp. pf.	Q	1.75%	Sept. 1
Con. Gas, Elec. Lt. & Pr., Balt.	Q	1.75%	Oct. 1
Con. Gas, Elec. Lt. & Pr., Balt. pf.	S	3 %	Oct. 1
Middle West Utilities pf.	Q	1.5 %	Sept. 1
North. Tex. Elec. com.	Q	$1	Sept. 1
North. Tex. Elec. pf.	Q	$3	Sept. 1
Phila. Elec.	—	1.75%	Sept. 15

Reports of Earnings.

INTERNATIONAL TRACTION.

International Traction Company reports earnings for the 12 months ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$6,748,779	$6,820,349
Net after taxes	2,813,051	2,669,537
Balance after charges	969,230	892,341
Preferred dividends	200,000	200,000
Renewed reserve	320,441	271,771
Surplus	448,789	420,570

HAVANA ELECTRIC RAILWAY, LIGHT & POWER.

Six months ended June 30:

	1915	1914
Gross earnings	$2,751,375	$2,675,456
Net	1,019,644	791,152

KEYSTONE TELEPHONE.

	1915	1914
July gross	$114,204	$111,467
Net	55,564	54,938
Surplus	28,624	28,707
Seven months' gross	784,825	767,715
Net	394,778	387,871
Surplus	209,174	206,056

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

No. 17,819. TELEPHONE SYSTEM.—An American consular officer in the Far East has transmitted a report, together with blue prints, specifications, etc., relative to an opportunity for the installation and supply of equipments for a telephone system. A copy of the report may be had on application, and the blue prints, etc., may be examined.

No. 17,821. ELECTRIC FANS.—An American consular officer in India reports that an electrical engineer in his district desires to be placed in communication with an American manufacturer of electrical goods used in hotels and office buildings, particularly electric fans. The man is about to furnish the electrical equipment for a large hotel, and also desires to submit bids for other buildings. Catalogs and full information should be sent at once. The man is willing to pay cash against documents in foreign country. Correspondence may be in English.

No. 17,863. ELECTRICAL SUPPLIES.—A represenative of a Norwegian firm, who is at present in New York City, states that he desires to establish commercial relations with American manufacturers and exporters of pocket flashlights, electric push buttons, etc. Cash will be paid against shipping documents in New York.

No. 17,877.—ELECTRICAL SUPPLIES.—An American consular officer in Siberia reports that a firm in his district desires to communicate with American manufacturers of electric lamps, chandeliers, and electrical appliances of all kinds. Catalogs, with prices, should be forwarded at once. Shipping weights, freight rates, etc., should be indicated. Correspondence should be in Russian or German.

No. 17,898. ELECTRIC MOTORS.—A merchant in Spain informs an American consular officer that he desires to receive catalogs and full information relative to stationary electric motors for pumping water. The merchant states that he has been accustomed to credit terms of 30, 60, or 90 days. Correspondence, etc., should be in Spanish.

NO. 17,964. ELECTRICAL AND OPTICAL GOODS.—A merchant in the Netherlands informs an American consular office that he desires to purchase electrical and optical goods, electric pocket lamps, etc. A credit term of three months, or 30 days with two per cent discount, is desired.

NO. 17,936. ELECTRIC MOTORS.—A business man in France writes an American consular officer that he desires to represent American manufacturers of electric motors of from 2 to 15 horsepower capacity for agricultural purposes.

PROPOSALS.

ELECTRICAL EQUIPMENT.—Sealed proposals will be received at the office of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until August 31, 1915, for furnishing miscellaneous globes; miscellaneous prismatic reflectors, as per Schedule 8671; miscellaneous W. T. attachment plugs; miscellaneous tips for W. T. attachment plugs, as per Schedule 8670; miscellaneous weatherproof sockets, as per Schedule 8669; miscellaneous cotton insulating tape; miscellaneous rubber insulating tape, as per Schedule 8672, all for delivery at Navy Yards, east and west.

PERSONAL MENTION.

MR. SAMUEL W. M'ELROY, Pompton Lakes, N. J., has recently been appointed city electrician by the local council. A.

MR. J. L. WHITE, manager of the Oregon Power Company at Albany, Ore., has been elected vice-president of the Albany Merchants Association.

MR. E. Y. STIMPSON, 650 Beacon Street, Boston, Mass., has been given the New England agency for the Detroit Electric, the Anderson Electric Car Company, of Detroit, having given up its salesrooms at 903 Beacon Street.

MR. W. S. JAMES, formerly with the Woolley-James Electric Company, Buffalo, N. Y., has severed his connection with the company and will hereafter be connected with the sales department of the Rochester Electric Supply Company, Rochester, N. Y.

MR. RUSSELL N. EDWARDS, a graduate of Purdue University, with a wide experience in mechanical and electrical engineering, has joined the organization of the Russell M. Seeds Company, of Indianapolis, Ind., a large and successful advertising agency handling a number of technical accounts.

MR. C. C. CHILDERS, president of the Childers and Waters Electric Company, and president also of the Louisville Builders' Exchange, is at the head of a committee of that organization which is preparing for the annual outing. This will be held on Labor Day, September 6, at Hike's Point, a locally popular resort.

MR. THOMAS F. KELLY, commercial manager of the Dayton Power and Light Company, Dayton, O., has been appointed by President E. W. Lloyd and the directors of the National Electric Light Association, State Chairman of the Membership Committee for Ohio, and a member of the Company Sections Committee of the Association for the ensuing year.

MR. FRED M. LEGE, JR., who has been general manager of the Brush Electric Company and the Galveston Gas Company, has resigned his position with the former company but will remain in charge of the gas company, which was recently purchased by Electric Bond and Share interests. Mr. Lege also will have a prominent place in the operating organization of the Electric Bond and Share Texas properties. M. R. Phipps has been appointed general manager of Brush Electric.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 16	Aug. 9
American Tel. & Tel. (New York)	122¾	122⅛
Commonwealth Edison (Chicago)	135	133½
Edison Electric Illuminating (Boston)	233	231
Electric Storage Battery common (Philadelphia)	62½	65¾
Electric Storage Battery preferred (Philadelphia)	62½	65¾
General Electric (New York)	171	171
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	4½	4⅞
Massachusetts Electric preferred (Boston)	33¼	34
National Carbon common (Chicago)	145	147
National Carbon preferred (Chicago)	119¾	119½
New England Telephone (Boston)	132	131
Philadelphia Electric (Philadelphia)	24¼	23⅞
Postal Telegraph and Cables common (New York)	76½	76½
Postal Telegraph and Cables preferred (New York)	66¾	66
Western Union (New York)	71	70⅝
Westinghouse common (New York)	112⅝	112¼
Westinghouse preferred (New York)	137½	131

Digitized by Google

MR. THOMAS B. SMITH, of Philadelphia, has been appointed to the Pennsylvania Public Service Commission by Governor Brumbaugh, taking the place of Congressman Keiss, who did not accept the appointment offered by the governor. Mr. Smith was born in Philadelphia in 1869, and was postmaster there during the administration of President Taft. He served in the Philadelphia Common Council and was elected for two terms in the legislature.

MR. D. C. TRACEY has been appointed supervisor of electric welding of the Baltimore & Ohio Railroad, with jurisdiction over this work at all shops of the system. It is believed that Mr. Tracey is one of the youngest men ever appointed to an official position on an American railroad. He is in his early twenties, has spent practically all of his working life with the Baltimore & Ohio, was educated in the night schools of that system, and developed himself through presistent application to his duties in the several apprentice courses and shops of the railroad organization. The appointment reflects credit upon the man and the system.

MR. ARTHUR M. TORREY, for the past four years in charge of the soliciting department of Hildreth and Company, recently resigned that position to take charge of the engineering contract department of W. S. Barstow and Company, 50 Pine Street, New York. This concern is engaged in engineering and construction work in various parts of the country and also controls the General Gas and the Eastern Power and Light corporations, operating some forty public utilities in the eastern and middle western states.

PROF. WILLIAM S. FRANKLIN has resigned as professor of physics at Lehigh University, where he has been for 18 years, first as professor of physics and electrical engineering and latterly as professor of physics, the two chairs having been separated in 1903. From 1892 to 1897 Dr. Franklin held a similar position at Iowa State College. He is a fellow of the American Institute of Electrical Engineers and the author of a number of textbooks which have attracted considerable attention on account of their original treatment of physics and mathematics and the attempt to give these subjects a human interest.

MR. HERBERT A. DALLAS has been appointed clerk of the State Board of Examiners of Electricians of Massachusetts for a three-year term at a salary of $2,000 per annum. Mr. Dallas has for the past nine years been assistant electrical engineer and inspector on electrical construction for the Schoolhouse Department of the City of Boston. He was in charge of laying out all electrical construction in new school buildings and had the care of the installations in existing buildings. He was born in Boston in 1878, was educated in the public schools and at the Evening High School and the Franklin Institute. He worked for the Public Buildings Department as a maintenance man prior to taking the position with the School Department. His home is in the Roxbury district.

PROF. ALEXANDER GRAY, of McGill University, Montreal, has been appointed professor of electrical engineering in Sibley College, Cornell University. Professor Gray will also be the head of the electrical department, filling the vacancy made by the resignation of Prof. H. H. Norris, who resigned from the position to engage in editorial work. Professor Gray will take up his new duties at Cornell in September. Prof. Alexander Gray was born in Edinburgh, Scotland, of a well known family of engineers. When fifteen years of age he commenced to serve his apprenticeship and worked for seven years at the lathe, bench and drafting board. During this time he attended evening classes and, later, the engineering classes of Edinburgh University, from which he graduated in civil and mechanical engineering in 1903. At this time he was awarded a Whitworth scholarship which enabled him to spend two years at McGill University, Montreal, where he studied electrical engineering. After graduation from McGill University, Professor Gray joined the engineering staff of the Bullock Electric Company, of Norwood, Ohio, and later the staff of the Allis-Chalmers Company, of Milwaukee, Wis., with which companies he remained for five years. During this time he gained wide experience in the

Prof. Alexander Gray.

design, construction and operation of all types of electrical machinery. In 1910 he accepted an appointment as assistant professor at McGill University, which position he has held for the last five years. Professor Gray has been granted a considerable number of patents for electrical apparatus. He has also contributed largely to the literature of his subject, his two recent books, namely, "Electrical Machine Design," and "Principles and Practice of Electrical Engineering," have been widely adopted as university texts and are favorably known to the profession.

MR. RAY PALMER, formerly commissioner of gas and electricity of the City of Chicago, announces that he has resumed his consulting engineering practice and is prepared to advise about or undertake general supervision of organization, valuation, rates, lighting and other public utility or industrial problems requiring expert engineering and accounting service. Mr. Palmer's offices are located in the Hartford Building, Suite 714, Chicago, Ill. Mr. Palmer, during his term as commissioner for the City of Chicago, rendered a highly satisfactory service to the municipality. He carried forward a great many improvements and placed the electrical department in a splendid position as regards efficiency and economy of operation. The last report of the Department of Gas and Electricity is a classic for its completeness and for the valuable data regarding the operation of a municipal lighting department. Mr. Palmer is a careful student of civic affairs, equipped with a fine education and a wealth of experience. His very pleasant personality attracted many friends to him, and he is without doubt one of the most popular and satisfactory officials the city has ever engaged. Just prior to his departure from his work as commissioner, Mr. Palmer was tendered a banquet and presented with many tokens of esteem by his associates in the department.

OBITUARY.

PROF. THOMAS BLISS STILLMAN, a well known chemical engineer, died of heart disease after a brief illness at his home in Jersey City, N. J., on August 10, aged 64. He was a writer of considerable note and for years a professor at Stevens Institute of Technology.

DATES AHEAD.

International Association of Municipal Electricians. Annual meeting. Gibson Hotel, Cincinnati, O., August 24-27. Secretary, C. R. George, Houston, Tex.

American Institute of Chemical Engineers. Seventh semi-annual meeting, San Francisco, Cal., August 25-28. Secretary, J. C. Olsen, Cooper Union, New York, N. Y.

Indiana Electric Light Association, Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive Secretary, E. J. Duprey, Fox-

Digitized by Google

croft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention. San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electric Railway Association. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-20. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Electric Machinery Company, Minneapolis, Minn., is again working its force full time and reports the business outlook for the fall encouraging.

The P. & B. Manufacturing Company, Milwaukee, Wis., has increased its capital stock from $5,000 to $25,000, and has moved its factory to larger quarters at 189 Fifth Street.

Robbins & Myers Company, Springfield, O., has issued a folder entitled "The Unusual Performance of an Unusual Motor." This refers to the type K induction motor, which is put out in sizes ranging from 0.25 to 20 horsepower inclusive.

The Delta-Star Electric Company, Chicago, Ill., is distributing descriptive leaflet No. 750, showing typical installations of high-tension air-break switches of various commercial voltages up to 66,000. Copies of this circular will be sent upon request to those interested.

The Mutual Electric and Machine Company announces that it has moved its main office and factory from Wheeling, W. Va., and that hereafter all mail should be addressed to West Fort Street and Fourth Avenue, Detroit, Mich. The new telephone number is Cadillac 2512.

Carbo Steel Post Company, Rand McNally Building, Chicago, Ill., has issued a booklet describing its steel poles and their advantages as compared with wood and concrete poles. The flexible type of pole is given special attention and cost data are given to prove its economy. Ornamental street-lighting posts are also included.

Fargo Manufacturing Company, Incorporated, Poughkeepsie, N. Y., has issued a revised edition of Bulletin No. 402 describing superior wiring devices manufactured by this company. These include various types of connectors, cable lugs and grounding devices. Copies will be sent to those interested upon request.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is distributing a well illustrated 16-page booklet issued by the Mergenthaler Linotype Company, of New York, devoted to the construction, application and operation of the Cutler-Hammer electrically-heated linotype pot. Copies of this booklet will be furnished to those interested upon request.

The Smith-Brown Battery Works, of Bloomington, Ind., has been purchased by Carl Fisher and F. R. Allison, of the Indianapolis Prest-O-Lite Company, who will remove the plant to Indianapolis. Prof. O. W. Brown, of the chemical department, of Indiana University, Bloomington, and inventor of the Brown system of batteries, has been engaged at a salary to go to Indianapolis and head the company.

Stow Manufacturing Company, Binghamton, N. Y., has issued a circular calling attention to some of the portable tools made by that company, which are driven by electric motors connected by flexible shaft to the cutting tool. These include various types of drills and grinders, a hand buffer, motor-driven screw drivers, etc. There is also a general utility tool for miscellaneous use.

The Hartford Machine Screw Company, Hartford, Conn., announces that the extensive additions to its mammoth plant at Hartford are rapidly nearing completion. In addition to housing the new general offices of the company, the designs for furnishing of which contemplate the most modern and approved equipment and efficient devices, the new building will afford space for extensive additions to the manufacturing facilities of the plant.

Bodine Electric Company, 2254 West Ohio Street, Chicago, Ill., has issued Bulletin No. 520, describing its interchangeable motors for both alternating and direct current. Both types in sizes from 0.1 to 0.25 horsepower have the same outside dimensions and speed ratings. The alternating-current motors are of the squirrel-cage type. They are self-starting under full load and are provided with a centrifugal switch which disconnects the starting winding after the rotor has reached rated speed. The direct-current motors have armatures of the slotted drum type and two field poles. The armatures are wound with double-silk-covered magnet wire. The bulletin gives full data.

Sangamo Electric Company, Springfield, Ill., has issued Bulletins Nos. 41 and 42. The former describes meters for electric railway service and points out the advantages of equipping railway cars with these Economy meters. Examples of operating results with their use are given. The second bulletin deals with the switchboard type of meter and gives illustrated descriptions of both watt-hour and ampere-hour instruments. The constructional advantages of these meters are pointed out and diagrams given for proper connection with transformers and shunts.

The Globe Stove & Range Company, Kokomo, Ind., has published a handsome catalog designated as No. 37, illustrating and describing electric ranges, ovens, hot plates, cooking devices and their accessories. The general descriptive matter gives in elaborate detail, with many illustrations, complete information with regard to mechanical and electrical characteristics of the heating elements. The balance of the catalog is replete with large-sized, well executed reproductions of the apparatus, together with descriptive matter and prices. Copies of this catalog will be furnished to those interested upon request.

The Boustead Electric and Manufacturing Company, Minneapolis, Minn., of which James T. Boustead is president, recently rented the store and basement adjoining its premises in order to take care of its increasing business. In addition to its other electrical business the company handles second-hand electrical machinery and has just purchased 53 motors and generators, ranging from one to fifty kilowatts, from the Pillsbury-Washburn Flour Mills Company, which is changing its equipment from direct to alternating current. The Boustead Company will mail a list of its second-hand machinery to those interested upon request.

The Electric Supply Company, Memphis, Tenn., has ready for distribution catalog No. 5. This is devoted to a comprehnsive illustrated list, with prices complete, of electrical supplies. This company has a well established reputation for handling only superior lines. It is the territorial agent for the Phillips Insulated Wire Company, General Electric Company, National Carbon Company, National India Rubber Company, American Electric Telephone Company, Fort Wayne Electric Works, Indiana Steel

Digitized by Google

and Wire Company, the Faries Manufacturing Company, DeVeau Telephone Manufacturing Company and American Ever Ready Company. The company's new building, one of the best equipped and most modern electrical supply establishments in the south, is located in the heart of the business district of Memphis. The entire resources of the organization are devoted to serving its chosen territory to best advantage. It does no contracting or retail business, and confines itself to the wholesale distribution of specialties of an electrical nature.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has printed a series of attractive four-color poster stamps, which feature the C-H push-button, 660-watt, brass-shell and porcelain sockets, and the porcelain pendant switch. A circular on the C-H push-button, 660-watt socket (pendant type) is being distributed to the electrical trade. This circular points out that the new section added to Rule 31 of the National Electrical Code requires sockets with three-eighths inch cap when not attached to a fixture and that they must be provided with an approved insulating bushing. The fact that three-eighths inch sockets are listed six cents higher than the C-H pendant-type socket is mentioned as another argument for the use of this socket for pendant work. The other features, such as the approved easily wired cord-strain relief and the high capacity of 660 watts are also mentioned. The new Cutler-Hammer phase-failure and phase-reversal protective device developed by Cutler-Hammer engineers is described in an 8.5-by-11-inch circular. Attention is directed to the ever present chance of burning out polyphase motors because of blowing of one fuse, and to the liability of serious accidents due to polyphase motors starting up in the wrong direction of rotation because of reversal of the phases. The protection provided by the new device is outlined, the construction is explained and the features of smallness and compactness are pointed out as being of considerable importance.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued leaflet No. 3566 describing its line of oil-immersed water-cooled transformers. When desired these transformers are supplied with a base fitted with wheels to facilitate handling. The cooling coils are arranged along the sides of the tank and are suspended from the cover and can be removed with it from the tank when necessary. Both shell-type and core-type transformers are built for water cooling in any capacity above 200 kilowatts. They are constructed for either single-phase or three-phase circuits at any commercial voltage and frequency. The Westinghouse Company announces the receipt of the following orders: The Western States Gas & Electric Company, Placerville, Cal., one 1,875-kilowatt, 2,300-volt, three-phase, 60-cycle water-wheel generator for an extension to present plant; Union Light, Heat & Power Company, Fargo, N. D., two 1,875-kilovolt-ampere, 2,300-volt turbo-generator units; Consolidated Gas, Electric Light & Power Company, Baltimore, Md., one 6,825-kilovolt-ampere 375-revolutions per minute synchronous frequency-changer set; Citizens' Light, Heat & Power Company, Johnstown, Pa., one 6,250-kilovolt-ampere, 4,000-volt, 60-cycle turbine unit with necessary auxiliary equipment.

Record of Electrical Patents

Issued by the United States Patent Office, August 10, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,149,171. Insulating Varnish. C. Baeder, Hoboken, N. J. Compound of resinous base, linseed oil, rubber, sulfur and oxygen compound of manganese, having low conductivity when dry.

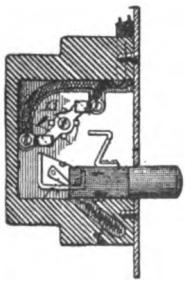
1,149,172. Electric Flat-Iron. H. P. Ball, assignor to General Electric Co., Schenectady, N. Y. Flat, reflexed heating unit cast in body portion.

1,149,173. Resistance Element. H. P. Ball, assignor to General Electric Co. Schenectady, N. Y. Insulated resistance enclosed in heat conductive sheath.

1,149,188. Incandescent Lamp. F. Dickenshied, assignor to General Electric Co. Metallic filament flattened at point of support to increase radiation.

1,149,199. Tampering-Preventing Device for Fire-Alarm Boxes. J. Karely, Chicago, Ill. Special structure to prevent unauthorized operation.

1,149,203. Electric Furnace. J. G. Marshall, assignor to Union Carbide Co., New



No. 1,149,362.—Wall Switch.

York, N. Y. Carbide furnace has a hearth and a spout of chilled carbide.

1,149,206. Elevator-Driving Mechanism. B. F. Mechling, Jr., assignor to Albro-Flem Elevator Co., Philadelphia, Pa. Mounting and gearing of motor.

1,149,207. Automatic Switch-Controlling Means. W. S. Menden, assignor to Megosin Co., Inc., Brooklyn, N. Y. Structural details of a rotary circuit make-and-break device making and breaking circuit a number of times in a revolution.

1,149,208. Glass Structure. O. A. Mygat, assignor to Holophane Glass Co., New York, N. Y. Configuration of glass inclosure for light.

1,149,210. Electrolytic Cell. H. R. Nelson, Elizabeth, N. J. U-shaped, permeable cathode in a container to which steam is introduced and liquid cathode product is collected in chamber insulated from cathode.

1,149,211. Method of Electrolysis. H. R. Nelson. For electrolyzing solutions of salts of alkali and alkali earth metals.

1,149,229. Telephone System. R. I. Utter, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of link circuit.

1,149,233. Process of Recovering High-Grade Phosphoric Acid. F. S. Washburn, Nashville, Tenn. Fume for further treatment is produced by submitting phosphate rock and silica to action of electric furnace.

1,149,237. Reflector. C. W. White, North Bennington, Vt. Guard at edge of reflector out of path of reflected light.

1,149,238. Electric-Furnace Regulator. R. H. White, assignor to Norton Co., Worcester, Mass. Has motor-moved electrode, the circuit of the motor being automatically controlled according to the position of the electrode.

1,149,245. Vehicle Signal Apparatus. B. L. Bobroff, Milwaukee, Wis. Automobile direction indicator; each signal arm carries electric lamp connected in circuit when arm is operated.

1,149,254. Apparatus for Producing Ozone and Separating Gases. H. Dumars, Glen Ridge, N. J. Air below liquefying temperature of ozone is flowed through electrical effluence device and liquid ozone and nitrogen gas separately collected.

1,149,256. Bottle-Filling Device. J. H. Godfrey, Chicago, Ill. Electromagnet opens valve controlling supply when bottle placed in position and permits valve to close when bottle is full.

1,149,275. Electromagnet. J. F. McElroy; S. H. McElroy, Execx., assignor to Consolidated Car-Heating Co., Albany, N. Y. Particular structure and arrangement of frame and plunger.

1,149,282. Insulator-Supporting Fixture. C. L. Beirce, Jr., Pittsburgh, Pa. Bracket for pole attachment.

1,149,312. Switch Movement. B. C. Webster, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. Rotary, snap switch.

1,149,315. Electric Switch. C. J. Zigler and W. P. Holden, Chicago, Ill. Arrangement of contacts, insulating partitions, etc., in oscillating switch which gravity and spring tend to open but which may be locked closed.

1,149,325. Electric Switch. T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Fluid-pressure operated, quick break switch.

1,149,358. Egg-Tester. W. E. Frost, assignor of one-third each to A. C. Leveque and J. P. Chevalier, Lewiston, Me. Particular structure and mounting of light receptacle.

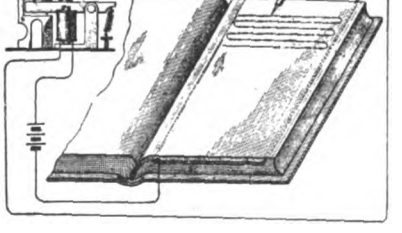
1,149,362. Wall Switch. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Push gives snap action to oscillating contact member. (See cut.)

1,149,378. Automatic Recording Scale. E. McGarvey, assignor to International Electric Co., Bellefonte, Pa. Poise screw controlling type wheels driven from electric motor through magnetic clutch, printing mechanism being controlled by position of beam.

1,149,382. Railroad Track Scale. M. Maurer, Pueblo, Col. Semaphore and lamp indicate if platform blocked against downward movement.

1,149,388. Spark-Plug Construction. J. W. Meaker, Detroit, Mich. Structural details.

1,149,395. Validating Stamp System. W.



No. 1,149,547.—Apparatus for Enabling Blind to Read.

H. Muzzy, assignor to National Cash Register Co., Dayton, O. Validating mechanisms at sub-station are selectively controlled from central station.

1,149,409. Quick-Break Electric Switch. E. Schwartz, assignor to Pelouze Mfg. Co., Chicago, Ill. Plug is spring gripped to hold it in circuit breaking and closing positions respectively and snap action is produced.

1,149,418. Signalling System. H. B. Stone, Providence, R. I. Local circuit controlling line circuit and controlled by polarized relay in key-controlled alternating current circuit, has special arrangement of contacts and condensers.

1,149,428. Telegraphy. P. B. Delany, assignor to Delany Telegraphic Transmitter Co., New York, N. Y. Successive impulses of dot and dash system automatically sent alternately over two lines and receiver manifests them in orderly sequence.

1,149,437. Terminal for Electric Wires. V. C. H. Gibson, Camden Town, England. Structure adapted for connection of flexible conductor.

1,149,441. Search or Headlight. F. J. Heiberger, Jr., Boston, Mass., and M. C. Steuart, Richmond, Va. Motor for operating shield mounted upon head lamp.

1,149,447. Trolley-Wheel Mount. J. James,

Digitized by Google

Woodlawn, Pa. Sectionally formed harp and wheel.

1,149,453. Speed Indicator. W. J. Landon, Seattle, Wash. Indicator hand successively closes electric indicator circuits.

1,149,496. Relay. H. W. Cheney, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. For use with circuit breaker on polyphase circuits.

1,149,502 and 1,149,503. Mining Machine. C. E. Davis, assignor to Goodman Mfg. Co., Chicago, Ill. Mounting and gearing of motor.

1,149,529. Closet. A. McCary, assignor to Gould Coupler Co., New York, N. Y. Seat-controlled electric heater for heating bowl contents.

1,149,531. Automobile Signal. J. C. Marsh, Manchester, N. H. Pointer has transparent panels and is interiorly illuminated.

1,149,533. Coping-Head. F. R. Patch, Rutland, Vt. For coping machines; mounting and gearing of driving motor.

1,149,547. Apparatus for Enabling the Blind to Read. H. Tideman, Menominee, Mich. Stylus moved across record sheet makes circuit of telegraph instrument through code perforations. (See cut.)

1,149,558. Electrical Accumulator. C. de-Sedneff, Paris, France. Configuration of plate.

1,149,560. Ventilated Fixture. T. W Dixon, assignor of one-half to W. H White, St. Louis, Mo. Special structure of support for socket and globe.

1,149,561. Stop Means for Automatic Typewriters, Etc. P. J. Dreher, Toledo, O. Removal of last sheet from table opens hole through which switch for driving motor is pneumatically opened.

1,149,571. Train-Stop. H. M. Gain, Belleville, Ontario, Canada. Danger condition sets track contact to close circuit to apply brakes.

1,149,583. Signal Device and Projector Therefor. M. R. Hutchison, assignor to Lovell-McConnel Mfg. Co., Newark, N. J. Driving motor of siren mounted in horn and controlled by air pressure at mouth of horn.

1,149,586. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Unit for snap switch comprising frame and contact mechanism therein.

1,149,592. Multiduct. T. E. Murray and A. V. McHarg, New York, N. Y., assignors to said Murray. Formed of sheet metal plates having number of longitudinal grooves secured together with grooves in register.

1,149,599. Junction or Terminal Block. H. Small, assignor to Vulcan Motor Devices Co., Philadelphia, Pa. Split sockets are clamped against plugs by drawing together blocks of insulation about them.

1,149,600. System of Motor Control. J. V. Smith, Louisville, Ky. Electromagnetically controlled and interlocked main, reversing and field switches.

1,149,601. Reversible Electric Motor. F. M. Spencer and G. W. Warnholz, San Francisco, and J. Wigmore, Oakland, Cal., assignors to Warnholz. Stationary and rotatable armatures in alinement, variable fields rotatable about armature and means for holding movable armature against rotation.

1,149,603. Protective Device for Busbar Circuits. P. Torchio and H. R. Woodrow, assignors to T. E. Murray, New York, N. Y. Generators tapped into inductances between main and distributing buses.

1,149,609. Safety Device for Moving-Picture Machines. E. M. Wooden, assignor to Perfectograph Mfg. Co., New York, N. Y. Operating level for mechanism returns to "off" position unless held by operator, the light switch being opened on such return.

1,149,610. Acoustic Apparatus for Detecting Sound Vibration in Non-Gaseous Media. D. W. Allis, assignor to Boston Talking Machine Co., Boston, Mass. Microphone contained in casing unaffected by sound vibrations except of bodies with which its casing is brought in contact.

1,149,614. Toll Telephone System. E. P. Baird, assignor to Baird Mfg. Co., Chicago, Ill. Toll device controls means for rendering receiver or transmitter inoperative.

1,149,631. Machine for Charging and Discharging Gas Retorts. H. A. Carpenter and R. L. Hibbard, assignors to Riter-Conley Mfg. Co., Pittsburgh, Pa. Travel circuit for the machine controlled by the charging mechanism.

1,149,651. Trolley Mechanism for Railway-Cars. C. Kaspar, Chicago, Ill. Vertically extensible pantograph supports wheel and horizontally extensible pantograph adapted to extend or contract vertical pantograph.

1,149,665. Electric Battery. F. N. Mason, Pittsburgh, Pa. Manner of assembling positive element, absorbent, and depolarizer in a dry cell.

1,149,666. Refillable Electric Battery. F. N. Mason. Modification of above.

1,149,701. Ductile Filament. O. M. Thowless, Newark, N. J. Refractory material is flashed on metal core, core is removed and resulting tube worked down to solid filament of proper size.

1,149,705. Search-Light for Firearms. E. S. Ward, assignor to Oregon Electric Gun Co., Inc., Portland, Oregon. Light and lens on barrel, battery in stock and circuit closed by push-pin when hammer is cocked.

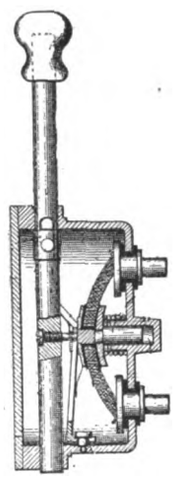
1,149,710. Heavy Oil Carbureter for Explosive Engines. M. Beck, Minneapolis, Minn. Electric fuel heater and thermo pile subjected to exhaust heat are alternately connected with storage battery by thermal switch controlled by combustion heat of engine.

1,149,721. Trolley Frog. W. H. Brown, Jerome, Pa. Has a detachable wearing plate.

1,149,735. Electric Switch. J. L. Creveling, assignor to Safety Car Heating and Lighting Co., New York, N. Y. Electromagnetic switch has series winding and two shunt windings one of which is cut out when switch is closed.

1,149,742. Automatic Elevator-Door Opening and Closing Apparatus. C. M. Einfeldt, Denver, Col. Electrically controlled hydraulic mechanism for operating doors closing shaft openings through floors.

1,149,746. Elevator Control Mechanism. F. M. Fitzgerald and R. S. Hatch, Chicago, Ill., assignors of one-third to F. M. Hatch. Main circuit switch in elevator-cab controlled by opening and closing of gates.



No. 1,149,755.—Switch.

1,149,755. Switch. G. W. Hart, assignor to The Hart Mfg. Co., Hartford, Conn. Sliding plunger cams laminated bridge at right angles against terminals. (See cut.)

1,149,758. Car Control System. F. Hedley, Yonkers, and J. S. Doyle, Mount Vernon, N. Y. Motor for operating car door controlled by momentum of car to prevent opening of door while car running.

1,149,759. Safety Platform Mechanism. F. Hedley and J. S. Doyle. Electrically operated mechanism for moving movable section of train landing platform toward train.

1,149,760. Automatic Safety Platform Mechanism. F. Hedley and J. S. Doyle. Movable section of platform automatically moved and controlled by train at platform. Related to above.

1,149,761. Automatic Control Mechanism for Safety Platforms. F. Hedley and J. S. Doyle. Related to above. Operation of movable section of platform dependent upon number of cars in train.

1,149,787. Circuit Closer. P. Sebock, Jr., Heatherman, W. Va. Push switch held closed by latch and released by electromagnet.

1,149,789. Means for Operating Switch Mechanisms. R. A. Schoenberg, assignor to Ida S. Rosenheim, New York, N. Y. Switch mechanism in lamp socket operated to open and close circuit by pushing inwardly on lamp.

1,149,798. Ignition Apparatus and System and Method of Spark Control. R. Varley, Englewood, N. J. Timer and generator armature relatively adjustable to maintain synchronism of timer and current phases.

1,149,817. Lamp Shade. T. D. Finizio, assignor to Kurz Electrical Co., Inc., New York, N. Y. Shade about bulb end and support secured at lamp base.

1,149,822. Sound-Amplifying Device. P. J. Hackett, assignor to Universal High Power Telephone Co., King County, Wash. Vibrations of telephone receiver diaphragm amplified by special construction.

1,149,843. Ignition Breaking Device. L. J. LePontois, assignor to Hurd & Haggin, Inc., New York, N. Y. Contacts opened by cam on generator shaft and electromagnet in circuit with generator winding.

1,149,852. Photographic-Printing Machine. F. W. Morton, Cedar Rapids, Iowa. Structure adapted for use with electric light.

1,149,866. Time-Controlled Electrical Contact Mechanism. A. L. Sohm, assignor to Sohm Electric Co., Chicago, Ill. Structure of contact device driven by second shaft of master clock.

1,149,874. System of Electrical Signaling. C. R. Underhill, assignor to Underhill Telegraph Translator Co., Jersey City, N. J. Electrically interrupted vibrations sent from a wireless telegraph transmitter in the form of signals are converted into electrically continuous signals at receiver.

1,149,913. Flash-Light. H. H. Hipwell and H. T. Hipwell, Pittsburgh, Pa. Tubular pocket lamp; details of switch.

1,149,933. Illuminated Match Stand and Automatic Electric Waiter-Signal. A. Martzolf, New York, N. Y. Comprises base and standard with electric lamp at top, battery and lever in base, the lever serving to connect and elevate the lamp.

1,149,971. Rectal Generator. J. B. Wagoner, deceased, by M. Wagoner, administratrix, San Francisco, Cal. Comprises tubular permanent magnet having specially formed knobs of insulation at each end and exposed dissimilar metals connected with said magnet but otherwise insulated.

1,149,973. Annunciator Fixture for Residences. E. E. Berthold, Chicago, Ill. Structure of plate having bell, push-button and speaking-tube mouth-piece.

1,149,974. Lithographic Plate and the Process for Producing the Same. C. Chisholm, San Francisco, Cal. Flexible celluloid base having thin layer of powdered copper imbedded in its surface upon which second layer of copper is electrolytically deposited and a thin layer of hard metal on this.

1,149,979. Universal Sound Transmitting Means. P. J. Hackett, assignor to Universal High Power Telephone Co. Structure for deflecting sound from a main receiving passage equally into a number of sound passages leading off from it.

1,149,980. Interrupter. C. Hartmann, assignor to Gould Coupler Co. Details of device normally closed and cam opened.

1,149,988. Gas Relief Device for Batteries. C. Staudt, assignor of one-half to C. Meder, New York, N. Y. Particular structure of plug providing gas vent from battery casing.

1,149,998. Dynamo Electric Generator. G. Inrig and L. Inrig, London, England. Armature has core movable into and out of coils by centrifugal governor to vary reluctance.

1,150,001. Electric Switch for Electric Lamps and the Like. A. H. Miller, Detroit, Mich. Details of thermostatic sign flashing switch.

1,150,005. Signal. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. Details of electric interlocker signal.

Patents Expired.

The following United States electrical patents expired on August 16, 1915:

609,015 and 609,016. Electric Elevator. R. Eickemeyer, Yonkers, N. Y.

609,043. Motor Car. C. O. Palmer, Cleveland, Ohio.

609,092. Electric Controller. J. D. Forrer, Johnstown, Pa.

609,124. Electric Brake. E. B. Skinner, Ogden, Utah.

609,142. Combined Battery and Electric Cell. J. C. Dagoneau, Beaufort, France.

609,154. Electric Telegraphy. O. J. Lodge, Liverpool, England.

609,173. Telephone System. A. F. Swan, Bayonne, N. J.

609,188. Electrical Traction. W. Kingsland, Llandudno, England.

609,229. Telephone System. C. E. Egan, B. L. Lawton and E. C. Wilcox, Meriden, Conn.

609,245 to 609,249, inclusive. Electric Circuit-Controller. N. Tesla, New York. N. Y.

609,250. Electrical Ignition for Gas Engines. N. Tesla.

609,251. Electric Circuit-Controller. N. Tesla.

609,252. Electric Rail Bond. J. S. Tucker, Chicago, Ill.

609,274. System of Control of Electric Motors. E. R. Gill, Englewood, N. J.

609,288. Means for Fastening Insulator Pins to Crossarms. L. Mitchell, Augusta, Ga.

609,331. Telephonic Measured-Service System. W. W. Dean, Boston, Mass.

609,356. Electrical Conduit Box. H. Krantz, New York, N. Y.

609,374. Telephone Repeater or Relay. J. S. Stone, Boston, Mass.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 9. CHICAGO, SATURDAY, AUGUST 28, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer.

A. A. Gray, General Manager. H. S. Tuthill, Business Manager.

C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Electrical Construction at the Panama-Pacific Exposition. 353
Local Associations for Contractors..... 354
Electric Cooking Apparatus..... 354
Service 355
Protection Against High-Frequency Surges..... 355
DEPARTMENTS:
Commercial Practice 360
Electrical Construction 364
Public Service Commissions..... 368
Questions and Answers..... 370
New Electrical and Mechanical Appliances..... 382
Latest Approved Fittings..... 386
Current Electrical News..... 387
Record of Electrical Patents..... 391
LEADING ARTICLES:
Electricity in a Cold-Storage Plant..... 357
Wiring and Conduit Work at the Panama-Pacific Exposition.—By A. A. Willoughby..... 365
Auxiliary Steam Plant of the Vancouver Island Power Company.—By H. W. Beecher..... 373
BOOK REVIEWS..... 381
MISCELLANEOUS:
Max Hebgen..... 356
Program of Convention of Iron and Steel Engineers..... 356
Special Rejuvenation at Los Angeles..... 356
Details of Cincinnati Appliance Campaign..... 360
New Offices for Beverly Company..... 361
Central-Station Service for Beef Warehouse..... 361
New Lighting Installation for Paducah..... 361
Thomas F. Kelly..... 362
Outdoor Illumination by Large Units..... 363
Portable Stone Crusher on Central-Station Service..... 363
Civic Celebration Marks Inauguration of New Street Lighting in South Boston..... 363
Examination of Electricians in Massachusetts..... 364
Among the Contractors..... 368
Meeting of Toronto Contractors..... 368
Plans for Prosperity Week in Louisville..... 369
The Lighting of Rifle Ranges..... 372
Electrical Exports to South America..... 372
Organization of Ohio Power Companies Perfected..... 378
Program for Panama-Pacific Convention..... 379
Lighting Installation Guards Factory From Intruders..... 379
Program of Electrochemical Society..... 380
Graphite 380
Program of Convention of Southeastern Section, N. E. L. A. 380
Government Exhibits at New York Electrical Show..... 381
New York Municipal Telephone Service to be Investigated 381
Municipal and Government Electric Railways in Ontario... 381

Copyright, 1915, by Electrical Review Publishing Company, Inc.

ELECTRICAL CONSTRUCTION AT THE PANAMA-PACIFIC EXPOSITION.

One of the notable features of the Panama-Pacific International Exposition is the electrical installation and especially that portion of it which has to do with the illumination of the Exposition buildings and grounds. In the issue of June 5 of this year, a description of the lighting details of the Exposition was given and in the present issue there is begun an account of the design and installation of the underground conduit and cable and transformer installations for supplying the electric energy which is being used for both lighting and power.

The electrical installation at the Exposition presents features which are to be found in connection with but few other projects. While the installation may be regarded as a temporary one, it was nevertheless desired to avoid as far as possible any overhead wiring and to keep the supply cables as far as possible under ground. Considerations of expense would naturally lead to a design which would not be so suitable for a permanent installation, and in addition to this the soil conditions were such that more rigid construction than that used would hardly be indicated. The ground upon which the Exposition has been laid out consists largely of an area which has been filled in with sand at such a recent period that it was settling at a rapid rate at the time construction upon the grounds was begun, and is still settling at a slower rate. The amount of this settlement is indicated in a diagram illustrating the article which is begun in this issue. Having in mind the various factors which would affect the operation of this system, it was decided to use fiber ducts inclosed in a wooden trough, and to utilize wooden manholes.

The selection of cables, transformers and meters was influenced very largely by the arrangement which was entered into with the Pacific Gas and Electric Company, according to the terms of which this equipment will be taken over by the power company at the end of the Exposition period and utilized by it in its regular construction work. This fact dictated a selection of types and sizes which would meet the requirements of the power company in its ordinary work and at the same time meet all the requirements of the Exposition installation. The details of the design and installation of this equipment will be found in the article referred to.

The design of the transformer vaults was dictated largely by considerations of fire hazard and it will be noticed that concrete construction was used for this

Digitized by Google

purpose and that the vaults were kept entirely outside of the Exposition buildings. These buildings being of a temporary nature, have not the fire-resistant properties which would ordinarily be found in buildings of more permanent construction and consequently the greatest care was necessary to prevent any danger being introduced by the electrical equipment.

The entire installation as here described has proven completely satisfactory in operation and has fulfilled all expectations in connection with it. There have been no serious failures in operation so far, and great credit is due those who have been responsible for the design and the construction work.

Mr. G. L. Bayley, the responsible head of the Electrical Department of the Exposition and Mr. L. F. Leurey, who has been in direct charge of the electrical construction and operation, are both to be congratulated upon the success of this work, which involved so many unique conditions and called for a layout that is not ordinarily found in routine work. The ELECTRICAL REVIEW AND WESTERN ELECTRICIAN is glad to be able to present this account by its Pacific Coast correspondent of a rather unique electrical achievement and one which no doubt will serve as a model installation in future work of the same kind.

LOCAL ASSOCIATIONS FOR CONTRACTORS.

The electrical contractor is coming to realize more and more the value of organization. This is manifest not only in the activities of the national and state associations, but in many local organizations which have helped to weld together the interest of local contractors and prevent the antagonism and reckless price cutting which has so often occurred in the past, leaving a record of disaster in its wake. The electrical contracting business has had to meet problems common to a number of other industries and trial has usually shown that these problems can best be handled by co-operation, whereas the individual can do little to improve local conditions. It sometimes seems to be a slow matter for such associations to accomplish anything, but it is really necessary first of all for men to get acquainted before they can achieve much in the way of co-operation, and there must be a real intent to achieve something, which will stimulate a desire for participation in association activities. There must also be what often appears as a very unselfish willingness for service, which, however, in the end usually redounds to the benefit of those who take an active part in securing the desired results.

Much has been accomplished by organizations of electrical contractors in the past and much is being accomplished today, but there still remains a great deal to be done and there are many communities where the local contractors are hardly on speaking terms with each other. Thorough organization and co-operation is needed, both nationally and locally, and there are many problems which can be met by local associations better than by the national organization, which, too, has enough problems of its own to absorb all of its available energy. The sooner electrical contractors learn to organize and to co-operate through local associations, the sooner will the problems of the electrical industry in their respective locations be solved.

ELECTRIC COOKING APPARATUS.

It frequently happens that machinery or apparatus which is designed and constructed with entire satisfaction so far as the electrical features are concerned, is found unsatisfactory or actually fails because of insufficient attention to the mechanical details. We have noticed this fault in electrical heating and cooking appliances, and the matter is again brought to our attention by the account given by a correspondent in the *Electrical Times,* of London, of his experience with an electric stove of American manufacture. It is upon details that successful operation of a device depends, and in this case some of the details seem to have been sadly neglected.

This particular stove was of the fireless type, with automatic switch and thermostatic control. The results of the cooking operation seem to have been entirely satisfactory and the energy consumption was low, so that the correspondent speaks enthusiastically of the cost and of the culinary success. He seems, too, to be converted to the policy of slow cooking at low temperatures, a practice which is not very general or very popular in England.

The picture presented, however, is not such a rosy one when the correspondent comes to consider the mechanical performance of the stove. It was evidently not rugged enough to stand ordinary hard usage. Details of design appear to have been defective and breakdowns have been frequent enough to be discouraging. Methods of avoiding the trouble are so obvious that the owner has improved certain points when making repairs. Thus the boiling over of liquid contents has caused short-circuits, a contingency that might readily be foreseen. Brass wire has been used in places, and this has corroded. Insulation has broken down; and so the story goes.

The owner of this stove happened to be an individual who could make proper repairs. The ordinary housewife, however, is in a different position, and failure of the apparatus in these respects is likely to lead to its abandonment, while at the same time electric cooking receives a blow to its reputation which will be lasting in certain minds. Before electric cooking can become popular, apparatus must be put out which will stand ordinary usage. We believe this is being done today and at least some of the manufacturers are realizing and are meeting the demands of this service. The way is thus being opened for a wide development of electric cooking.

That this development is coming in this country is not to be doubted. Power companies in the West have taken the matter up seriously and are dealing intelligently with the rate problem. The Duluth Edison Electric Company has a rate of 2.4 cents per kilowatt-hour, and in some hydroelectric territory it is lower.

Digitized by Google

SERVICE.

A central-station company may consider its function to be the supply of electrical energy or the furnishing of a certain service. Properly both are involved. Some companies place emphasis upon one, some upon the other. Since the first is always understood, it seems desirable to place the emphasis upon service, as the importance of this element is not always realized.

The rendering of service may be interpreted in many ways. To some officials it means little more than the furnishing of energy, in other words, keeping voltage upon the supply lines. To others it means that this voltage shall be steady and of the nominal value and that interruptions shall be few and far between. To others it connotes free lamp renewals, or possibly the maintenance of an appliance department. To others it suggests the supply of illuminating engineering advice or other services usually performed by a consulting engineer. To others it signifies the courteous attention in the office to the wants of customers, the speedy investigation of complaints and the prompt correction of any mistakes which may have been made. And so we might go on. Each individual conjures up a different picture, depending upon his past experience, his present ideals, etc.

The modern central-station manager is expanding his idea of service still further. To popularize the use of electrical energy in ever broadening lines, he aims to relieve the consumer of all care in connection with central-station service. This is not only a convenience to the consumer, but it enables the central station to ensure adequate conditions of use and thus control to some extent the reputation of electrical applications. This attitude was early manifested in the furnishing of lamp renewals, but for a long time the principle involved received no other application. Now, however, it has been extended.

A notable instance is found in the electric sign. Some companies not only arrange for switching current off of signs for their patrons at a stated hour in the evening, but undertake entire maintenance of the same, replacing burned-out lamps, painting at intervals and supplying whatever other care or repairs may be necessary. Such service need not be supplied gratis. A reasonable charge is expected and should be applied. In some instances the central station retains ownership of the sign, so that the arrangement simmers down to a case of hire as well as maintenance and current supply and the charge made must include interest on the investment.

Another application of this idea is found in the furnishing of battery service for electric vehicles. The care of an electric vehicle resolves itself largely into the care of the battery, and if an owner can be relieved of this burden, there is an extra inducement for him to take up the electric as the most satisfactory solution of his transportation problems. This represents another opportunity for the central station to increase its usefulness and its business. By handling a large number of batteries in one place, the problem of battery maintenance is much simplified, and by selling the customer his energy in the chemical form rather than the electrical, it is really made more available for the latter's use. This represents service in the fullest sense of the word, although the furnishing of energy is still at the bottom of the proposition. Perhaps the most satisfactory aspect of such service is the ability of central-station experts to keep in touch with the use of electric vehicles and to discover when things are not as they should be, before the vehicle gets a reputation for failure that is due to its abuse or improper application.

"Service" may be made to include many things; and the more it includes, the less will judgment of the power corporation rest upon the mere fact of its rate for supplying energy. The central station should make of itself an indispensable servant, and not a mere purveyor of energy.

PROTECTION AGAINST HIGH-FREQUENCY SURGES.

A variety of devices have been provided for the protection of lines against abnormal conditions, such as may be produced by lightning, by arcing grounds or even by switching. They consist mainly of arrangements which provide a path to ground from the line when the voltage reaches a predetermined value, while at the same time offering insulation to lesser voltages. Their use presupposes a high voltage as the only source of danger.

There are, however, at times, surges of moderate voltage but of high frequency or at least very steep wave front produced upon the line, and it is very desirable to provide a means of dissipating these. A recent suggestion offers a very simple solution to this problem. It is to connect a condenser between line and earth. This is of such a capacity that at normal frequency the charging current is of no moment, whereas at excessively high frequencies, the admittance of the condenser rises in proportion to the frequency, and the condenser current is of sufficient magnitude to relieve the line.

For high-voltage lines the problem becomes one of finding a suitable condenser, since it is not easy to design one with the necessary electric strength while having at the same time a suitable capacity. The Moscicki type of condenser seems to meet these requirements better than any other. It can be constructed to withstand 60,000 volts. The usual form is a glass tube with metallic coatings, both inside and out, and provision for avoiding discharges at the edges.

The use of such a condenser does not involve a spark gap with its uncertainties, it requires no attention, it does not permit current of line frequency to follow a discharge, and it is used without a series resistance, although a fuse should be provided in case of condenser breakdown. The condenser does not afford protection against high voltages of low frequency, and hence does not displace the spark gap or other device for this purpose, but merely supplements it.

Digitized by Google

MAX HEBGEN.

A Tribute by H. M. Byllesby.

Max Hebgen, who died in a private pavilion at the Presbyterian Hospital, Chicago, on the morning of Tuesday, August 24, was forty-six years of age. He was born in Milwaukee, Wis., of German parentage. He began his distinguished career in the great hydroelectric development of this country with the Standard Underground Cable Company and the Westinghouse Electric & Manufacturing Company, of Pittsburgh, Pa., about 1886. After working in the shops of these companies, Mr. Hebgen located in Butte, Mont., taking employment as a lineman with the old Butte Electric Light and Power Company, about 1888. This company at that time was principally owned by ex-Senator William A. Clark, of Montana, and his immediate associates.

Mr. Hebgen remained continuously in the employ of this company through its various absorptions, and at the time of his death was vice-president and chief engineer of the Montana Power Company. This company, which is a monument to the creative genius of Mr. Hebgen, has water-power developments on the Big Hole River; on the Missouri River, at Great Falls; on the Yellowstone River, at Billings; and two large developments on the Madison River, all in the state of Montana. This company, which is one of the largest hydroelectric companies in existence, has been uniformly successful, both as an operating company, with the successful solving, largely from an original standpoint, of the many engineering problems encountered; as well as conspicuously successful financially. Among the many fields filled by the Montana Power Company is the supplying of electricity for the electric operation of the Butte, Anaconda & Pacific Railroad and the electrification, now under way, of the Bitter Root Mountain division of the Chicago, Milwaukee & Puget Sound Railway.

The large activities of Mr. Hebgen had extended from the experimental and pioneering period of long-distance transmission and hydroelectric development up to the present situation of the Montana Power Company, which can truthfully be said to be the at-present last word on successful hydroelectric, long-distance transmission work.

Mr. Hebgen was an intense worker; a man entirely self-educated. He entered his profession endowed with magnificent health, a sound intellect, a distinct inventive capacity and an unlimited ability for hard and successful work. He was beloved by all who knew him, and it is probable that no more successful nor popular officer of any corporation has existed than Mr. Hebgen, who, while occupying this position of great popularity in the organization, also was a thorough disciplinarian, and his popularity was bottomed on the profound respect which his organization held for his character, his abilities and his physical and moral courage. Mr. Hebgen is survived by a wife and one son.

The entire field of hydroelectric, long-distance transmission, including the solving of many lightning troubles, owes a vast amount to the devoted service of Mr. Hebgen, and in his death has met an almost irreparable loss.

Program of Convention of Iron and Steel Engineers.

The ninth annual convention of the Association of Iron and Steel Electrical Engineers will be held at the Hotel Statler, Detroit, Mich., on September 8, 9, 10 and 11.

The opening business session will be held on Wednesday, September 8 at 10 a. m. Sessions for the reading of papers will be held on Wednesday afternoon, Thursday morning and afternoon, and Friday morning and afternoon. Saturday morning will be devoted to a final business session and in the afternoon excursions and visits to plants will be made. On Thursday evening the annual banquet will be held.

The sessions on Thursday will be joint sessions, with the American Institute of Electrical Engineers, two of the papers presented being provided by the latter society.

The following program of papers has been arranged:

"Improved Non-Condensing Power Plant by use of Direct-Current, Mixed-Pressure Turbine Equipment, Etc.," by R. F. Patterson; "Wire Rope and Its Relation to Steel Making," by James F. Howe; "Recent Developments in Power-Generating Apparatus," by P. M. Lincoln; "Protection and Control of Industrial Electric Power," by Charles P. Steinmetz; "Motor-Generators Versus Rotary-Converters," by E. Friedlaender; "Some of the Latest Developments in Electrical Equipment," by K. A. Pauly; "Progress in the Iron and Steel Industry and the Electric Furnace," by Karl G. Frank; "Mechanical Analogies in Electricity and Magnetism," by W. S. Franklin; "The Electrification of Steel Mills and the Use of Central-Station Power," by Brent Wiley and Wilfred Sykes; "Purchased Power for Steel Mills," by C. S. Lankton; "Some Electrical Applications in Steel-Mill Practice," by D. M. Petty; "Latest Development of Electric Cranes for Steel Mills, Manufactured by the Alliance Machine Company," by E. H. Kendall; "Installation of Electrical Equipment to Comply With Requirements of Safety," by Walter Greenwood.

Special Rejuvenation in Los Angeles.

On August 12 a private rejuvenation was held through a special dispensation from the reigning Jupiter, Homer E. Niesz, at the Los Angeles Athletic Club at 12 o'clock noon. A class of 30 was obligated. Included in this class were some of the most prominent men identified with the electrical industry in southern California.

Probably the most prominent of these was S. M. Kennedy, general agent of the Southern California Edison Company, whose name and reputation is well known throughout the country. Of the 30 who were initiated 15 were members of the active working staff of the Southern California Edison Company. They included A. W. Childs, superintendent of sales; E. H. Mulligan, district agent, Pasadena; A. B. Wollaber, district agent, Santa Monica; W. R. Neelands, district agent, Venice; Fred Schwartz, district agent, Monrovia; C. S. Walton, district agent, Los Angeles; A. A. Taylor, district agent, Pomona; Paul J. Denninger, district agent, Whittier; C. H. Peirson, advertising agent; W. L. Percey, treasurer; E. D. Stead, bookkeeper; H. M. Fay, power salesman; Harry J. Bauer, attorney, and Dr. H. C. Stinchfield, chief surgeon.

The Los Angeles Gas & Electric Corporation was represented by William Baurhyte, first vice-president; C. P. Houghton, second vice-president; C. S. Vance, third vice-president; and from the Pacific Light & Power Corporation were C. S. Ward, vice-president; E. R. Davis, general manager; A. M. Kemp, treasurer and comptroller, and Edward Woodbury, electrical engineer.

The rejuvenation was in charge of J. Harry Pieper, Tribune of Los Angeles Chapter, and was attended, in addition to the candidates, by J. G. Pomeroy, Jovian Congressman for the Thirteenth District, and James N. Colkitt, Jovian Statesman for California and Arizona. Henry F. Holland was the specially appointed Vulcan who administered the oath.

This brings the total number initiated into the Jovian Order by Los Angeles Chapter for this year up to 87, which gives Los Angeles the lead in rejuvenations.

Empire State Meeting.

The annual meeting of the Empire State Gas and Electric Association will be held in the Engineering Societies Building, New York City, on Thursday and Friday, October 7 and 8. The program for the meeting will be announced later.

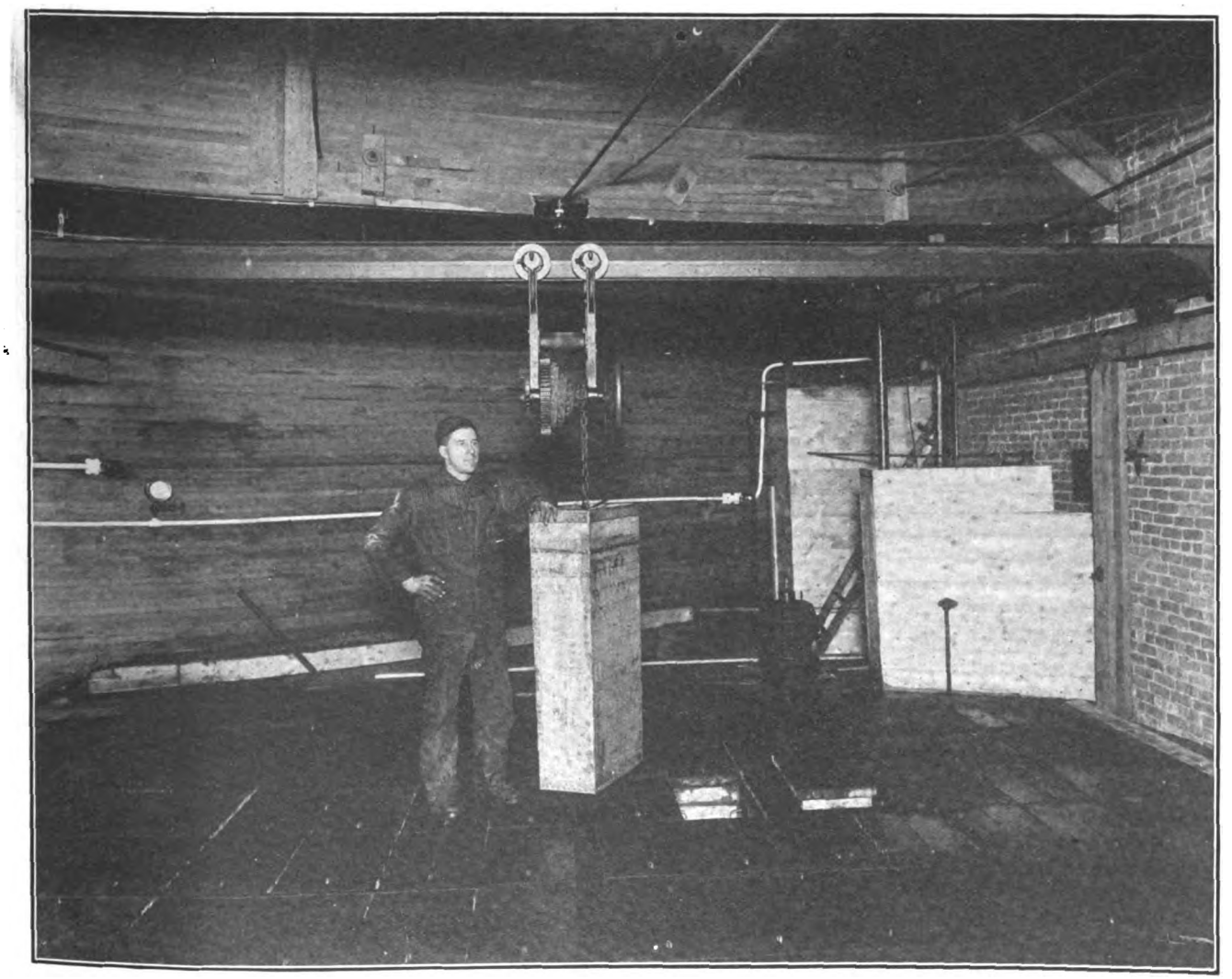
Digitized by Google

Electricity in a Cold-Storage Plant.

The high load-factor and off-peak characteristics of ice-making and cold-storage plants makes this class of business particularly desirable for central stations. This article describes the electrical equipment in a typical plant which purchases its energy from the local utility.

Since the development of the raw-water system for the manufacture of artificial ice, central-station service is particularly adapted to this class of work. Formerly practically all artificial ice was made from distilled water requiring a steam plant. With the raw-water system no steam plant is required, the only heat needed for the process being in connection with the use of hot water for loosening the ice from the cans.

The subject of this article, the plant of the Consolidated Cold Storage Company, Auburn, N. Y., operates a combination ice and cold-storage business, the ice being marketed by the Crystal Ice Company, which is a local selling organization. The ice plant has a capacity of 20 tons daily, and there are in the storage warehouse 200,000 cubic feet of storage space, which is maintained at temperatures ranging from zero to the freezing point in different rooms. These storage facilities are utilized by local merchants and produce dealers, who pay a stipulated space rental. The refrigeration system is a combination of compression and brine circulation, using ammonja in the direct expansion coils, which cool the brine.



Freezing Room Showing Motor-Driven Brine Pump in Background.

Central-station service is used exclusively for light and power, and is furnished by the Empire Gas & Electric Company from its three-phase, 60-cycle, 2,300-volt mains. The three transformers are located between two poles with supporting cross arms, in the rear of the machinery room. The secondary is connected to give a three-phase four-wire system, the lighting circuits being connected between the neutral and one of the phases. The power circuits have a voltage of 220 volts.

Before taking up a description of the electrical equipment it may be well to give a brief outline of the typical ammonia compression and brine-circulation system, as installed by the Consolidated Company. The ammonia expands in the expansion coils in the brine tank, extracting the heat from the latter. The ammonia compressor is for increasing the pressure of the gasified ammonia; the condenser for cooling and liquefying the gasified ammonia. By means of the expansion valve the flow of liquefied ammonia under condenser pressure is controlled as it flows from the receiver to the expansion coils, in which a materially lower pressure is maintained by the compressor in order that the refrigerating medium may boil at a sufficiently low temperature to absorb heat from the brine, and consequently refrigerate it.

In order that some of the work of

Digitized by Google

refrigeration may be carried on while the plant proper is shut down, either because of accident or in order to avoid the expense of skilled labor during part of the 24 hours, the brine-circulating system is employed. The cooled brine is circulated through the cold-storage rooms and the ice-making tank by a brine pump, or pumps. The initial cooling effect of the evaporating ammonia is expended in the brine, which is circulated by the brine pump, as already stated.

Salt, either sodium chloride or calcium chloride is required for making the brine, and suitable insulation is provided for the brine tank, the brine cylinders of the pumps and all brine piping outside of the cold-storage compartments in order to reduce to a minimum the losses due to the radiation of cold, or more accurately speaking, the absorption of heat. In addition to the first cost of the above-mentioned items, the operating expense or power required to operate the brine pump must be considered; first, for the circulation of the brine from the brine tank through the cooling coils back to the tank; second, to overcome the friction of the brine traversing the above cycle; third, to produce sufficient additional refrigeration to make up for the heating effect produced mechanically by the circulation of the brine and the heat actually absorbed through the brine tank and brine-pipe insulation; and, fourth, to make up for the greatly reduced efficiency occasioned by the necessity of operating the refrigerating plant proper at a materially lower back pressure in order to produce a sufficiently lower ammonia temperature to make up for the second heat transfer encountered between the atmosphere of the cold-storage compartments and the ammonia gas. The increased operating expenses directly resulting from the inherent low efficiency of the brine system is sometimes as high as 25 per cent, and isolated instances have been found where the cost of circulating the brine alone was almost as great as that of cooling it. This is in reference to the cold-storage part of a plant, as in the ice-making department it is necessary to use brine, and further the ammonia coils are immersed in the brine, the latter being circulated about the tank only.

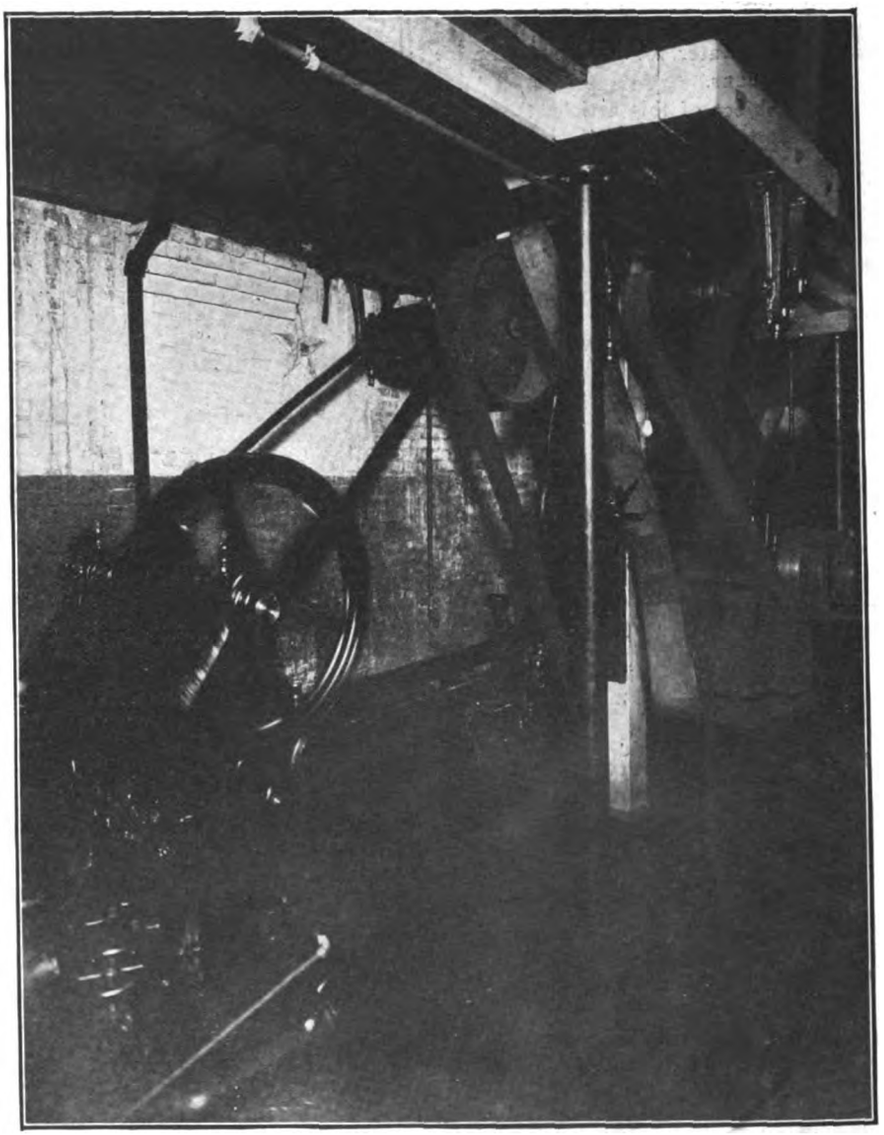
Machine-Room Equipment.

The principal unit in this department is a York 25-ton, vertical two-cylinder single-acting ammonia compressor, belt-driven by a 50-horsepower, three-phase, 60-cycle induction motor. This machine furnishes refrigeration for the entire plant. A 10-horsepower motor with the same characteristics is belted to a jack-shaft, which drives a Gould 7 by 8-inch triplex brine-circulating pump, and a Gould 5 by 8-inch triplex water pump for furnishing water to the ammonia condenser.

For handling the various lighting and power circuits a switchboard consisting of two slate panels, and an auxiliary wood base, all supported by an angle-iron frame and pipe standards, is provided. The large panel contains three motor-feeder switches and the main power switch. The smaller panel is equipped with four lighting-feeder switches, a main switch and a watt-hour meter for the lighting system. Mounted on the auxiliary panel are watt-hour meters for the power circuits and a graphic recording wattmeter with the necessary current and potential switches. A triple-pole switch is supported at the right side of the switchboard, which controls the circuit leading to the ice house in an adjoining building. From the auto-starters the motor leads are carried in conduits beneath the floor. A freight elevator operated by a 10-horsepower motor serves the various floors of the cold-storage department. Conduit work is used throughout.

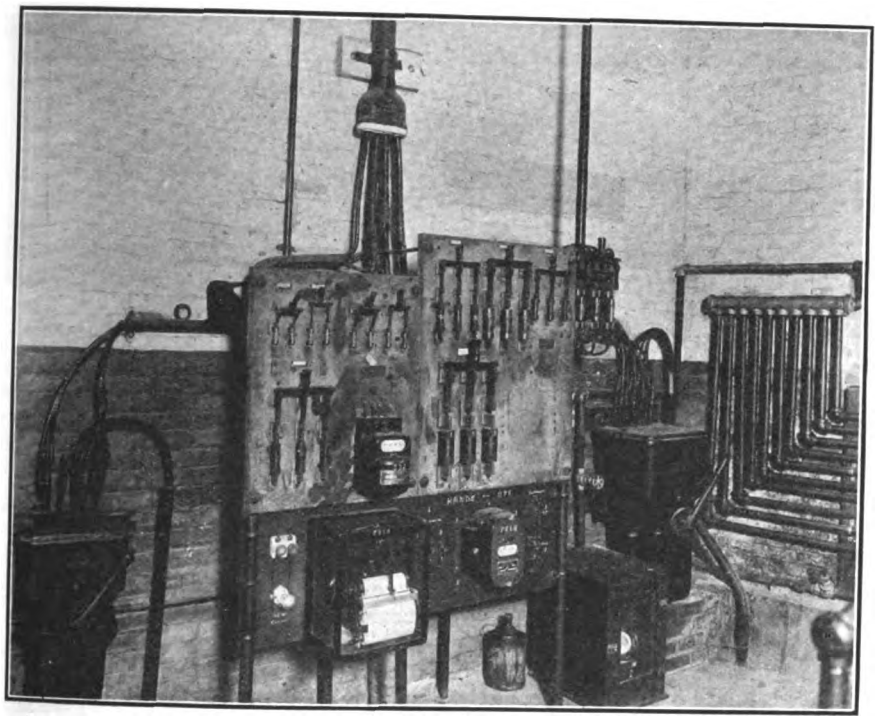
Ice-Plant Equipment.

In the ice-making department there are also several motor applications, which will be explained in connection with their applications. This department has a capacity of 20 tons of ice daily. The ice cans are approximately 1 by 2 by 4 feet, and turn out 300-pound cakes of ice. The brine tank has a capacity of 240 cans, and it requires 48 hours to freeze the contents of a can. The system of freezing and "pulling" the ice cans is as follows: At the beginning of operations half the total number of cans, 120, are placed in the tank so that they occupy every other space, both lengthwise and crosswise, of the tank. Twenty-four hours later the remaining cans are placed in the vacant spaces. Then in 24 hours from this operation the first lot of cans are "pulled" out by means of a manually

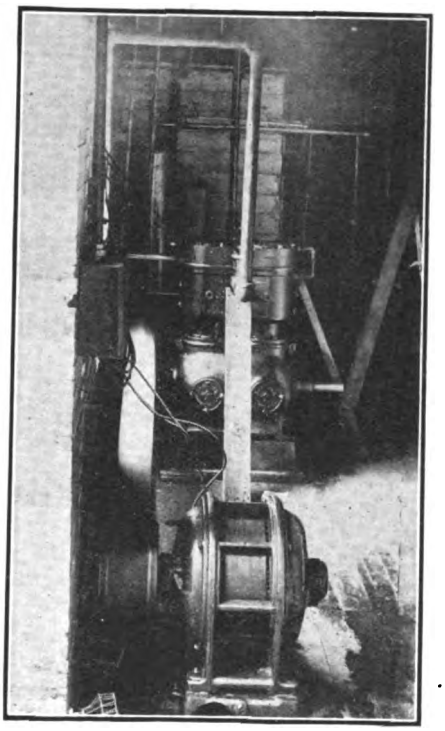


Motor Driving Brine and Water Pumps.

Digitized by Google



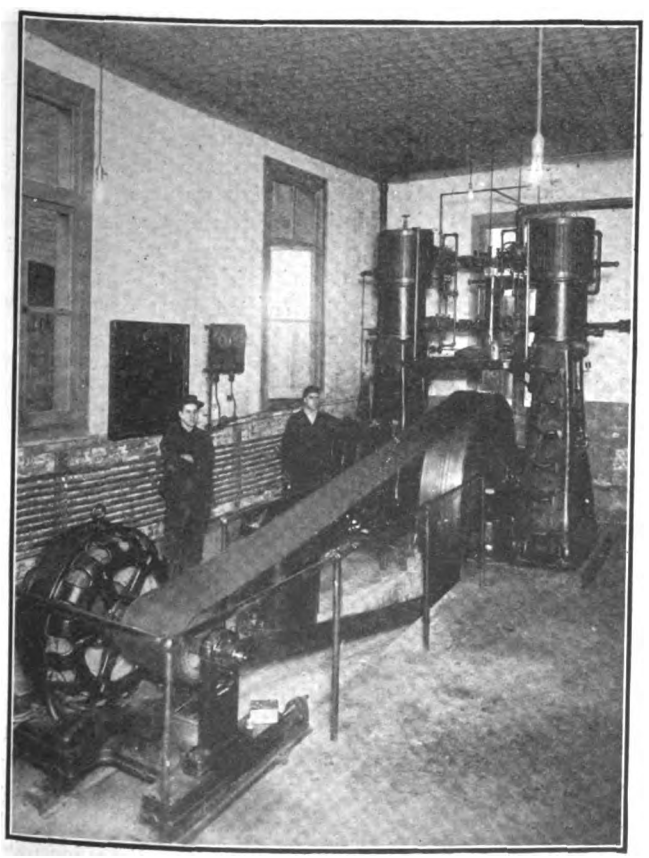
Switchboard, Showing Auto Starters for Motors.



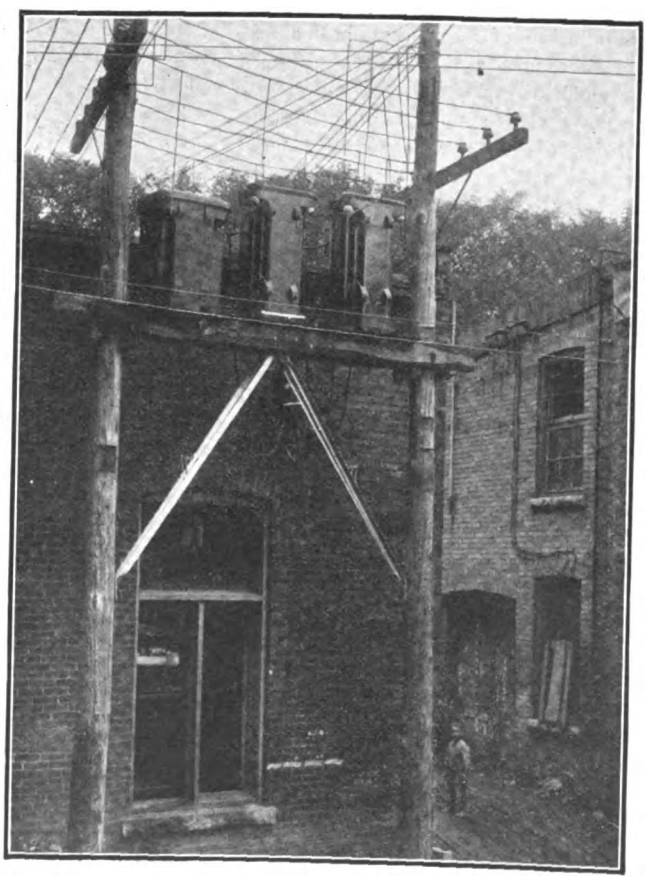
Motor-Driven Air Compressor.

operated crane. The cans that are pulled are placed on the ice-dumping machine and sprinkled with hot water. The cake of ice automatically slips out of the can and travels down a chute to the ice-storage room. The empty cans are then filled, by means of a can filler, with city water, which passes through two filters, and replaced in the tank.

There is a system of piping running between every row of cans connected to a source of compressed air. This piping has rubber-tube connections, which are attached to the can, the latter being provided with air ducts leading to the bottom of the can. The current of air passing up through the water causes the impurities and discoloration to rise to the surface, and the ice is subsequently scraped. Compressed air is furnished by a Gardner 8 by 8-inch double-cylinder air compressor belted to a 15-horsepower induction motor, and a 6-by-6-inch air compressor of the same type and make belted to a 10-horsepower induction motor. The brine in the ice-making tank is circulated by a two-horsepower vertical induction motor direct-coupled to a circulating pump.



50-Horsepower Motor Driving 25-Ton Ammonia Compressor.



Service Entrance at Rear of Ice Plant.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Details of Cincinnati Appliance Campaign.

When it is stated that the sales of electrical appliances by the Union Gas & Electric Company, Cincinnati, O., in July of this year ran approximately 167 per cent ahead of such sales for the corresponding month of last year, it requires no great perspicacity to arrive at the inference that there has been some vigorous and effective work in that direction. The company's special campaign, inaugurated this spring and operated through its accessory department, in charge of R. E. Flower, manager of the "Electric Shop," is directly responsible for the increase.

The success with which the campaign has met, and the interest manifested by Cincinnati consumers in the variety of electrical appliances for domestic use which are now on the market, and sold by the company, is especially remarkable in view of the fact that cheap gas furnishes such strong competition that in the whole city, which with its immediate suburbs has a population of more than half a million, there are only 11,000 consumers. The work of increasing this number to one more closely approaching the possibilities of the population is a large one, and will be taken up after a campaign for that purpose is fully organized. Just now, however, it can truly be said that the development of the situation is being handled in remarkably successful fashion.

The fact that, as in any city, the possible customers for electrical appliances, on any date, consist only of those who are then using electricity, and that in Cincinnati the Union Gas & Electric Company is the sole concern supplying current to consumers, at once simplified the situation, as far as the attack was concerned. That is, it pointed out that the 11,000 customers on the company's books were those who could be approached, with at least the certainty that they were possible buyers of electrical goods. This, coupled with the resulting fact that these customers are directly approached monthly with their bills, formed the foundation for the campaign which has been conducted for the past few months by Mr. Flower.

The billing system used by the company, in line with that of progressive central-station companies everywhere, includes the division of the city into convenient districts, enabling a single force of meter inspectors to be kept at work constantly, and distributing the payment of the bills over the whole month. In Cincinnati there are six districts, the bills being sent by mail. Following out the line of action indicated, the same two-cent stamp which carries the bill to the customer has for some time past also carried a slip or folder calling his attention definitely to some one or more appliances, and making a specific price on it.

Frequently, for instance, these slips took the form of coupons, worth a certain amount in cash upon the purchase of designated goods. One such coupon was good for five dollars on the purchase of an electric washing machine, and another for four dollars on a combination offer of an electric iron and stove. It is not in human nature, especially the feminine half of it, to throw away lightly bits of paper of this potential value; and these coupons, and others of like nature, have proved especially valuable in securing business.

The business is actually secured, however, not by this advertising matter alone, but by close follow-ups through a compact and efficient sales force working out of the Electric Shop. It consists of 20 men, who cover district after district, beginning the day after the mailing of bills in each, for the specific purpose of selling the goods which have been advertised to the consumer that month. This means not only concentration of the sales force upon electric consumers only, and in given districts, but concentration upon certain goods, which have just been brought to the attention of those upon whom the salesmen call.

An important aid to the men in covering the field consists of an extraordinarily complete card-index of consumers, which, made up from the information on the company's books and gathered by salesmen on previous visits, covers every customer completely. Each card shows full details concerning the residence of the customer, as to the number of rooms and the like, and also shows in detail what appliances are already in use by the customer. This gives automatically a list of those which may be sold to him, as well as furnishing a possible means of attack through his favorable experience with those in use.

Each salesman, on entering a district, takes with him 50 of these cards, representing 50 consumers whom he is to cover in that district in the period immediately following the mailing of the bills. It takes several days, as a matter of course, to cover this many, and records of the work done are shown on the cards, in spaces provided for that purpose. The customer's interest in any particular device, demonstrations, trials, engagements for another call, are all shown, in order that no detail connected with a possible sale may be lost.

In this manner virtually the entire city is covered completely every month, by salesmen who, as time progresses, not only have an increasingly accurate knowledge of their individual customers, brought about by regular contact with them, but also an extremely detailed familiarity with the goods which they have to sell and the conditions under which they have to be sold and operated. Moreover, there is no apparent reason why this system, expanding with the natural increase in the number of customers, should not be continued indefinitely. As the list of goods is covered, a fresh start is made, covering it again.

The list carried on the card, however, shows that there is a sufficiently wide range for sales work with the average customer to take some time to cover thoroughly, as it includes heating pad, iron, toaster, percolator, vacuum cleaner, sewing-machine motor, washing machine, fireless cooker, curling iron, vibrator, range, reading-lamp, portable lamp, chafing dish, Mazda lamps, fans; and the extent to which the list of usable domestic accessories has been added to in the past few years indicates that further additions may be expected, almost without limit.

An especially interesting feature of the sales work of this department lies in the effective application of a merit rating system for the salesmen, which keeps the manager in close touch with their work and offers a direct incentive to the men to keep going at their best

Digitized by Google

rate. The fact that they are paid on a combination of salary and commission guarantees that each will receive approximately what he earns, and no more; but the rating system referred to is an extension of this.

It consists in a complete scoring schedule, under which every sale receives credit in the shape of points, while each lapse is marked in points deducted. One point, for instance, is credited for each dollar's worth of sales, plus another for each 50 watts' consumption added by the device sold; this is for the purpose of impressing the fact that what the company is trying to accomplish is not merely the sale of goods, but the increase in the load through an increase in the consumption of current. Ten points are credited for each hour of overtime work, whether in the office or with a customer, and ten are given for a new sales idea of value.

Deductions from credit include ten points for carelessness in reports, and the like; for tardiness; for each half-day lost, except for illness; for delayed execution of a customer's order or in filling an appointment; and others of a like nature. Thus each salesman's score, which is kept up to date daily, shows accurately what he has been doing in the way of actual work; and while the contest itself keeps the men keenly interested, as any real contest will, an added incentive to effort is given in the shape of cash prizes for the top and second men each week, of six and four dollars, respectively. And, as the records are made up daily by Mr. Flower, he is necessarily kept in extremely close touch with each man's work, which is in itself a point of considerable value.

The remarkable increase in the amount of business secured indicates sufficiently the success of the systematic selling effort being conducted, and promises well for the upbuilding of the company's business. With the application of similar methods to increasing the number of consumers, through a house-wiring campaign and by other means, it is certain that an immense advance in the domestic use of electricity in Cincinnati will be seen within the next year or so, in view of the large proportion of the population now not using current in any form.

New Offices for Beverly Company.

The Beverly Gas & Electric Company, Beverly, Mass., has just moved into its new building, on Cabot Street in that city. The company occupies one-half of the entire lower floor and the basement, as offices, stock and display rooms. The front lobby is finished in white marble and contains an attractive display of electric stoves, table appliances and lamps. In the basement are cabinets for the storage of lamps and shades.

New Office Building of Beverly Gas & Electric Company.

The company serves over 1,500 lightings customers and its power customers number nearly 100. The territory served includes, besides Beverly, the towns of Wenham, Topsfield and Hamilton, and the company sells energy to the Manchester Company. According to the last returns its kilowatt output for the year was 2,258,356 kilowatt-hours. The maximum net rate is 11 cents, with $1.00 monthly minimum. No free renewals are given.

Central-Station Service for Beef Warehouse.

Electricity has an important place in the operation of an up-to-date wholesale beef plant, in the conveying of the product to and from storage, the supply of cold air for refrigeration and the lighting of the storerooms, which of necessity are artificially lighted.

The Boston Edison Company has recently closed a contract with E. C. Swift & Company, Boston, Mass., calling for energy for power and light for a modern refrigerating plant that is said to be the finest of its kind in the world. The main "beef box" for the storage of dressed beef is 88 by 58 feet and has a capacity of 10 carloads, or 250 whole cattle, with a total weight of 250,000 pounds.

The walls are constructed of cement, with a three-inch cork insulation and glazed white tiles. Cold air blasts are supplied from the Quincy Cold Storage & Warehouse Company by motor-driven fans, and the interior is lighted by means of six rows of seven 25-watt Mazda lamps arranged in series and controlled by a push-button switch at the end of each line. Beef is run into the storeroom on Duncan overhead tracks, and elevated to other parts of the building, where smaller storerooms are provided, by means of two 3,000-pound Otis freight elevators operated by seven 5-horsepower motors at 900 revolutions per minute, located in monitors on the roof.

A sample room, egg and poultry rooms and freezer are also electrically chilled and lighted. The temperature of the main refrigerator is kept at 34 degrees and of the freezer at about 20 degrees.

The firm has expended $100,000 on the new plant, which has been under construction since March.

New Lighting Installation for Paducah.

Merchants along Broadway and the retail sections of the cross streets in Paducah, Ky., have tired of supporting the "white way" which has served that thoroughfare for two years and will leave the project in the hands of the city commission. Representing the Retail Merchants' Association, a committee has asked that the city continue to supply the present system until the first of the year, after which it is suggested that a system of ornamental standards be provided for. The present white way was originally a temporary affair, designed for use during a street carnival, but continued because of the good effect produced. The current for the installation has been supplied by the Paducah Light & Power Company.

Digitized by Google

SUCCESSFUL COMMERCIAL MANAGERS.

Thomas F. Kelly.

There is perhaps no company that enjoys a better reputation for progressiveness and originality in sales activities than the Dayton Power & Light Company, of Dayton, O. In spite of the disastrous flood of 1913 and the business depression during a large part of 1914, the business of the company has increased at an astonishing rate and indications now point to a greater increase for 1915 than during either of the two previous banner years.

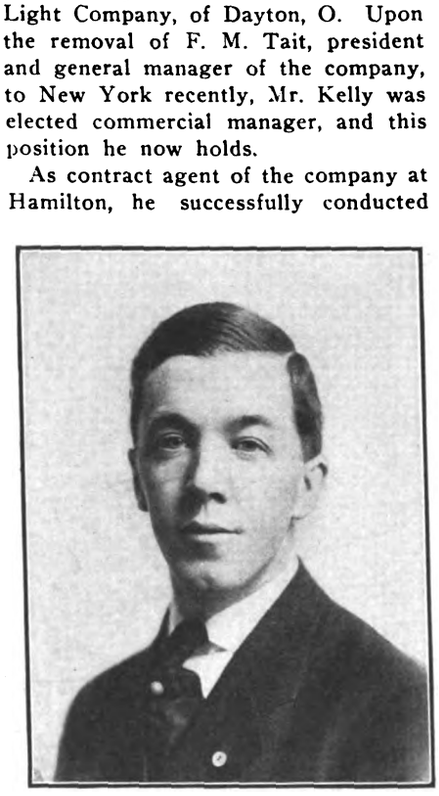
To achieve the success which it has the Dayton Power & Light Company first, has always been keenly alive to the value of the "public-be-pleased" policy and has followed this rigidly. Next in importance has been the consistent and intelligent work of the sales department in familiarizing the public with the economy and conveniences of electric service for both lighting and power. Aside from the ordinary methods of obtaining business, however, many original sales and publicity ideas have been carried out in Dayton, and an appreciable share of the new business secured during the past two years can be attributed to these activities.

Thomas F. Kelly, until recently sales manager of the company, is largely responsible for the advances that have been made since 1913, and to him belongs credit for the originality which has characterized the work of the sales department. Mr. Kelly is a firm believer in newspaper advertising, whether in paid space or in the reading columns. Very frequently the Dayton Power & Light Company is engaged in some activity, either civic or industrial that is of real news value, but if such opportunity for favorable publicity is not at hand Mr. Kelly promptly creates some situation that will bring the name of the company before the public and emphasize the value of electric service. For instance, on a hot, sultry morning recently Mr. Kelly had 16-inch oscillating fans placed on the lighting standards of two of the principal streets in the shopping districts. While the fans were placed simply as an advertisement many shoppers actually found comfort in the cooling breezes, and the newspapers promptly heralded the act as another evidence of the concern of the company for the welfare and comfort of the community.

This was just one of the many stunts carried out by Mr. Kelly to keep the subject of electric service but more particularly central-station service always before the people of Dayton. That this policy has been successful is proved by the new business secured.

Thomas Fitzgerald Kelly was born at Hamilton, Ontario. In 1900 he entered the employ of the Hamilton Electric Light & Power Company as office boy. He quickly advanced through the various departments and was appointed contract agent of the company in 1907. He remained in that capacity until he resigned in January, 1913, to become sales manager of the Dayton Power & Light Company, of Dayton, O. Upon the removal of F. M. Tait, president and general manager of the company, to New York recently, Mr. Kelly was elected commercial manager, and this position he now holds.

As contract agent of the company at Hamilton, he successfully conducted



Thomas F. Kelly,
Commercial Manager, Dayton Power & Light Company.

many business-getting campaigns and many new features connected with the sale of electric light and power in Canada saw their first "light" at Hamilton.

While at Hamilton he was very active in civic affairs, in the work of the Canadian Electrical Association and the National Electric Light Association of Canada.

Mr. Kelly was one of the organizers of the Hamilton Ad Club, being its first secretary, and was re-elected for a second term, resigning as secretary when he went to Dayton.

He was the first chairman of the Commercial Section of the Canadian Electrical Association, and was the author of many papers at the annual conventions of this Association.

Mr. Kelly organized the Hamilton Electric Light & Power Company Section of the National Electric Light Association and was appointed its first president. He was unanimously re-elected for the second term, resigning when going to Dayton.

Although Mr. Kelly's connection with the Dayton Power & Light Company started less than two months previous to the flood, which visited Dayton in March, 1913, the year 1913 showed a net increase of customers served in the Dayton district alone of 33 per cent. This was considered exceptional, but was the result of the efforts made to have homes in the flooded district wired while they were being papered and redecorated. The company shortly after the flood rented from the Federal Sign System (Electrical) nine blue-enamel steel signs reading "Wire Now" and had them installed on the store fronts of the different electrical contractors in Dayton. This publicity, coupled with timely newspaper advertising bearing one of the wiring campaign slogans of the company, "Wire Now—Ask Us How," was one of the many plans used to secure this increase.

In spite of the conditions existing during 1914 the company had a net increase in customers served in Dayton district of 26 per cent.

Mr. Kelly has been in charge of the business-promotion work and since his connection with the company, it has secured the Water & Electric Light & Power Company at Wilmington, the electric light and power property at Cedarville (serving Cedarville, Clifton and Yellow Springs) the Municipal Electric Light & Power Plant at Osborn and in addition it has secured franchises and street-lighting contracts at New Carlisle, Fairfield and Bowersville.

At Dayton Mr. Kelly has also been very active in civic affairs, the Jovian Order, the Ohio Electric Light Association, the National Electric Light Association and the Electric Vehicle Association of America.

Mr. Kelly is an active member of the Retail Merchants' Bureau of Dayton and of the Greater Dayton Association. As a member of the Association he is chairman of the Community Christmas Tree Committee and of the Publicity Committee. He is an active member of the Dayton Advertising Club and is captain of one of two "efficiency" teams.

About January 1, 1914, there were about fifteen Jovians in Dayton when Mr. Kelly was appointed statesman and during his administration 178 new candidates were initiated into the Order.

At the annual convention of the Jovian Order at St. Louis, in October, 1914, he was appointed, under the change in the constitution, statesman for the state of Ohio.

In 1913 he was appointed chairman of the Committee on New Business Cooperation of the Ohio Electric Light

Digitized by Google

Association, and because of his interest in this work was re-elected chairman at the convention of the Association, held at Cedar Point in July, 1914. At the convention in July, 1915, he was made chairman of the Advertising Committee.

As chairman of the Committee on New-Business Co-operation for the past two years Mr. Kelly has conducted a series of co-operative meetings, which have established a precedent in Association affairs. Large attendances, running as high as 200, have characterized the gatherings, at which excellent programs dealing entirely with new-business topics have been presented.

In October, 1914, he was appointed by President H. H. Scott of the National Electric Light Association, chairman of the State of Ohio Membership Committee of the Association, and since that time Company Sections have been started at Dayton, Cincinnati and Mansfield, and Mr. Kelly is actively endeavoring to have Company Sections formed at Cleveland, Columbus and Youngstown. When the Company Section was formed at Dayton, Mr. Kelly was unanimously elected its first chairman.

Mr. Kelly was a member of the Membership Committee of the Electric Vehicle Association in 1914, and was reappointed by President J. F. Gilchrist for 1915. He is also a member of the Engineers Club of Dayton and of the Dayton City Club.

Outdoor Illumination by Large Units.

The new standard for outdoor illumination set by the lighting of the San Francisco Exposition is being emulated in the larger cities of the country, and it is probable that within a short time many beautiful buildings will be thrown into luminous relief by light rays from concealed sources. The Louisville Gas & Electric Company has just made arrangements to illuminate the front of the new Bernheim Building in this manner. Five projectors to be located on a roof across the street from the building will transmit the light from 500-watt type C Mazda lamps. The agents for the building are to use this method of advertising to attract desirable office tenants.

Minot Company Builds Line to Burlington.

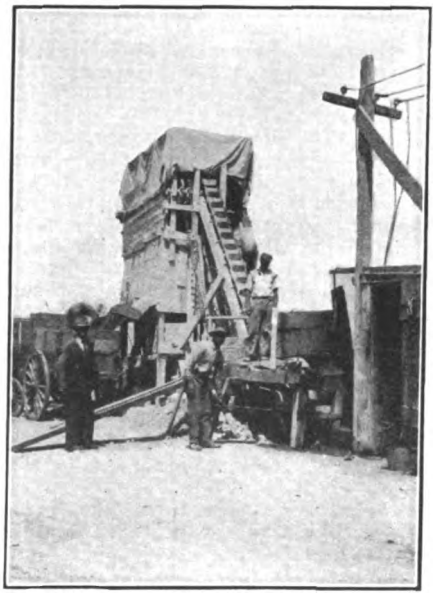
The Consumers Power Company, Minot, N. D., a Northern States Power Company subsidiary, is constructing an eight-mile extension of its lines to serve the town of Burlington, N. D. Burlington is a thriving community and about 50 houses are being wired.

Portable Stone Crusher on Central-Station Service.

An electrically operated stone crusher is an important part of the field equipment of Clark & Gore, Boston, who are constructing a section of Commonwealth Avenue in that city, with wood block on concrete.

This crusher, which has a capacity of about 100 tons a day, is located in an intersecting street, and to it is hauled by team the Telford stone paving with which the street was originally laid, consisting of large boulders and Roxbury pudding stone. This rock is crushed to a two-inch and one-inch aggregate, to enter into the composition of concrete for the new roadway.

The crusher rests on 12-by-12-inch



Portable Electrically Operated Stone Crusher.

parallel timbers 40 feet long, and in a motor house on the same frame is installed a 35-horsepower Crocker-Wheeler induction motor which operates on Boston Edison Company service, 900 revolutions per minute at 220 volts. The motor operates the crusher and also a bucket conveyor which carries the crushed stone about 25 feet to discharge chutes from which teams are loaded. The belt connecting the motor with the driving wheel is 10 inches wide and about 20 feet long, and the motor and crusher being on the same timber framework, gives rigidity to the apparatus. A 30-kilowatt transformer is located on a pole at the street curb.

When the crusher is to be moved, the timbers are raised and set upon low wheels and the whole apparatus moved as a unit by a steam roller. A section of 3,700 linear feet was served from two positions of the crusher.

Great economy was effected in not having to haul the rock a long distance to a permanent crusher, and then re-haul the crushed stone to the job, as the readiness with which the machine is moved places it within close reach of the work on which it is engaged, and in locations where steam operation would be highly objectionable, if not prohibited.

Civic Celebration Marks Inauguration of New Street Lighting in South Boston.

An improved system of street lighting on Broadway, between Dorchester Street and Dorchester Avenue, South Boston, Mass., was opened on August 16, with a public demonstration which included a parade, band concerts and a speech by Mayor Curley.

The installation consists of 69 6.6-ampere magnetite arc lamps with standard equipment, erected on 18-foot poles, following the practice of the Boston Edison Company in placing lamps with a view to utilitarian rather than spectacular considerations.

The poles are of metal pedestal and cap with wood shaft, and are set in concrete bases, the units being located opposite to one another on either side of the street, which is 43 feet between curbs, and spaced on 125 to 150-foot centers. The lamps are divided on two circuits and alternated. They replace 50 standard arcs on gooseneck poles.

Water-Heater Campaign in Boston.

The Edison Electric Illuminating Company of Boston is conducting a novel campaign for the introduction of the Cutler-Hammer water heater, which is advertised to boil water in 45 seconds.

A frame in the show window contains 25 horizontal panels, one above another, each bearing figures beginning with $25 and diminishing to $1 at the bottom. At the right is a placard which says: "One dollar off every day until sold. What price will it sell at? The frame is lighted by a lamp contained in a hooded reflector, and a sample of the apparatus is displayed in the window.

El Reno Company Builds Line to Serve Indian Agency.

An extension of nearly seven miles of transmission line is being constructed by the El Reno Gas and Electric Company to serve the Indian Agency and the El Reno Vitrified Brick Company. Other business along the right-of-way which will probably be secured includes light and power for Fort Reno, Rock Island Railway pumping load and a considerable amount of irrigation power and other business from the farmers.

Digitized by Google

Electrical Construction

Examination of Electricians in Massachusetts.

The first of the examinations of applicants for certificates and licenses under the new law in Massachsetts, which requires employing firms and journeymen workers to take out certificates in evidence of their fitness, were held in six cities of the state on August 11, and were in charge of members of the Examining Board or their agents. The following numbers of candidates took the examinations in the two classes: at Boston, 137; Lowell, 44; Springfield, 53; Worcester, 50; Fitchburg 35; Pittsfield, 13; total, 332.

The examinations were held at city halls or other public places, and consisted of questions formulated by an agent specially employed by the Examiners, as the clerk, who is the only technically trained man connected with the Board, was not selected in time. The latter will, however, mark the papers and announce the results.

It appeared that several men took the examination without first having filed a formal application. In order to cover candidates for certificates who were not informed as to the date and place of the local examination through not seeing the advertised notice, an additional examination was held at Boston August 25, when a different set of questions was propounded for answer.

The law requires two examinations in each of several convenient centers each year.

The following were the questions to which answers were required, in writing, from Class "A" applicants; i. e., employing electrical contractors:

1. Explain with sketches the ordinary three-wire system as used by the Edison Company. Show how it is possible for the system as a whole to be in balance and yet to be very badly out of balance in some places where it would be a source of danger.
2. Make drawings to show how you would distribute the lighting circuits of a large office building to be served from a low-voltage three-phase system. Any good method will be satisfactory if it can be operated with a supply voltage permitting direct connecting of the lamps.
3. Calculate the size of wires to be used for the following motors: 10 horsepower, 220 volts, 85 per cent efficiency, direct current; 5 horsepower 110 volts, 80 per cent efficiency, three-phase, 60 cycle; 100 horsepower, 2,300 volts, 90 per cent efficiency, 25 cycles, three-phase.
4. What methods are used to protect from mechanical injury the various kinds of insulations used on interior conductors of all kinds?
5. What are the provisions in the N. E. C. for the use of flexible tube?
6. What are the rules covering the use of transformers inside of buildings? When might it be necessary to so place transformers?
7. How are the several parts of interior conduit work grounded? Is the common method thoroughly satisfactory?
8. What is the difference between a three-wire system and a three-phase system as far as the installation work is concerned in a lighting layout? Draw two methods of planning for the three-phase layout.
9. How is a storage battery charged from a generator which is also supplying the lights which will later be supplied by the battery? Make sketches of the wiring used or other devices.
10. In general what are the principles governing the installation of electric heating devices?

Questions on the National Electrical Code.

1. What rule applies to the use of electric lights and gas-lighting wires on the same fixture?
2. What rule applies to the use of an incandescent lamp as a dimmer for an arc lamp on an incandescent circuit?
3. What controls the size of a fuse at a branch circuit?
4. How must a ground wire be run through a building?
5. What rule applies to the use of alternating current in iron conduits?
6. How should an economy coil of an arc lamp be installed?
7. What is the smallest size of conduit permitted?
8. How many small electric fans can be wired from one fuse block?
9. How is a ground wire connected to the ground?
10. Where may you use fused link rosettes?

The following examination was for Class "B" certificates, i. e., journeymen's:

Questions on the National Electrical Code. Give in your answer either the number or numbers of the rule, the exact wording of the rule, or the substance of the rule, as you may prefer; and if you so desire, add any explanation or reason for the rule. Answer any ten questions.

1. What rule applies to the use of electric lights and gas-lighting wires on the same fixture?
2. What rule applies to the use of an incandescent lamp as a dimmer for an arc lamp on an incandescent circuit?
3. What controls the size of a fuse at a branch circuit?
4. How must a ground wire be run through a building?
5. What rule applies to the use of alternating current in iron conduits?
6. How should an economy coil of an arc lamp be installed?
7. What is the smallest size of conduit permitted?
8. How many small electric fans can be wired from one fuse block?
9. How is a ground wire connected to the ground?
10. Where may you use fused link rosettes?
11. Where and under what conditions may slow-burning wire be used?
12. For concealed knob-and-tube work, what is the correct spacing of insulators and height of knobs?
13. Under what conditions may a single-pole service switch be used?

Questions to be fully answered in a manner that would be satisfactory if giving instructions to one seeking information. Answer four.

A. Make a sketch showing the necessary wiring and connections in order to control a single light from two places. From four places.
B. How may the three wires of an Edison circuit be quickly identified? Does your method indicate the polarity and if not how could you tell?
C. What is a hickey and where and how used?
D. How would you ground the various parts of a BX job?
E. How could you make a good ground detector suitable for constant use on a two-wire plant?
F. How could you tell whether or not a circuit was connected to an alternating-current supply?

Contracts Open.

The Belvidere (Ill.) Board of Education will receive bids until September 10 for the electric wiring, fixtures and telephones for the new high school.

City Electrician W. E. Barclay has prepared plans for a new police and fire-alarm system for Aurora, Ill. The proposed system will cost about $25,642. The matter is now before the City Council.

W. A. Thomson has plans to erect a $70,000 grain elevator in Louisville, Ky., to be electrically operated. It is stated that the Burrell Engineering Company, of Chicago, probably will get the contract. The elevator would cover 1,500 square feet and be 150 feet high, with bins 65 feet high, and would be capable of handling 100,000 bushels of corn daily.

Digitized by Google

Wiring and Conduit Work at the Panama-Pacific Exposition.—I.

By A. A. Willoughby, Pacific Coast Correspondent.

The designing of a system for the distribution of electrical energy at the Panama-Pacific International Exposition involved the careful consideration of many factors, both commercial and engineering, that rarely enter into the design of standard underground construction. The main idea to be kept in mind was the cost of installing a system which while it must be ample to cover all contingencies that might arise, yet would be constructed for only very temporary use. The intent of this article is to point out the factors that influenced the design of the system that was finally installed and designers of electrical distribution systems may be able to glean ideas helpful from the standpoint of preliminary design as well as the installation and operation of such a system. Guy L. Bayley has been chief electrical and mechanical engineer and L. F. Leurey, his assistant and engineer of operation and maintenance since the organization of the department.

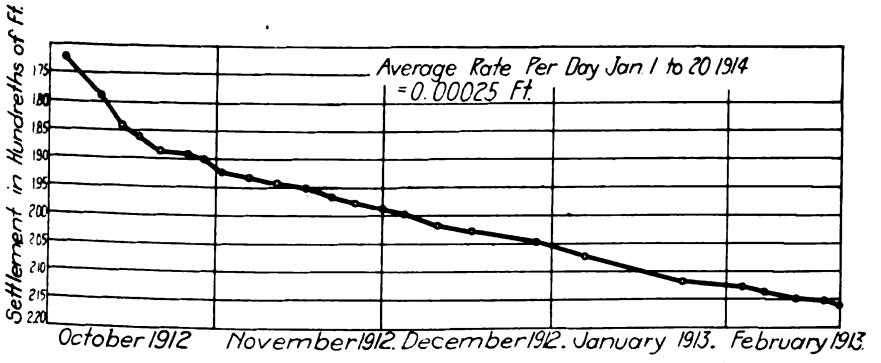


Fig. 1.—Curve Showing Rate of Settlement of Ground.

The results attained have been admirable. There has been perfect continuity of service at all times, no interruptions having been recorded since opening day and the cable system has proven itself capable without additions to the initial design, of handling all the changes in physical conditions that have arisen since the inception of the original Exposition plans. Construction costs were kept at a low figure and yet the system was as carefully designed and installed as if for permanent use, whereas its life is but for a few months. The main feature of the system lies in its flexibility and its ability to assimilate readily the various loads, particularly during the night illumination period.

A preliminary scheme covering the scope of illumination and commercial lighting and power was made as soon as the ground plans of the Exposition site had been detailed and definite roads, parkings and building locations had been determined. The illumination plan has varied but slightly from the original scheme adopted. The amount of power required for illumination was readily determined and would naturally be subject only to minor changes. The power which would be required for the exhibitors and the amusement and state and foreign sections was a more or less indefinite question up to within three or four months of the opening of the Exposition. Many factors absolutely unknown were constantly entering into this section of the work, resulting in a continually varying load characteristic from month to month. Consequently any distribution design that would be sufficient to meet the possibilities of the situation had to be ample in its allowance for contingencies and had to cover completely in its scope every individual section of the Exposition grounds.

Numerous and sudden changes later on in the Exposition period in the groupings and size of the state and foreign buildings proved the wisdom of having a cable system as complete as was installed, because changes were continually occurring in this section up to within a short time of the opening day. Not being able to forecast exactly the extent of the participation by foreign countries, the tendency of the engineers was to install a cable system as flexible as possible, having a sufficient number of cables and these so interlocked by ties that the loss of some cables could quickly be compensated for by readjusting the loads among the remaining good ones.

That so liberal a layout could have been planned was due to an advantageous contract made between the Exposition company and the Pacific Gas & Electric Company, which company fortunately had an operating system of such magnitude that it offered unusual possibilities of absorption of equipment at the close of the Exposition. Had the Exposition been compelled to purchase all of its equipment outright, with a large initial investment and shrinkage in value at the finish, a far less comprehensive system would have been installed, it being an almost universally recognized axiom in work of this character that economy in first cost far outweighs all other considerations. Consequently a much more complete system, more certain of successful continuous operation, was made possible through the contract with the Pacific Gas & Electric Company.

The contract embodies three main features, as follows:

(1) The furnishing of all illuminating gas used in the grounds, the Exposition acting as a retailer.

(2) The furnishing of electrical energy at the busbars of the power company's station, situated adjacent to the grounds, the Exposition being the retailer and to a very large extent, the consumer.

(3) The rental to the Exposition of all power apparatus used by the Exposition for transforming and distribution purposes, including pole-type transformers, lead-covered cables, double-braided secondary cables, oil switches, panelboards, overhead line material for the amusement section and outlying sections of the grounds, two 1,000-kilowatt motor-generator sets and two 250-kilowatt motor-generator sets for transforming alternating to direct current for power and lighting and for furnishing energy to the searchlamps in the scintillator and on the roofs and towers.

The basic idea of the contract was the furnishing, besides the energy, of all equipment in the transformer stations and in the distribution system within the grounds, at actual cost plus freight and cartage charges. The Exposition pays a blanket interest rate and is to dismantle and return the equipment to the power company's warehouses at the close of the Exposition period. The initial cost of the apparatus less cartage is to be credited on the return of the apparatus. The principal advantage of the contract from the Exposition point of view was an immediate saving in a large capital outlay for apparatus and enabling the transfer of funds from the blanket allotment allowed the department, and applying these funds towards securing better distribution

Digitized by Google

facilities and a more excellent illumination program than if it had been necessary to purchase the equipment outright. The contract in effect made possible the laying out of an elaborate system throughout, complete in every detail.

Engineering Features.

Practically the entire portion of the grounds where the cable system was laid, occurs in a built-up area. A great deal of the site is dredger-fill silt and sand from the bottom of the bay and consequently low and flat, being but a few feet above maximum high tide and making manhole drainage practically impossible. It was seen by the engineers that it would be difficult to lay out a self-draining duct line without enormously increasing the quantity of fill required for purely building purposes. The sewers and drains occur at such elevations that it was not possible to drain the duct line into either system. Water-filled manholes in turn introduced an unusual operating hazard, calling for more insurance against breakdowns.

The silt and sand fill being subject to more or less continuous settlement, determined the character of the conduit adopted for inclosing the cables. The curve of settlement in Fig. 1, ascertained through careful measurements taken by the engineering department, shows a continual settlement with probable decreasing speed throughout the entire Exposition period. The character of the duct line had to be such as to withstand a maximum of deflection with a minimum of induced strain. The use of concrete was out of the question, due to the fact that it was unnecessarily durable for such a short period and would not stand the strains of deflection due to settlement as well as cheaper material.

Three other types were considered. The first was the installation of a wooden pump-log system, consisting of creosoted duct held together at the joints by heavy stay pins driven in the ground and by bonded ties. The second was the use of a simple type of wooden-stave pipe. The third and the one utilized was one-eighth-inch Linaduct, packed in sand and laid in wooden troughs. This was the cheapest possible form of fiber conduit and has proven unusually successful.

It was laid in lengths varying from 14 to 20 feet. The trough was first lined with approximately an inch of sand. The conduit, having sleeve joints, was laid 0.75 inch apart and to within one inch of the outer walls. Sand having a gradation sufficiently fine as to afford an easy flow, was spread over the first layer of conduit. This was then wetted and sluiced into the interstices and making a layer above the conduit. Successive layers of conduit and sand were placed in position until the trough was filled. The trough covers consist of transverse strips of 1.5-by-8-inch and 1.5-by-12-inch lumber, sawed to size in the shop. The conduit box sections were made up in the shop, roundabout bands being nailed four feet apart and the corners being held by sheet-iron straps. The joints at the end of the box sections were made by scabs extending from one end of each section, making a butt-joint connection between the boxes proper, and extended end of the box being nailed to the next section in the field.

Fig. 2 gives a view of the conduit-laying operations, showing final layer of duct being placed prior to the box cover being put on. The manhole shown is in the low portion of the grounds in the state and foreign section, where the standing water plane is close to the surface, and is known as a shallow manhole, 4 by 4 feet in size. Intermediate U-cleats for stiffening the sandbox are shown.

This type of construction not only met all the expectations of the engineers in combatting deflection due to settlement of the soil but also possesses advantages not foreseen at the time. It was impossible to foresee the numerous openings about and under the lines at different points, undermining the conduit structure in making gas, water and high-pressure fire-service taps, covering not only the Exposition's own activities but also those of consumers. Due to the great rush of construction and the impossibility of inspection at all points where services were being installed, the duct lines were exposed in many cases as much as 6 and 8 feet. In several in-

Fig. 2.—Conduit Receiving Top Layer of Ducts, and Manhole.

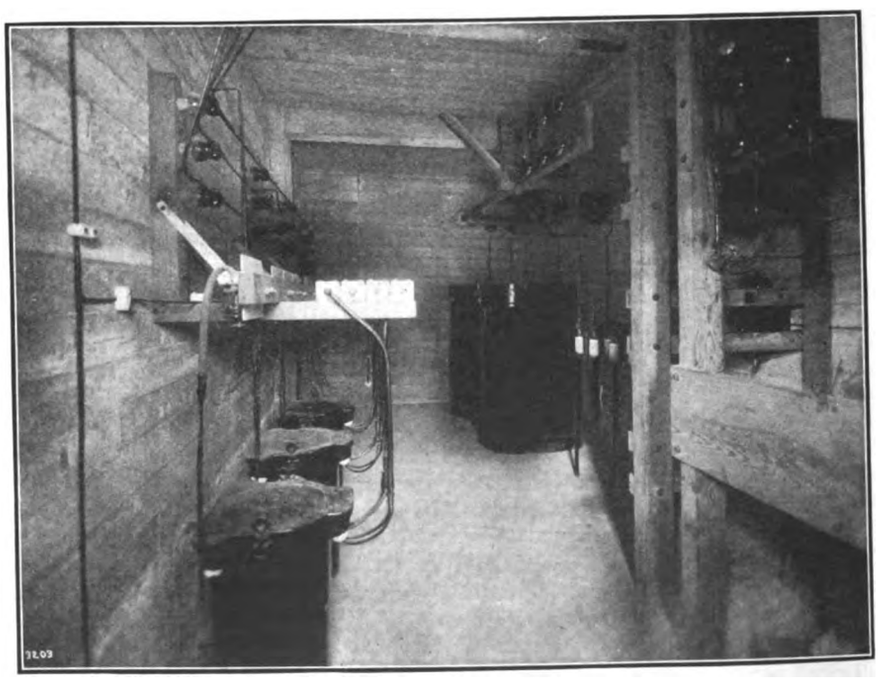


Fig. 3.—Transformer Vault, Showing Cantilever Framework Construction.

Digitized by Google

stances building scaffolding was found resting on the line—in some places immediately over excavations. The most aggravated case of this kind was found where a building contractor had used the duct line as the main sill for his bridge over which he hauled his construction materials. Naturally the line sagged under these strains but not enough to cause any appreciable trouble in installing the cables.

The physical appearance of the ground had a great deal to do with the designing of the distribution system. The engineers were able to foresee that it would be impossible to install branches and services until the character of the loads to be carried had developed and permanent plans had been adopted for the various buildings and consumers' locations. To minimize cutting the macadam and asphalt pavements for late service connections, necessitated the location of the main trunk lines as far as possible in the garden strips and parking spaces adjacent to the roads on the side next to the buildings. While this had many advantages, it led to some complications in routing the trunk lines to avoid future planting of large trees and the avoiding of kiosks and small buildings bordering the avenues. Other complications occurred during the construction of the lines due to the vegetation and flowers already planted. The chief obstacle encountered was in the disposition of the parking spaces which were terraced around the main group of exhibit palaces for architectural reasons, so that in crossing under the various court entrances, the lines had to be depressed as much as four feet below the terrace levels. By the plan of using the parkings, more manholes were required than if the conduit had been laid in the streets, but the extra cost has been more than balanced by the added advantages, particularly in the ease in making extra service taps. A considerable saving was effected through the use of the parkings rather than the streets adjacent to the buildings, in the lesser amount of cable necessary between the main source of supply and the transformer vaults in the various buildings.

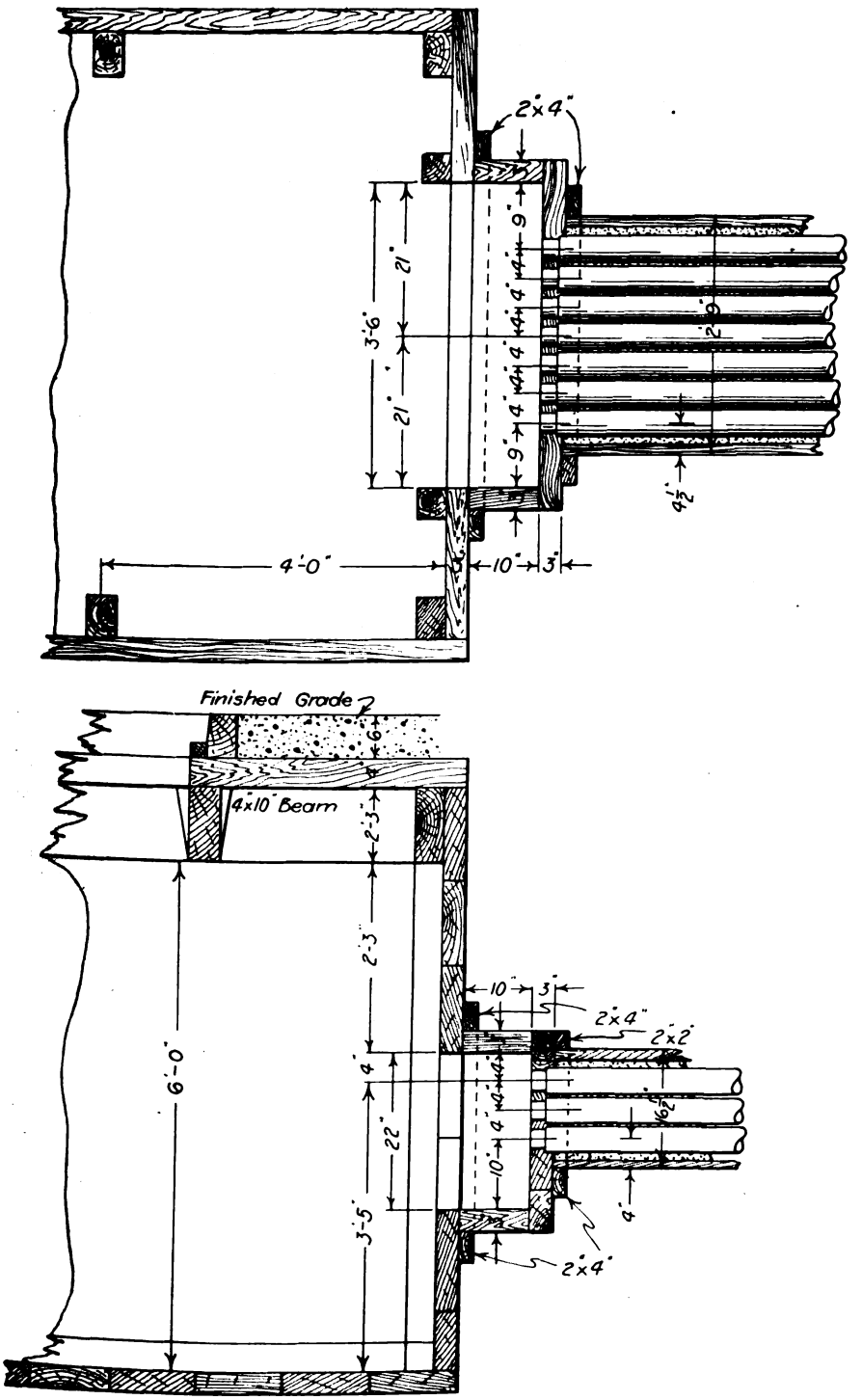


Fig. 4.—Horizontal and Vertical Section of Manhole.

Type of Manholes.

The manholes were built of selected Oregon pine dipped in carbolineum, and were built up in the field, with the exception of the covers, which were constructed in the sawmill. The covers are carried on wooden beams supported on vertical posts at the sides of the manhole. While a number of manholes are situated in the parkings, all covers were designed to withstand the maximum traffic load that could come over them. All the manholes were designed with a flexible neck-piece so as to permit raising and lowering according to the grade, which varied greatly in places, owing to changes in landscape elevations. Some of the manhole necks are as short as 6 inches, while others are as deep as 2 and 3 feet. The conduit manholes were purposely depressed several inches below grade with this in view and in cases where future conditions were uncertain or unknown, greater depression was allowed. The extra long manhole necks were utilized wherever the duct lines had to be depressed to unusual depths, as in the case of railroad tracks entering the exhibit buildings below terrace levels. This effected a considerable saving in manhole construction costs, as it was cheaper to extend the necks to the surface than the full manhole.

Another help toward economy was the type of cable entrances to the manholes. This entrance or wart, as it is termed, consists of a box made up in the shop and having a depth of 12 inches. This box was nailed on the face of the manhole proper at the point where the cables enter. (See Fig. 4.) The outer face of the wart was bored to correspond with the inside diameter of the conduit and

Digitized by Google

counterbored for a depth of one-half-inch, slightly larger than the outside diameter of the conduit, to provide a thrust for the same and to form a beginning point for the conduit men to commence operations. The procedure followed was to open the trench and to nail the wart at the point of cable entrance, the planking of the manhole having been sawed out previously. The principal economy in the use of warts is that they made the manhole actually constructed equivalent to a manhole two feet longer. The bending of the cable was begun inside the wart and carried around through the manhole and into the other warts. This made possible much smaller manholes and greatly reduced excavation costs.

The type of manhole cover which was installed is a simple wooden cover, dropped into a beveled recess frame which is a part of the manhole neck previously mentioned. This type was used throughout the higher portion of the grounds, where the manholes were of standard depth to comply with existing state laws, which call for five feet clearance. In the State and Foreign Section, where the standing water plane is close to the surface of the ground and where it is impractical to dig to the standard depth owing to the continual flooding, it became necessary to make the covers equal to the full size of the manhole, and in two sections for easy handling. In these sections the manhole is four feet deep and when open, the workers have full clearance above and around them.

The above described conduit plans were followed throughout the grounds with the single exception of the main trunk-line cables between the substation and the main group of exhibit palaces. Due to the quantity of cable employed in these trunk lines, the duct was built in two sections of standard concrete construction for safety, with the exception of the manholes, which were of wood. The cables were niagrated when passing through the manholes. When the trunk lines reached the first group of buildings, practically one-half the cables were run around the main group of buildings on the north side and the other half by way of the south side and the main entrance gates. The gate cables were designed for a two-fold purpose —to provide efficient distribution for the isolated buildings in that section and the illumination units in the South Gardens and to form an additional tie for the State and Foreign Section.

(To be continued.)

Among the Contractors.

The Union Electric Company, of Nashville, Tenn., has the contract for electric wiring in the new Parrish apartment house, which is under construction, and also for a new bungalow being built for Mrs. Eura Lee McLain.

Herbrick & Lawrence, of Nashville, Tenn., are handling the electric wiring in the new Plater residence in that city.

The Hub Electric Company, 1819 Carroll Avenue, Chicago, is distributing brass foot rules containing an inch scale on one edge and upon the other two draftsman's scales of one-eighth inch to the foot and one-quarter inch to the foot. They are very handy and useful rules.

Meeting of Toronto Contractors.

There will be a convention of electrical contractors at Toronto, Canada, September 6, 7 and 8. Meetings will be held at 2 College Street. The following program has been arranged:

Address on "Organization and Its Merits, with Particular Reference to Our Organization," by E. A. Drury, Toronto.

"Licensing of Electrical Contractors. What other cities have got, and how we should work towards getting the License." (Speaker to be selected.)

"Do it Electrically," by Walter Carr.

"Rules and Regulations of the Hydro-Electric Power Commission of Ontario," by H. F. Strickland.

"Proper Accounting System for Electrical Dealers and Contractors." (Speaker to be selected.)

"Workmen's Compensation Act of Ontario as it affects Electrical Contractors," by E. M. Trowern.

"The Possibilities of Advertising in the Electrical Business," by Frank H. Rowe.

"The Relation of the Trade Newspaper to the Electrical Trade and to the Association," by J. C. Armer.

"The Relation of the Jobber to the Dealer and Contractor, and the Jobbers' Function in the Trade." (Speaker to be selected.)

"The Re-Sale Problem," by G. T. Dale.

"Competition from Power Companies and Municipalities," by George W. Hill.

General Discussion and Suggestions.

(a) Consideration of the advisibility of establishing a Provincial Organization.

(b) Making this Convention an annual affair.

Public Service Commissions

Conducted by William J. Norton

IDAHO.

Idaho Traction Company. In holding that the Commission is without authority to require the Idaho Traction Company and the Boise Railway Company to enter into an agreement for the transfer and exchange of passengers, the Attorney General says: "A due regard for the orders of this Commission by those public service corporations over which this Commission has jurisdiction, requires, upon the part of your honorable Commission, a most rigid observance of the limits of that jurisdiction, and in those matters wherein the legislature has clearly not conferred jurisdiction, an assumption of such jurisdiction would argue for a similar disregard of legal and statutory obligations by those companies over which your honorable body is, by law, invested with supervisory powers."

MAINE.

North Yarmouth Water Company. The Commission refused to grant the company's application for authority to issue securities, holding that bonds should not be authorized without a substantial stock margin. The opinion in this case is based on the policy outlined in the Black Stream Electric Company case. (ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, May 22, p. 955.) From the facts in the case it appears that all of the cash paid in as capital was withdrawn; that the corporation parted with all its tangible assets except real estate, which cost $100, and pipe, etc., not exceeding a value of $300; and that it ceased to do business. The company still holds its franchise, and now seeks

Digitized by Google

to re-establish its business, and for this purpose asks authority to issue 20-year five-per-cent mortgage bonds of the aggregate amount of $10,000. The Commission says that although the amount involved is small the policy of the Commission should be made clear.

The Commission finds that the company is practically a new corporation seeking authority to secure its entire capital and that the case comes under the policy adopted in the case of the Black Stream Electric Company.

"While the original certificates of stock are still outstanding, the value which they represented has been withdrawn dollar by dollar by their former owners. Except for $400 at most, they now represent no tangible assets. Unless they are vitalized by new money substantially the entire undertaking will be financed from bonds. It is well settled that franchise value cannot be considered as an element in rate-making, and this bookkeeping asset ($3,000) would therefore be valueless any time the question of rates might be raised. The Commission could not permit the petitioner to construct a plant on $6,000 of bonds and exact rates to provide a return on $9,000 of capitalization. So far as the book value of the real estate is concerned, the corporation paid $100 for it. It may have been, and probably was, an excellent trade—might have been at $500. But the accounting rules of this Commission require purchased property to be carried at cost, and, although it was purchased before the Public Utilities Act became operative, considering this in effect as equivalent to capitalizing a new enterprise, we do not think that we ought to deviate from the rule.

"We then have in effect a new corporation with assets capitalizable at $400. All outstanding stock above that represents nothing that can now be considered, or that would give it earning value in the hands of possible future purchasers. This construction is no hardship upon its present owners, because it cost them nothing. Before additional securities are issued all in excess of $400 should be turned into the treasury or made good by the advancement to the corporation of an equivalent amount of cash. Bonds should not be authorized without a substantial capital stock margin.

"If, therefore, the present stockholders will reduce the amount of capital stock outstanding to not less than $2,000 par value and pay into the treasury of the corporation cash for all stock remaining outstanding in excess of $400, at par, the Commission will grant an order authorizing the issue of five-per-cent mortgage bonds sufficient to secure a combined capital of $6,000, when said bonds are sold on not less than a six-per-cent basis."

The case is to remain open a reasonable time pending action of the petitioner on these suggestions.

MISSOURI.

Standards of Service. Rules were issued by order of the Commission, July 10, 1915, for the regulation of gas and electric service, applying to both private and municipal plants. These rules, together with the rules governing water utilities, are printed in pamphlet form and are made effective as of October 1, 1915.

NEW JERSEY.

The Delaware and Atlantic Telegraph and Telephone Company was authorized to transfer on its books $4,728,500 of the capital stock of the Bell Telephone Company of Pennsylvania to the New York Telephone Company. The Bell system in the northern part of the state has been operated from New York and the system in the southern part from Philadelphia. As a result of the transfer of stock approved by the Board the entire Bell system in New Jersey will be operated from New York.

Up to two years ago the Delaware and Atlantic Company also operated a telephone system in northern Delaware. There, as in New Jersey, it was backed by the Pennsylvania company. Following a suggestion by the State Board of Utility Commissioners of New Jersey, the Pennsylvania company disposed of its holdings in the Delaware and Atlantic to the Diamond State Telephone Company, which thus became the sole operating company in Delaware.

The result of placing the Bell telephone system in Delaware in the hands of one company is said to have been an entire success, and also to have been one of the leading factors in the project to bring about a unification of management of the Bell system of New Jersey.

NEW YORK—Second District.

The Central Hudson Gas and Electric Company was authorized to issue $500,000 of 10-year, six-per-cent bonds, in $1,000, $500 and $100 denominations, convertible into common stock on and after October 1, 1918. The proceeds will be expended in making extensive improvements and additions to its plant and distribution system in Poughkeepsie, Newburgh and surrounding territory.

INTERSTATE COMMERCE COMMISSION.

Rock Island Railroad. The report of the investigation of the Rock Island railroad made by the Interstate Commerce Commission charges the railroad officials with misrepresentation in their reports to stockholders and shows losses in stock transactions aggregating more than $20,000,000. The Commission, in severe criticism of the past financial operations of the company, says: "Those guilty of misleading reports to stockholders should be subject to adequate penalties.

"A director of a railroad is a quasi-public official who occupies a position of trust. A director who submits blindly to the exploitation of his company is a party to its undoing, and he should be held responsible to the same extent as if he had been a principal instead of an accessory before the fact. The greater his prominence the greater his responsibility and the greater his dereliction. * * *

"It should be just as grave an offense for an official of a railway to be faithless to his trust for financial gain as it is for an elected official of this Government to betray his trust for a money reward."

Plans for Prosperity Week in Louisville.

Louisville Jovians will have charge of the local celebration of "electrical prosperity week" and have already begun in a small way what will be elaborate preparations by the time the last of November arrives. At the last meeting of the League the movement was started and plans discussed at considerable length.

One of the special things that has been determined upon is that there will be a parade of electrically operated automobiles, in which an effort will be made to enlist every such vehicle in Louisville. At the same time the League will try to interest the merchants of the city, prevail on them to decorate their stores for the occasion and on those who handle electrical things to emphasize them during that week.

One of the practical undertakings in order is a census of the electrical trades of the city. Through Robert Montgomery, of the Louisville Gas & Electric Company, and his committee, an effort will be made to list all those whose livelihood depends upon their interest in one or another phase of the electrical industry. This, it is estimated, would run to perhaps 10 per cent of the total payroll list of the city.

If these facts could be given proper publicity it is believed that the business interests of the city would appreciate the wisdom of making an appeal for the patronage of this element of the population and the element dependent on it.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 296.—High Cost of Rendering Bills.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

No. 301.—Transformer Winding.—What size of wire should be used for primary and secondary winding for a transformer to step down 220 volts to 110 volts, capacity about 10 amperes? Also what quantity of wire of each size should be used? Does any manufacturer carry such transformers in stock?—R. D. F., Corona, Cal.

No. 302.—Air and Electric Rock Drills.—Are electric rock drills used to any extent for preparing holes for blasting in quarries, tunnels and metal mines? How do they compare with air drills? Where air drills are used is it better to supply them from a central compressing plant or from small, portable motor-driven compressors near the place where drilling is being done?—J. B. L., Albuquerque, N. M.

Answers.

No. 295.—Supply Voltage.—Is it customary in the franchises of electrical central-station companies to stipulate what the supply voltage shall be for residence and power customers, or is this left to the option of the company?—K. F. T., Cheyenne, Wyo.

The voltage of supply is rarely specified in a franchise, and then it is for special cases only. The matter of supply voltage is one that is decided by economic conditions, it is an engineering problem and one that can be solved by the use of sound engineering principles. As with so many other matters of a similar nature, the various supply voltages have become more or less standardized, thanks to the manufacturers, the central-station companies and various engineering societies, and those existing today may be said to be the result of the concerted action of the above bodies. For the public, through a franchise, to dictate upon this matter would be very unwise and short-sighted, tending to retard development, resulting in inefficient methods and higher rates for energy.

There are, however, two instances where the matter of voltage is taken up quite frequently. One of these concerns the passage of high-tension lines through the streets of cities overhead, and here a maximum potential is often specified. The other instance is that affecting the quality of the power supply, of which continuity of service, voltage regulation and frequency are important factors, for under this heading it is customary to stipulate that the supply voltage shall not exceed a certain limit above and below normal. Querist should read the book on "Municipal Franchises," by D. F. Wilcox, for it contains a large amount of interesting material about all kinds of franchises, including many of the details included in the franchises of many of the large cities.—K. R., Chicago, Ill.

No. 298.—Gelatinous Battery Electrolyte.—In some types of small storage batteries made especially for use where they are likely to be upset there is used some sort of jelly-like paste instead of the ordinary liquid electrolyte. What is this paste composed of? Does it increase the internal resistance of the battery? What effect, if any, has it on the efficiency, capacity and life of the battery? —C. M., Jackson, Mich.

Electrolyte jelly is made by adding acid to water glass. Water glass is sodium silicate and directions for making it are given below. A jelly electrolyte reduces the capacity twenty per cent, increases the internal resistance, decreases the battery efficiency, but prolongs the battery life and prevents slopping to a considerable extent. This electrolyte was formerly used in all government sparking batteries.

The proportion of jelly to acid is one to nine. For example:

No. Plates	Jelly	Acid
5	35 c.c.	315 c.c.
7	50 c.c.	450 c.c.
9	60 c.c.	540 c.c.
11	90 c.c.	810 c.c.

Water glass can be made in small amounts by crushing small quartz crystals (silicon dioxide) and dissolving the powder in sodium hydroxide. On a large scale it can be made by melting together sodium sulphate, quartz sand, and powdered charcoal. The resultant mass can be dissolved in water. Water glass dries out and in spite of the fact that sulphuric acid is deliquescent and absorbs water from the air, the solution in the batteries should be watched as closely as if it were only ordinary electrolyte.—R. L. L., Minneapolis, Minn.

The writer knows of no storage battery employing a semi-solid or gelatinous form of electrolyte that successfully fulfills the conditions imposed in practice. There are, of course, batteries in use that utilize a jelly-like electrolyte, but it is only in isolated cases; the number in use is so small and the capacity so very limited that they must be looked upon as curiosities rather than commercial products at this time. The ingredients, and the method of manufacturing the paste used in these batteries is not definitely known, it being rather a trade secret.

As compared with a battery using the ordinary liquid electrolyte, the battery using a paste will show lower efficiency, shorter life, lower output for a given weight, and will hold its charge for a shorter time. The chief difficulties seem to be on account of erratic internal resistances, due probably to local temperature changes; comparatively rapid loss of specific gravity; and the inability to hold the charge. To the writer's knowledge a storage battery employing a gelatinous electrolyte was placed on the market on quite an extensive scale by one storage-battery company, but the battery is no longer marketed, the company having gone out of existence.

Large sums of money have been spent in extensive research and lengthy tests by some very large storage-battery companies, here and abroad, in the endeavor to develop an electrolyte that would be capable of replacing that of the liquid form. So far the end sought has not materialized, in that nothing has been found that will meet the practical conditions imposed for any length of time.—K. R., Chicago, Ill.

No. 299.—Protecting Third Rail.—What effective means, aside from using the inverted third rail, can be used at highway crossings of an electric railway equipped with the ordinary upright third rail to prevent pedestrians from entering on the right of way at the crossing and coming in contact with the live rail? This right of way is fenced in except at the crossing gaps, where the third rail is interrupted and cattle guards are provided at each side of the crossing.—W. R. A., Elmhurst, Ill.

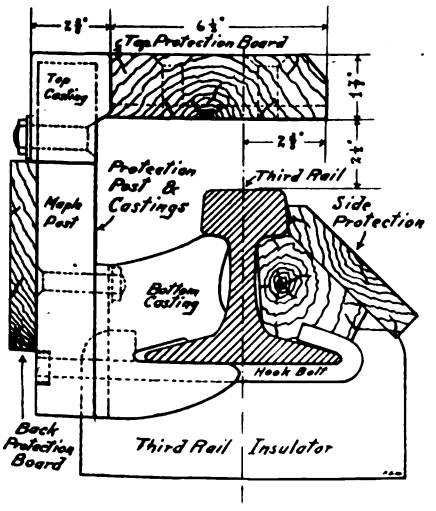
On the West Jersey & Seashore Railroad the third rail throughout is of the standard cross-section and composition. The rails are in lengths of 33 feet, weigh 100 pounds per yard, and have a conductivity about equal to that of a copper rod of 1,200,000 circular mils area. The third-rail end approaches are made of cast iron. In order that no special insulator need be made to support the end a cast-iron "chair" is used which is designed to fit the regular insulator and to center and hold the end approach thereto. The side approach, used at cross-overs, consists of a plank mounted at an angle on the side of the rail.

At grade crossings and other places where a break occurs in the third rail, each rail is joined electrically by a cable jumper of one million circular mils area. The cable is drawn into a black bituminized-fiber tube, which is laid in a solid concrete protection, the stub end of the cable being connected to the rail by two bare copper bonds. A concrete hood fits over the top of the cable terminals.

Digitized by Google

Originally the third rail was equipped with protection only at stations, 75 feet on either side of road crossings, and in terminal yards, the construction being shown in the accompanying diagram. The bottom casting is attached to the rail by a hook bolt, which supports the whole protecting structure. A maple post, attached to the bottom casting by a bolt, supports the top casting, to which are bolted the ends of adjacent top-protection boards of two-inch plank, which average seven feet in length, this distance therefore being the spacing of protection supports at stations. At end approaches the top-protection board extends slightly beyond the last support; therefore the top casting here is modified by eliminating a part of the vertical web. The bottom casting is also modified to fit the end-approach casting. The wood used in the original protection was not treated in any way except by being given several coats of paint after installation; that used in later installation was given two coats of hot creosote.

The present method of mounting and protecting third rails on station platforms



No. 299.—Protected Third Rail.

and certain crossings on the B. & O. R. R. is a good one, but even a brief description would be too lengthy here. Some idea can be gained of this method in the *General Electric Review* of November, 1914.—P. B. W., Verbena, Ala.

No. 300.—Fire-Extinguishing Materials.—How do sawdust and carbon-tetrachloride compare with each other and with water and with sand for extinguishing fires in varnishes, transformer oils, etc.? How do the two substances first named act to quench a fire?—H. D., Chicago, Ill.

Water, sawdust, sand and carbon-tetrachloride are all good fire-extinguishing agents, but their efficiency depends largely upon the circumstances under which they are used. Water may be used satisfactorily, if it is miscible with the burning liquid. Varnishes and transformer oils do not fall in this class and, as a general rule, water cannot be used if they should happen to take fire. However, if only a small amount of oil is on fire and there is available a large amount of water, the cooling effect of the large volume of water may be sufficient to extinguish the flame.

To extinguish burning oils it is customary to resort to a smothering effect rather than a cooling effect. Material is used which forms a sort of blanket over the burning liquid, thus excluding the air and causing the flame to become extinguished from a lack of oxygen. This blanket may be either a solid or a gas.

Sawdust and sand come under the head of solid blanketing materials. Sawdust is particularly well adapted for use in extinguishing burning varnishes and oils. The material floats on top of the burning liquid and keeps the air removed. The sawdust itself may take fire, but this does not matter since sawdust burns without flame and at too low a temperature to do any harm. It is good practice to mix a quantity of sodium bicarbonate with the sawdust. This mixture is non-inflammable and gives excellent results.

Sand is also used to extinguish fires by "smothering" the flame. It cannot be used, however, where a tank of oil has taken fire for the simple reason that it will sink to the bottom of the liquid. If oil which has been spilled on the floor takes fire, sand may be used quite effectively to extinguish the flame.

Carbon-tetrachloride operates in two ways as an extinguisher. Its vapor is quite heavy and when the liquid is poured or sprayed over burning oil the heavy carbon-tetrachloride vapor settles down and acts like the sawdust blanket. It also mixes well with most oils and if a sufficient amount of the tetrachloride is used it will render the liquid non-inflammable. The use of this agent is widespread and it is regarded as a very efficient means of extinguishing burning oils and varnishes.

Ranking these extinguishing agents according to their value for use on burning oils, the writer would arrange them as follows: 1. Carbon-tetrachloride. 2. Sawdust mixed with sodium bicarbonate. 3. Sand. 4. Water.—C. A. B., Cleveland, O.

In order to successfully extinguish oil and varnish fires, it is necessary to employ a method that will shut off the supply of oxygen in air sufficiently so that combustion cannot be maintained, rather than attempt to lower the ignition point of the substance in question, as is done when water is used. The most economical means to be used will be determined by the quantity of oils or varnish which are to be treated. However, in any case, a blanket is to be formed over the fire. This blanket may be simply a mechanical one, such as a close fitting cover suspended by easily fusible links which melt and allow it to fall and cover the container; sand or sawdust thrown on in sufficient quantity will produce the same result. The fusible-linked cover is standard practice approved by the Underwriters, and, if conditions will permit of its use, is to be preferred to the sand, etc., for the reason that it is difficult or expensive to separate these by filtration or precipitation, unless the quantities are so limited that their cost may be neglected and recovery unnecessary; this method will serve because the materials cost nothing.

Carbon-tetrachloride will give good results by reason of the gases evolved spreading over a larger area and hence being more effective than the sand, etc. This requires but a low cost of installation, when manual operation is resorted to, and need not necessarily be applied under pressure, although if so used or sprayed it is naturally more effective. Carbon-tetrachloride has an advantage over the regular fire extinguishers employing an acid and alkali in water solution producing CO_2 gas delivered under pressure created by effervescence, in that it is a non-conductor of electricity and may be safely used on conductors carrying current. There are extinguishers on the market which employ carbon-tetrachloride as the base of the extinguishing materials.

It is very easy and interesting to demonstrate the blanket effect of CO_2 gas by the following experiment: To a small quantity of bicarbonate of soda add a little sulphuric acid; pour the gas evolved into a deep saucer in which has been previously placed a small piece of lighted candle, and note that as the gas covers the flame it is promptly extinguished.

When oils in large quantities are to be extinguished, carbon-tetrachloride may be pumped to the container and delivered over the burning surface. A very quickly effective method is to charge the room containing the oil, etc., with live steam; this is supplied through a system of piping that is in reality a duplicate of what is known as a dry sprinkler system, but with the exception that the sprinkler-head seals have been removed and are normally not under pressure, a controlling valve being located well out of the danger zone.

If the fire in question is in such an exposed location that the blanket cannot be maintained but is dissipated by air currents, etc., the above methods will not avail. The latest practice in this connection is to use a foaming soap solution applied in the same manner; this has proven successful under varying adverse conditions. Reports of tests on both methods can be obtained from the National Fire Protection Association.—M. K., Passaic, N. J.

Coal production in Iowa in 1914 showed a decrease of 1 per cent as compared with 1913, the output in 1914 being 7,451,022 short tons, valued at $13,364,070.

Digitized by Google

The Lighting of Rifle Ranges.

At the annual meeting of the Illuminating Engineering Society in London there was an interesting discussion on the lighting of rifle ranges.

This discussion was opened by A. P. Trotter, himself a member of the City of London National Guard Volunteer Corps. In modern warfare, and in rifle shooting, especially, vision plays a great part. The question was raised whether the conventional methods of artificial lighting for rifle ranges are the best adapted to training men for shooting in the open, where the conditions of lighting are totally different, and some of the points raised have decided interest both to illuminating engineers and to musketry instructors, many of whom were present at the meeting. In the course of his remarks Mr. Trotter alluded to various difficulties experienced particularly by elderly men, in seeing the sights of the rifle. These difficulties seem to be connected with the method of lighting. Mr. Trotter found that he could obtain much better results on an open-air range, and he therefore set about designing a system of artificial lighting which approached more nearly to open-air conditions. It was pointed out by several speakers that an extreme contrast between the illumination of the target and the relatively dark surroundings is a drawback. This conclusion seems in agreement with some of the work carried out in this country by Dr. Cobb, and seems to be partly attributable to the fact that the dark surroundings open up the pupil aperture to an abnormal extent and accentuate defects of vision.

In most rifle ranges the men fire from a situation in almost complete darkness down a "tunnel," the brightly lighted target being at the far end. In these circumstances it is possible to over-light a target, and from experiments made by Blok, Clark and others in London, an illumination of the order of 50-foot candles is sufficient to cause a distinct effect of glare, rendering the sights and the bull's eye indistinct. In the open, however, apparently on account of the adaptation of the eye to the general brightness, men find no difficulty in aiming at a target illuminated with hundreds or even thousands of foot-candles.

The plan adopted by Mr. Trotter, in conjunction with Mr. Brazil, is shown in Fig. 2. The target is viewed through apertures in a series of white illuminated screens, the brightness of which may be slightly less than that of the target. In this way the great part of the retina is occupied by an image of moderate brightness and the undesirably high contrast is avoided. Some experiments with this system have already been made, and so far it appears that distinctly better results are obtained.

In the course of the discussion particulars of a large number of ranges in London were given by A. Blok, who suggested that for ordinary targets an illumination of 12 to 15 foot-candles is comfortable, while for pictorial targets 20 to 30 foot-candles may be allowed. Naturally no unscreened sources of light should be visible, the local lamps used for the target being always covered with appropriate reflectors. Several speakers pointed out that it would be an advantage for the firing point to be illuminated to some extent, partly because this enables the instructor to see the attitudes of men firing and partly because it facilitates clear vision.

The chief reason given for the present system of firing from a point in complete darkness is that inconvenient reflection of light from the sights must be avoided. It was pointed out, however, that such reflections are usually caused by the presence of naked lamps, and would not occur if well diffused indirect lighting was employed. Another important point is the color of the light used for pictorial targets. Many of these have hills, fields, etc., in light green and orange, and it becomes quite difficult to distinguish objects if they are illuminated by an old and dirty incandescent lamp which gives a dull and yellow light.

Several speakers expressed themselves as in favor of the "orthoptic" sight (in which observations are made through a fine pin-hole). This appears to act like the stop on a camera, improving the eye lens and giving sharper definition. On the other hand the use of a pin-hole naturally means the loss of a considerable amount of light, so that the method may not be so applicable when the objects looked at are only faintly illuminated.

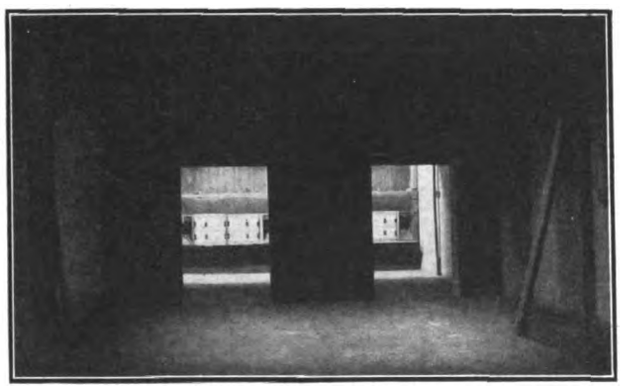


Fig. 1.—Conventional Method of Lighting Rifle Ranges.

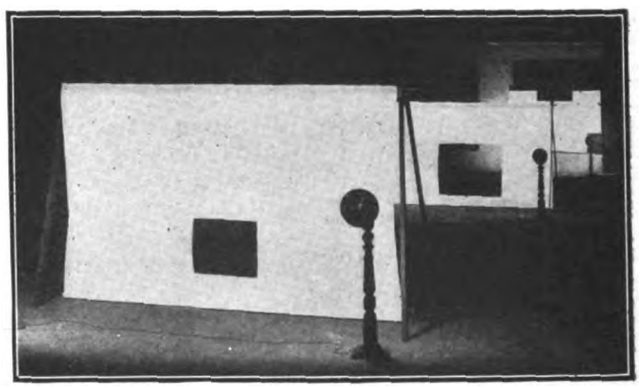


Fig. 2.—New System of Arranging Lighting Suggested by Messrs. Trotter and Brazil.

Electrical Exports to South America.

During the month of July, 1915, electrical supplies were exported from the port of New York to the various countries of South America in amounts reaching the following values: Argentina, $24,940; Brazil, $38,814; Chile, $16,307; Colombia, $24,333; Peru, $7,422; Uruguay, $3,601; Venezuela, $8,376; all other countries, $3,591.

The values of electrical machinery exported during the same period were as follows: Argentina, $9,550; Brazil, $2,239; Chile, $12,709; Colombia, $1,874; Peru, $1,293; all other countries, $1,717.

Copper wire was exported in the following amounts: Argentina, $15,126; Brazil, $12,456; Chile, $4,237; Colombia, $2,880; Peru, $1,544; Uruguay, $637; all other countries, $896.

As about 85 per cent of the exports from this country to South America go from the port of New York, these figures will give a good idea of the electrical exports from this country.

Correction.

In the article entitled "Test of a Direct-Current Motor" in the issue of August 7, typographical errors appeared in two of the formulas.

In the middle column of page 241, 14 lines from the bottom, the expression for the I^2R loss in the armature should read

$$W=2r/n(I/2n)^2 2n.$$

In the first column of page 244, twenty-third line, the diagonal line separating the numerator and demoninator has been omitted. This equation should be

$$R/R_1=R_0(1+0.0042t)/R_0[1+0.0042(t+r)].$$

Digitized by Google

AUXILIARY STEAM PLANT OF THE VANCOUVER ISLAND POWER COMPANY.

By H. W. Beecher.

This article describes the mechanical features of a modern steam plant designed primarily for burning oil, but with the possibility of substituting coal for fuel. It typifies present practice on the Pacific Coast including automatic regulation of the fuel.

The development of water power along the Pacific Coast by various public service corporations has brought to light the fact that a steam plant as an auxiliary is almost a necessity. At any rate the development companies have usually completed the installation by adding a steam auxiliary with a considerable percentage of the capacity of their entire equipment. To insure continuity of service and protection of their customers, one by one the companies have installed these steam plants, or so multiplied their distribution and hydroelectric properties as to prevent shut-down of their systems by the disablement of any one of their hydroelectric plants or their transmission systems.

The combination of the necessity for the speedy installation of additional capacity and the advisability of putting in a steam power plant as an auxiliary to its system was responsible for the Vancouver Island Power Company, Limited, installing at Brentwood Bay, B. C., near Victoria, one of the finest steam turbine plants in the Greater Northwest. The installation was made during the summer of 1912.

The company had in operation at that time its hydroelectric plants at Goldstream and Jordan River. The Jordan River plant was placed in operation in the autumn of 1911, thus increasing the capacity of the system by 8,000 kilowatts, but nevertheless, the load continued to grow at such a rate that this increase appeared to be inadequate to meet the probable demands of the load carried in the winter. Owing to lack of time, further additions to the hydroelectric plants could not be made, therefore the installation of the steam power plant as an auxiliary was decided upon. A remarkable coincidence occurred within one-half hour after the first unit of the steam plant had been phased out and pronounced ready for operation by the contractors. The Jordan River plant, which had been running for some two years without shut-down or failure of transmission line, ceased operation through transmission troubles, immediately necessitating the commercial use of the new unit of the steam auxiliary.

The problem of locating the new steam auxiliary was by no means an easy one. At this time the city of Victoria was enjoying a real-estate boom which showed prospects of being prolonged indefinitely. This condition of affairs naturally made the price of inlying water-front property prohibitive. A careful investigation of the various sites taken in connection with the location of power load resulted in the proposed plant being installed at Brentwood Bay, on Saanich Inlet, and the installation of the combination of steam auxiliary and substation for transmission of direct current for use on the Saanich interurban, owned and operated by the British Columbia Electric Railway Company, Limited, which controls the public utilities of

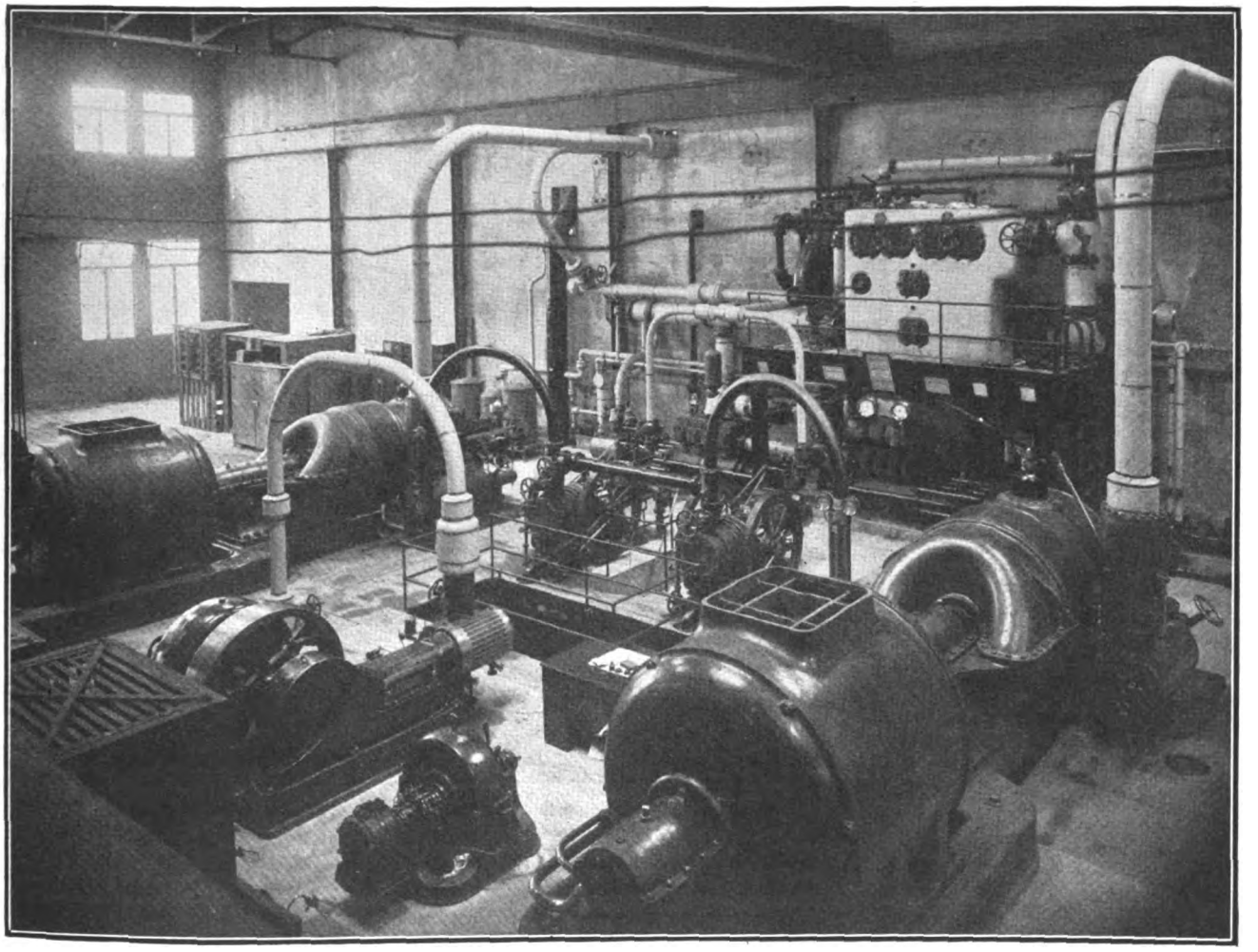


Fig. 1.—Turbine Room of Vancouver Island Power Company, Limited.

Digitized by Google

Vancouver, New Westminster, Victoria, and their immediate vicinities. The Vancouver Island Power Company is a subsidiary of this corporation.

From a study of the territory to be served, with respect to distribution of load in relation to the interurban requirements and with regard to the location of transmission lines, it became evident that the plant should be located as near as possible to the Vancouver Portland Cement Company and the Bamberton Portland Cement Company, as well as near the middle of the transmission line. Both of these cement companies depend upon the Vancouver Island Power Company for their power. It was of equal importance to have location within suction limits and in close proximity to ample supply of deep water, both for condensing purposes and to simplify the handling of fuel, either oil or coal, from barges or cargo steamers. The site at Brentwood Bay, on Saanich Inlet, is about 12 miles north of Victoria and near the tracks of the Saanich Interurban line, of the British Columbia Electric Railway Company.

The wharf permits of the landing of the largest oil tank steamers for delivery of their cargo with ease and safety.

The site of the power plant, when work first started in June, was covered with a luxuriant growth of virginal timber, as is shown in some of the illustrations. The timber had to be cut and removed, the undergrowth grubbed out, the stumps bored and blown up and the refuse collected and burned. The overburden at the site of the plant averaged about two feet thick, and amounted to about 3,500 cubic yards. The underlying rock was a shattered formation of igneous nature and weathered rapidly. The land slopes rapidly up from the shore, involving a considerable cut on the back portion, in order to bring the plant within proper suction limits, and not impose too much head on the circulating pumps. The excavation involved the blasting out and removal of considerably over 27,000 cubic yards of material.

In order to provide easy facilities for the storage and handling of coal, should such fuel be adopted, and also to secure suitable foundation for the concrete chimney, it was decided to run the boiler room alley perpendicular to the shore line.

As soon as a working space was secured, portable track and side-dump cars of one cubic yard capacity were employed. These were filled by hand with shovel and ran by gravity to the dump. By tunnelling and loading a cross-cut, large shots were set off, breaking down many yards of the fractured rock at each charge.

It was necessary to establish a camp and about forty tents were put up, laid off on temporary streets, with cook-house properly located. The preliminary work was driven ahead, night and day shifts being employed. Machinery began to arrive before the foundations were in place, and the plant was ready for operation before November 1, less than five months in all being consumed in the construction of the plant.

In laying out the plant, it was decided to provide for two rows of boilers, with a firing alley between as will be noted from the accompanying illustration. The power plant is of steel-frame construction, with reinforced concrete curtain walls, and consists of three bays, 137 feet long, housing the boiler room, turbine room, and transformer station. The bays are 93 feet 4 inches, 69 feet 11 inches and 50 feet 8 inches in width respectively, as shown on the general plans. While the elements of economy and simplicity were given first consideration, a decidedly pleasing architectural appearance has been maintained throughout, and the permanent building has been completed of suitable size to house the ultimate capacity of the plant. This was done for economic reasons, as the plant was so far away from Victoria that construction work had to be done by means of camps, and it was deemed advisable to complete the entire building at once.

The structural steel for boiler room is of sufficient strength to support overhead bunkers, suspended between the boilers, should it ever be desired to use coal fuel, and the head room of boiler room and location of columns has been laid out with this in mind.

Near the roof of the building, at such points as to give a maximum of light, windows of liberal size and frequently spaced have been distributed around the building, in the curtain walls. In addition to the lighting secured in this manner, the tar and gravel in the roof of the building is broken by a considerable number of skylights, suitably distributed. These skylights are fitted with louvres, so as to provide ample ventilation, as shown plainly in Fig. 2. This illustration also shows the temporary lightning arresters, and high-tension distributing lines, with the steel towers for the permanent lines prominent in the foreground. More will be said about these later, in the description of the transformer station.

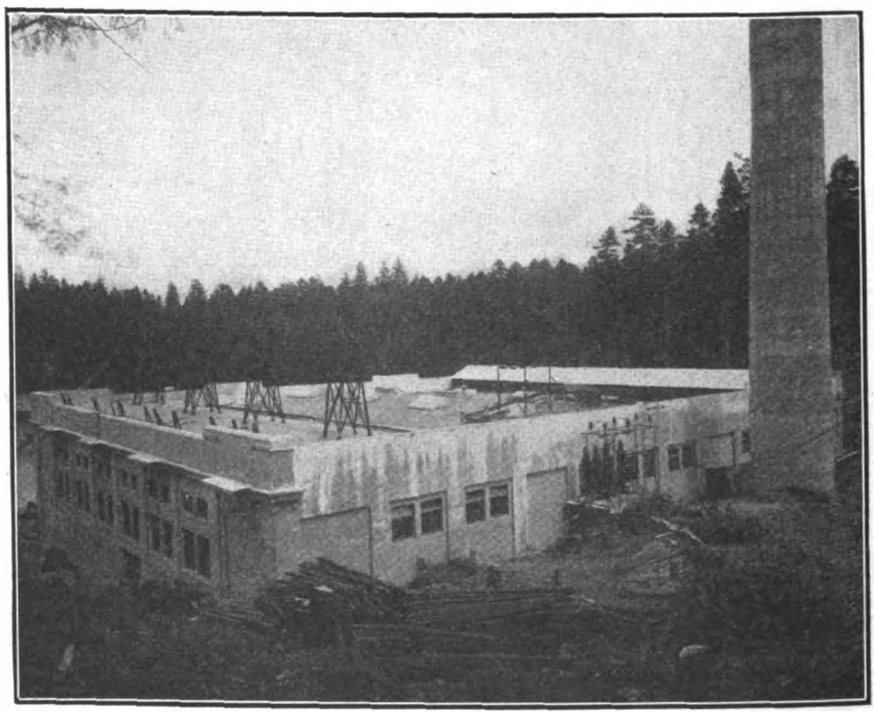


Fig. 2.—Roof Construction of Power House.

No attempt was made to crush and use the native rock, either for foundation, concrete or in the wall, and all concrete walls are made up of an aggregate consisting of high-class washed gravel. The concrete walls have been given a 0.75-inch cement-plaster finish, which sets off very nicely the architectural effect desired.

The main doorways in the building are of ample size for the passage of any machinery which may reasonably be expected to be used in connection with the plant. These doorways are

Digitized by Google

closed by large sliding doors, having wicket or man doors for the ordinary passage of the operators.

In Fig. 3 is shown the circulating discharge piping and on the extreme right the circulating water inlet tunnel, with its retainng wall, and just to the left of it, the remnants of the grid apron, up which most of the machinery was taken from scows.

The present plant consists of six Babcock & Wilcox patent safety water-tube boilers, of forged-steel construction, arranged in three batteries of two boilers each. Provision has been made in the building for the installation of ten additional boilers, making a total of sixteen. These boilers were built by Babcock & Wilcox, Limited, of Glasgow, Scotland. Each

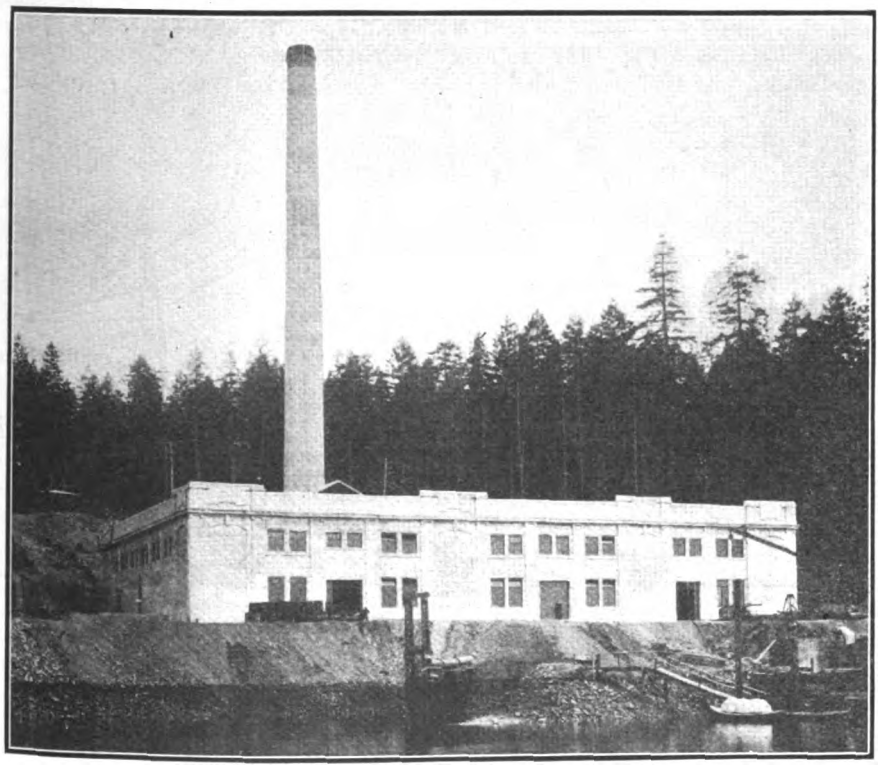


Fig. 3.—Completed Power House.

boiler consists of 18 sections, each having 12 four-inch tubes, 18 inches long, over which are mounted two steam and water drums, 46 inches in diameter, and 24 feet, 3 inches long. The total water heating surface of each boiler is 4,780 square feet. The boilers are designed for a working pressure of 200 pounds per square inch, and are in accordance with the standard construction of the Babcock & Wilcox Company, for the above pressure. These high-pressure boilers make possible the use of 180 pounds steam pressure, at the turbine throttles, with the attendant economy features.

Each boiler is equipped with one Babcock & Wilcox forged-steel superheater, designed to give from 80 to 100 degrees Fahrenheit superheat, at the boiler nozzle, when using California fuel oil. If coal is adopted as a fuel, special baffling will be necessary to prevent excessive superheat, as the same amount of surface is not necessary for coal as for oil fuel.

Each boiler is provided with a Peabody patent fuel-oil-burning furnace. The furnace is fired from the bridge wall forward, but is controlled at the boiler front. The distribution of flame is over a large area of boiler-heating surface, preventing localization of heat and blow-pipe action, and minimizing the possibility of burning out tubes. The furnaces are arranged for the use of three burners per boiler.

The burner connections through the ash-pit doors are shown in Fig. 6.

The boilers are set with eight-foot furnace height, and the ash-pits have been temporarily filled in, and the ash tunnels installed so that the boilers may later be converted to coal stoker feed, with a minimum of expense or delay. The method of handling the ashes corresponds with that which was installed in the Electric Company's plant in Vancouver, by the same firm of contracting engineers, and which gave such satisfactory service prior to the conversion of that plant to oil fuel.

The steam turbo-generators installed are of Allis-Chalmers manufacture. These turbines are of the well known Parsons reaction type, with certain modifications. Principal among these are: the system of balancing, the shroud ring over the tips of buckets, the governor, and the packing on low-pressure end. The generator is of the well known design for generation of three-phase alternating current, at 2,300 volts. The combined units operate at 1,800 revolutions per minute.

For excitation purposes, a 75-kilowatt, 125-volt, direct-current generator, direct-connected to a simple side-crank, non-condensing, inclosed, self-oiling, automatic engine, built by A. L. Ide & Sons, is provided. This exciter is placed between the main units. The engine is designed for the same pressure and superheat as the main units, and it operates very satisfactorily, under these conditions of service. One 75-kilowatt, 125-volt, direct-current generator, direct-connected to one 110-horsepower, three-phase, 60-cycle, 2,300-volt induction motor, is also provided for excitation purposes, for use at light loads, when the use of the steam-driven unit would cause an excess of auxiliary steam over that required for the heating of the feed water, with its attendant loss of economy. These generators and motors were supplied by the Canadian General Electric Company.

Each turbine exhausts directly through a corrugated copper expansion joint, into a Wheeler Admiralty surface condenser, of the dry-tube type. Each condenser contains 4,000 square feet of cooling surface. The tubes are brass, 0.75 inch in diameter, No. 18, B. w. g. The dry plates in the condenser drain off the water of condensation, as it is formed, and allow it to fall to the bottom of the condenser, where it is withdrawn by the hot-well pump. This arrangement prevents the condensation which takes place in the top portion from drowning the lower tubes, thus increasing their rate of conductivity. At the same time, the temperature of condensation is increased, the temperature of the air-pump suction reduced, and the quantity of circulating water required is diminished. The low temperature of the air-pump suction decreases the volume of air to be handled, thus reducing the necessary displacement.

One Wheeler patent rotative dry vacuum pump, of the Yoke frame crank and flywheel type, is furnished with each condenser. These pumps are of the flashport valve type, by which the air compressed in the clearance is automatically transferred to the vacuum side of the piston, prior to starting the return stroke. This reduces the effective clearance to a minimum, and increases the volumetric efficiency to a maximum. There is also furnished with each condenser, and placed directly under it, one cast-iron hot well, with a direct connection to a 2.5-inch special Wheeler centrifugal hot-well pump. These pumps are brass fitted,

Digitized by Google

have specially constructed passages to give easy access to the throat of the runner, and each is driven by a 7.5-horsepower Kerr steam turbine, operating at 2,400 revolutions per minute.

Three 14-inch Wheeler centrifugal circulating pumps are installed. These are brass-fitted throughout. Two of these pumps are direct-connected to, and driven by, Kerr steam turbines; the third pump is motor-driven. Each pump is of the double-suction balanced type, and draws its water from a pump pit, located directly below and which will later be described. The water is discharged through individual multiple-disk check valves.

All of the above condensing apparatus, consisting of condensers, air pumps, hot-well pumps, and circulating pumps, was furnished by the Wheeler Condenser & Engineering Company.

Two Warren horizontal duplex simple steam-driven boiler-feed pumps, mounted on cast-iron drip pans, are provided. The pumps operate non-condensing, each pump being of ample capacity for the present plant, the other being in reserve.

One open-type feed-water heater is provided. This heater receives the hot-well pump discharge and make-up water at the top, and distributes it over iron trays, from which it falls in a finely divided spray. The auxiliary exhaust is passed through this spray, condensing it and at the same time imparting its heat to the feed water. Ample storage space is provided in which to care for the ordinary variation in water level, in the heater reservoir, due to fluctuation of load. The supply of auxiliary exhaust-steam available can be regulated by the use of either steam or motor-driven circulators, as may be required, so as to obtain a maximum temperature of feed water, and at the same time, utilize all the auxiliary exhaust without waste.

In the pump pit has been installed an Underwriter's fire pump, fitted for salt water and connected to a hydrant system throughout the plant. This pump is of the multi-stage centrifugal type, manufactured by The Platt Iron Works Company, and driven by a Kerr steam turbine, of suitable power and speed. The pump has a capacity of 750 gallons per minute, against a pressure of 100 pounds.

Located about 500 feet away from the plant, and at an elevation above it, two steel oil tanks, each of 5,000 barrels' capacity, are provided. Each of these tanks is fitted with the necessary connections for filling and emptying, besides heating coils, smothering pipes, drain pipes, etc. The tanks are placed on specially prepared sand foundations, and have been surrounded by earth embankments of such diameter and height as to contain 1.5 times the contents of the tank. These embankments are a safety feature, providing against possible failure of the tanks. These tanks are provided with metal covers, with access doors, and permanent ladders inside and outside. A specially constructed filling pipe provides means by which the tanks are filled from either oil barges or tank steamers. This filling pipe extends to the south of the plant, and down on to and along the face of the wharf, and is fitted with a number of outlets, onto which the oil tank steamers can make connections. The wharf is so laid out as to allow the oil tank steamers to approach it with the least possible difficulty.

The oil pumping equipment, by which the burners are fed, is not directly connected to the main oil-storage tanks. For daily use, two 600-barrel auxiliary oil tanks are provided. These are made of reinforced concrete. The ground was excavated to receive them, below the level of the boiler-room floor, and they are built side by side. The tanks are fitted with the necessary measuring devices, filling pipes, oil suctions, smothering pipes, heating coils, manholes, etc.

These auxiliary oil tanks are shown in Figs. 4 and 5. The pipe coming down from the main storage tank, and the gauges by which oil in the auxiliary is measured, are seen to the left of the building in Fig. 3. "No Smoking" signs are prevalent about certain portions of the plant, where there might be danger due to the presence of combustible gas.

The combustion of the fuel oil is automatically controlled by the Moore automatic fuel-oil regulating system, invented by J. R. Atchison and C. R. Weymouth. In this system, the fuel oil is pumped to the burners under pressures varying from 10 to 50 pounds per square inch, depending on load conditions, there being a uniform pressure throughout all portions of the plant, all burners being wide open or nearly so. The amount of oil burned, with variation of load, is controlled by the pressure of oil at the oil pumps, the intensity of fire increasing and decreasing in all boilers simultaneously. The oil pressure is automatically controlled by steam-pressure regulator, the variations in oil pressure and in intensity of fire being such as to maintain a uniform steam pressure on the plant.

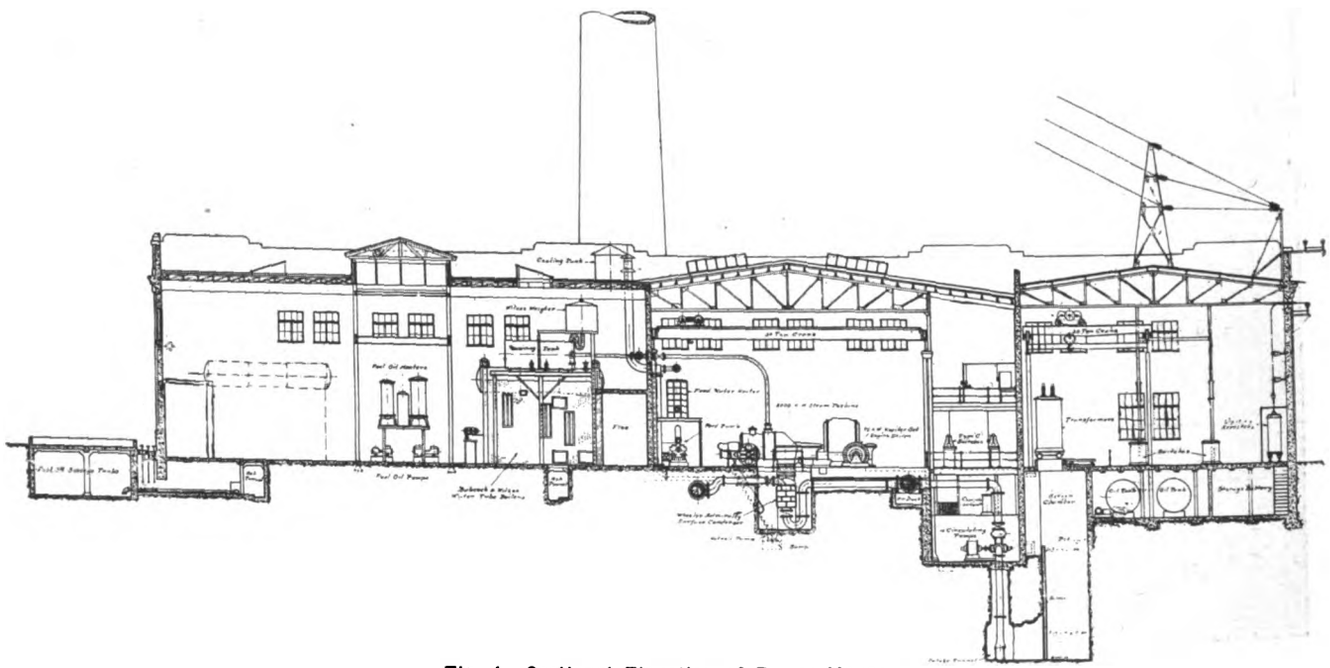


Fig. 4.—Sectional Elevation of Power House.

Digitized by Google

For atomizing purposes, steam is supplied to the oil burners by a separate low-pressure main, the pressure in this main being automatically controlled by variation of the oil pressure in the oil main. A ratio regulator is used, automatic in its action, which maintains such steam pressure in the low-pressure steam main as is necessary for atomizing the particular amount of oil burned, corresponding to any momentary oil pressure.

The air supply for combustion is controlled by a damper controller, also automatic in its action, which increases the damper opening with an increase in oil pressure, and vice versa. The movement of the controlling lever is governed by the action of the oil pressure on a diaphragm. This movement is opposed by the action of a spring, so that the amount of motion on the main lever is proportional to the oil pressure. This movement is multiplied through a hydraulic cylinder, connected to a rock shaft running over all of the boiler in one panel. Each boiler damper is connected to this shaft, and the connecting levers are set at such angularity, with respect to the connecting rods operating the dampers that the proper air supply is provided over the entire range of load, the final adjustment being from actual trial at the plant.

In actual operation and test, it is found that this automatic system of control is safe, reliable, and meets with the approval and hearty endorsement of the firemen. Owing to the fact that the firemen's work is very much simplified by the use of these regulators, they are as much desired by the firemen of the plant as by the management. Were it not for this accord, such automatic contrivance could not be successfully installed and operated.

On completion of the ultimate plant, the boiler-room main steam piping will form a complete ring with properly located isolating valves. All main steam piping is made up with an improved type of Van Stone joints, and fittings are avoided by the use of welded nozzles. Special anchorages are provided on the columns of the buildings, and liberal bends are used to take up expansion and contraction. Between anchorages at proper intervals, heavily constructed sliding supports are installed. No cast-iron fittings are used on superheating steam lines, and all flanges and bolts are constructed with the idea of making an especially tight system of piping. Following the latest practice, no valve is placed between turbine and condenser, and should it be desired to operate the turbine non-condensing, the steam passes through the top portion of the condenser to the atmospheric exhaust valve. Experience has shown that the conditions under which it might be necessary to operate in this manner are so remote that consideration need not be given to them in comparison with the losses incidental to the air leaks prevalent when using the valve and necessary fittings.

All high-pressure steam piping is covered with an extra thickness of 85-per-cent carbonate of magnesia sectional covering. Covers for valve bodies and flanges are also provided throughout. The effect of this heat insulation has been to reduce the attendant pipe radiation to a minimum. This is particularly desirable in an auxiliary plant, on account of the long

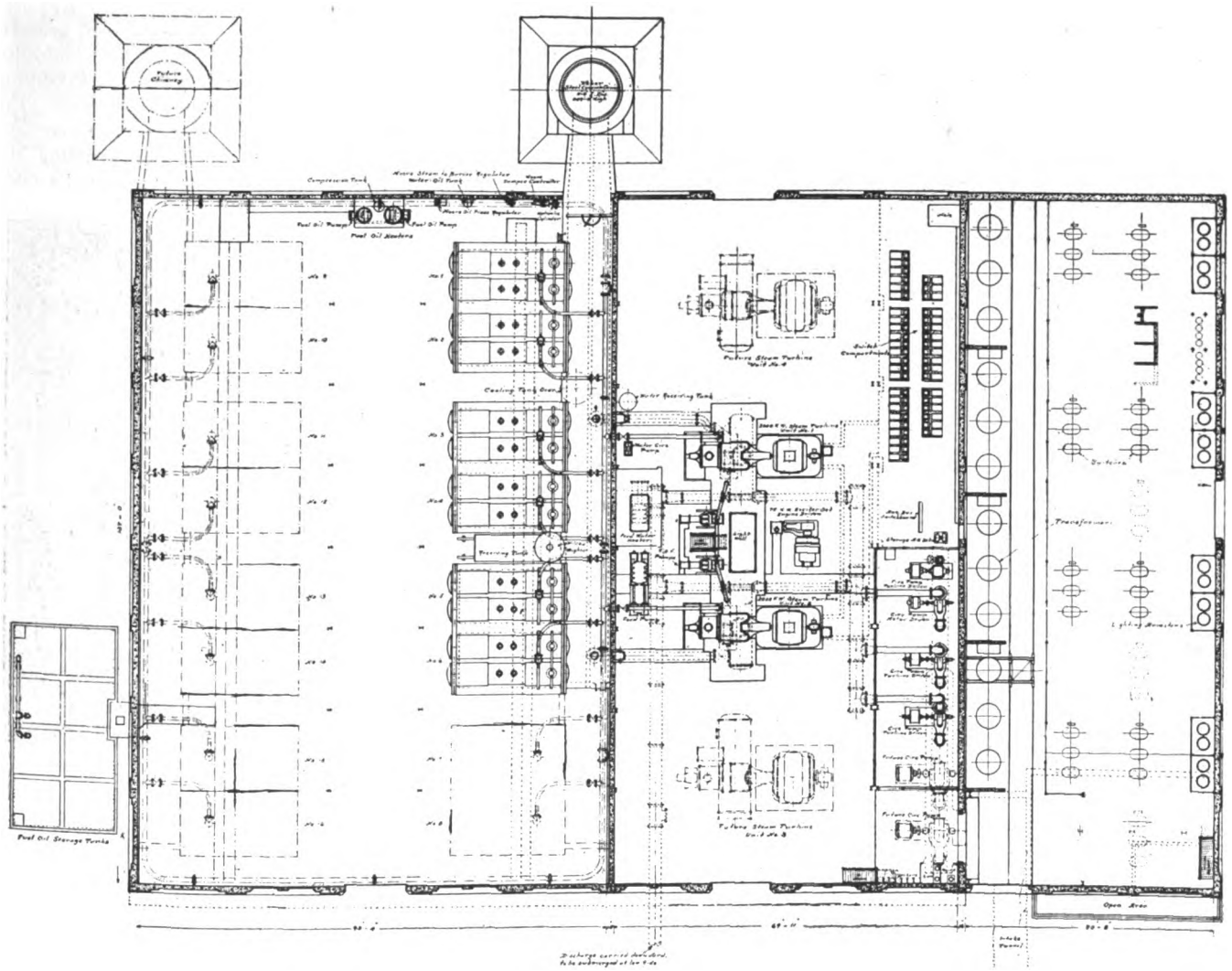


Fig. 5.—Ground Plan of Power House.

Digitized by Google

periods of time during which the plant may be held in reserve with steam pressure maintained on all piping.

The chimney is constructed of reinforced concrete with a separate concrete lining and air space extending up one-third of its height. It is 255 feet high and 11 feet inside diameter at the top. It is of sufficient capacity to serve eight boilers when operating with coal fuel, and is, therefore, more than able to supply ample draft for the present boiler installation. This chimney is far more pleasing to the sight than the more common type of cylindrical concrete chimney. A brick flue with a concrete cover connects the boilers to the chimney.

For convenience in handling, erecting and repairing machinery, a 30-ton, hand-operated, traveling crane was installed. Also a smaller one for the transformer house has been put in.

Cast-iron circulating water pipes were used throughout. A large water receiving pit was blasted out of the rock directly below the pumps, and this was connected by tunnel with the deep water. Screens of ample area were installed at the mouth of the tunnel. A cast-iron discharge pipe, extending below the surface, provides a water-sealed return which, due to siphon effect, reduces to a minimum the heads against which the pumps have to work.

As the supply of fresh water near the site of the plant was very limited, a supply was obtained from Durant's Lake, four miles away. The company owns the water rights. The level of this lake is about 500 feet above the level of the site of the plant, and at its outlet a timber-crib, earth-filled dam, 12 feet high, with ample spillway capacity, has been constructed. The pipe line, for the distance of two miles from the dam, is a steel pipe 6 inches in diameter, and for the remaining two miles, it is 4 inches in diameter. This water is delivered at the site of the plant into a 50,000-gallon wooden tank, 24 feet in internal diameter, and 16 feet high, and placed at such an elevation on the fill as to give suitable head for general service about the plant.

The generators and motor-generators are connected to the 2,300-volt busbars through a flexible system of switches, so that any piece of apparatus can, if necessary, be isolated from the rest of the plant. These switches are controlled from a black-slate switchboard placed on a gallery in the annex of the turbine room. In the high-tension switch room, necessary switches for controlling the following high-tension lines are provided: one three-phase, 60,000-volt, incoming line in the Jordan River plant; two three-phase, 60,000-volt, outgoing lines to Rock Bay substation, Victoria; one three-phase, 60,000-volt, outgoing line to the Tod Inlet Cement Works and the Bamberton Cement Works. Each of the circuits is protected by means of aluminum-cell lightning arresters.

The necessary switches are also provided for the following feeders: two three-phase, 11,000-volt power feeders; two 600-volt, direct-current interurban railway feeders. All of these switches are controlled from the 16-panel black-slate switchboard, from which the generator switches are operated.

For this purpose, a 60-cell, 300-ampere storage battery is used. This battery will also supply current for emergency lights in the building. For motors, pumps, blowers, etc., used in the building, a 2,300-volt service bus is provided. It is protected from the main bus by an oil switch, of high breaking capacity. The service feeder switches are hand-operated.

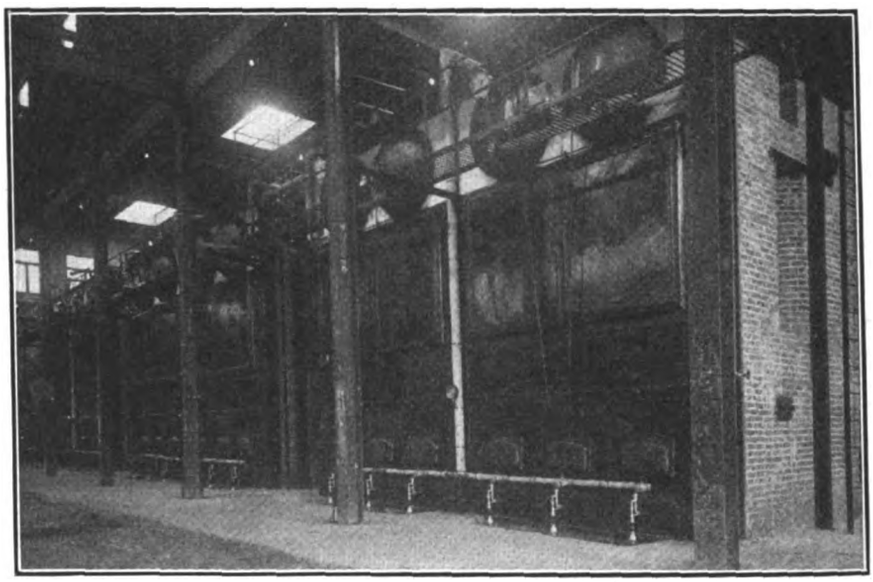


Fig. 6.—Boiler Room of Vancouver Power Plant.

The proposed ultimate development of the Brentwood Bay steam plant is 20,000 kilowatts. The preliminary installation consists of two 2,000-kilowatt Allis-Chalmers turbo-generators, as much better delivery could be obtained on units of this size than on those of 5,000 kilowatts. The 2,000-kilowatt units are so located in the middle of the turbine room that they can be replaced by 5,000-kilowatt units, if this course is found desirable. The location of the 2,000-kilowatt units is also arranged so that if these units are left in place, one 7,500-kilowatt unit can be placed on each side of the existing ones.

As previously stated, the contractors for the work were Charles C. Moore & Company, of San Francisco and Seattle. C. R. Weymouth is chief engineer of the company and had charge of the designing of the plant. J. H. Hopps, advisory engineer, and J. R. Atchison, superintendent of construction, represented the contractors on the ground. The work was under the general direction of G. R. G. Conway, chief engineer of the British Columbia Electric Railway, Limited, assisted by M. V. Hunt, electrical engineer, and G. M. Tripp, engineering superintendent.

Organization of Ohio Power Companies Perfected.

The organization of the several subsidiary companies which will distribute the current of the Floodwood generating plant at Floodwood, O., controlled by the Central Electric Producing Company, has been completed. The four companies operating in the various towns served, and handling the output, are all controlled by the Ohio Electric Securities Company, which was organized under the laws of Maine for that purpose. These four companies, besides the one named, include the Hocking Power Company, operating in and around Nelsonville, O.; the Mutual Electric Company, operating in Middleport and Pomeroy; and the Athens Electric Company, at Athens. The last named company, which recently took over the distributing system of the company formerly operating at Athens, expects to expand its facilities considerably this fall, in order to serve a larger part of the population. Plans are also under way for serving a greater number of mines than the ten at present reached by the company's wires, the present dullness in the Hocking coal fields, however, being an abstacle to this part of the work. P. C. Morris, of Nelsonville, has been made vice-president and general manager of the several properties named.

Digitized by Google

Program for Panama-Pacific Convention.

The sessions of the Panama-Pacific convention of the American Institute of Electrical Engineers, will be held in the Native Sons of the Golden West Building, San Francisco, Cal., September 16, 17 and 18. Headquarters will be at the St. Francis Hotel. Joint sessions with the American Electrochemical Society and the Institute of Radio Engineers have been arranged.

The following program of papers has been announced, parallel sessions being held on Thursday and Friday.

Thursday, 10:30 a. m.

"Physical Limitations in Direct-Current Commutating Machinery," by B. G. Lamme.

"Automatically Controlled Substations," by E. W. Allen and Edward Taylor.

Marine and Lighting Session.

"Standard Marine Electrical Installations," by H. A. Hornor.

"Recent Improvements in Electric Lighting of Steam Railroad Cars," by R. C. Lanphier.

2:30 p. m.

Three parallel sessions will be held as follows:

Electrophysics Session.

"The Effects of Transient Voltages on Dielectrics," by F. W. Peek, Jr.

"Arc Phenomena," by A. G. Collis.

"Experimental Researches on Skin Effect in Conductors," by A. E. Kennelly, F. A. Laws, and T. H. Pierce.

Valuation of Public Utilities Session.

Symposium on Inventories and Appraisals of Properties.

Part I, by C. L. Cory.

Part II, by W. G. Vincent.

Part III, by W. J. Norton.

These papers will be supplemented at the session by contributions from other members of the Committee on Inventories and Appraisals of Properties.

Joint Session with the Institute of Radio Engineers.

"Sustained High-Frequency High-Voltage Discharges," by Harris J. Ryan and Roland G. Marx.

Friday, September 17, 10:00 a. m.

Two parallel sessions will be held, as follows:

Telephony and Telegraphy Session.

"Submarine-Cable Rapid Telegraphy: Ocean and Intercontinental Telephony," by Bela Gati.

"Automatic Switchboard Telephone System of Los Angeles," by W. Lee Campbell.

"Continuation of Discussion on Inductive Interference." Introduced by Joint Committee on Inductive Interference.

Mine Work Session.

"Diesel Engines for Generator Drive," by Charles Legrand.

"A Large Electric Hoist," by Wilfred Sykes.

"The Modern Electric Mine Locomotive," by Graham Bright.

2:30 p. m.

Three parallel sessions will be held, as follows:

Joint Session with the American Electrochemical Society.

"Overhead Electrolysis and Porcelain Strain Insulators," by S. L. Foster.

"Corrosion of Copper Wireless Antennae," by L. W. Webb.

"Electrochemical Possibilities in California and on the Pacific Coast," by J. W. Beckman.

Transmission Session.

"Delta-Cross Connection of Transformers," by G. P. Roux.

"Harmonics in Transformer Magnetizing Currents," J. F. Peters.

"Phenomena Accompanying Transmission with some Types of Star Transformer Connections," by L. N. Robinson.

"Abnormal Voltages in Transformers," by J. Murray Weed.

"Calculation of Short-Circuit Phenomena of Alternators," by N. S. Diamant.

Joint Session with the Institute of Radio Engineers.

"Radio Development in the United States," by Robert H. Marriott.

The other national engineering societies will be holding meetings at the same time. The American Society of Mechanical Engineers will meet in the same building, but will have headquarters at the Clift Hotel. The American Society of Civil Engineers will meet at the St. Francis Hotel. The American Institute of Mining Engineers will meet at the Bellevue Hotel.

These meetings precede the International Engineering Congress, which will meet during the week September 20 to 25, in the new Civic Auditorium. Over 3,000 members have already been enrolled in the Congress.

The membership fee is $5.00 and should be sent to W. A. Cattell, secretary, Foxcroft Building, San Francisco. Members are entitled to one volume of the printed proceedings free; other volumes can be secured by purchase, there being 11 in all.

Sessions of the Congress devoted to electrical engineering will be held on Thursday morning and afternoon and on Saturday morning. The following papers will be presented:

"Economics of Electric Power Station Design," by H. F. Paishall, London, Eng.

"The Water Power of Sweden," by Sven Luebeck, Stockholm, Sweden.

"Electric Power in Canadian Industry," by Charles H. Mitchell, Toronto, Can.

"Industrial Effect of Low Cost of Electric Energy," by Louis A. Ferguson, Chicago, Ill.

"The Effect of Hydroelectric Power Transmission upon Economic and Social Conditions, with Special Reference to the United States," by Frank G. Baum, San Francisco, Cal.

"Electrical and Mechanical Installations of the Panama Canal," by Edward Schildhauer, New York, N. Y.

"Electric Welding," by C. B. Auel, Pittsburgh, Pa.

"The Application of Electricity to the Heating of Metals," by F. L. Bishop, Pittsburgh, Pa.

"The Electric Motor as an Economic Factor in Industrial Life," by David B. Rushmore.

"The Influence of the Electric Motor on Machine Tools," by A. L. De Leeuw, Elizabethport, N. J.

"Effects of Electrolysis on Engineering Structures," by Albert F. Ganz, Hoboken, N. J.

"The Mechanical Problem of the Electric Locomotive," by G. M. Eaton, East Pittsburgh, Pa.

"On the Production of High Permeability in Iron," by Ernest Wilson, London, Eng.

"Electric Illumination," by S. H. Blake, Schenectady, N. Y.

Lighting Installation Guards Factory from Intruders.

An effective means of lighting a factory grounds, to prevent improper entrance, is installed at the works of the Merrimac Chemical Company, North Waburn, Mass. This concern is manufacturing high explosives for the European armies, and in order to make certain provision against spies or other improper visitors by night, the company has erected a 10-foot wire-net fence completely around a 15-acre lot containing five mills. About 25 feet inside the fence is a line of poles, about 30 feet apart, each carrying a 16-watt Mazda lamp with metal reflector, on an arm directed toward the fence.

This lighting installation gives a view of the space between the fence and the buildings, so that the watchmen, of whom there are several on guard constantly, will detect any person entering the grounds.

A newspaper story that wires for high-tension current were installed in connection with the fence was characterized by Superintendent Shannon as false, there being no intention to utilize this method of protection, he said.

The electrification of industries in India by expert Americans and with American machinery is brought out in the new 640-page India Hand Book, price $1, which is obtainable from the Superintendent of Documents, Washington, D. C., or from the eight branch offices of the Bureau of Foreign and Domestic Commerce in Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco.

Digitized by Google

Program of Electrochemical Society.

The following papers have been announced for the twenty-eighth general meeting of the American Electrochemical Society, which will be held at San Francisco, Cal., September 16-18, with headquarters at the Clift Hotel:

"The Cottrell Process on Silver Furnace Gases," by Charles H. Aldrich.

"Collection and Therapeutic Use of Radium Emanation," by R. S. Bosworth.

"Electrolytic Precipitation of Gold, Silver and Copper from Cyanide Solutions," by G. H. Clevenger.

"Solution Stratification as an Aid to the Purification of Electrolytes," by F. Pyne.

"Electrolysis of Copper-Sulphate Liquors Using Carbon Anodes," by Lawrence Addicks.

"Use of the Flaming Arc in Paint and Dye Testing," by W. R. Mott.

"Radiography of Metals," by W. P. Davey.

"Electrolytic Antimony Refining," by Anson G. Betts.

"Electrodeposition of Nickel," by C. W. Bennett, C. C. Rose and L. G. Tinkler.

"Power for Electrochemical Industries," by D. R. Lyon and R. M. Keeney.

"Peptonization of Chromium Oxide," by W. D. Bancroft.

"Synthesis of Phenylhydroxylamine," by F. M. Frederiksen.

"Electric Steel Costs," by F. T. Snyder.

"Electric Furnace Melting of Ferroalloys," by R. S. Wile.

"Heat Losses from an Electric Steel Furnace," by W. H. Wills, Jr., and A. H. Schuyler.

"Electrochemical Possibilities on the Pacific Coast," by J. W. Beckman.

"Electromotive Forces," by W. D. Bancroft.

Graphite.

The United States is a large consumer of the several kinds of graphite, but only a moderate producer, much of the graphite used in this country being imported from Ceylon and Mexico. Relatively large quantities of amorphous graphite are, however, manufactured at Niagara Falls.

The graphite industry in 1914 was somewhat affected by the war, which after October practically stopped the importation of graphite from Ceylon and Madagascar into the United States until the close of the year. The larger American dealers had a reserve stock on hand, so there was no serious shortage during November and December, and since then trade has so adjusted itself that Ceylon graphite now comes into this country by way of London. In spite of the disturbed conditions in Mexico, the imports of graphite from that country nearly equaled those for 1913.

According to Edson S. Bastin, of the United States Geological Survey, the production of natural graphite in 1914 in the United States amounted to 4,336 short tons, valued at $324,118. Of this quantity, 1,725 tons were amorphous, valued at $38,750, and 2,611 tons were crystalline, valued at $285,368. The greater part of the crystalline graphite —all the "flake" variety—was produced in New York, Pennsylvania, and Alabama. A small quantity of crystalline graphite was produced in Montana. The entire output of natural graphite in 1914 showed an increase in value as compared with that of 1913 but a slight decrease in quantity.

The production of manufactured graphite in 1914 by the International Acheson Graphite Company, of Niagara Falls, was 10,455,139 pounds, or 5,228 short tons, valued at $698,800. This is an average price of $6.68 per ton.

Wasteful Coke Production.

While Germany is carefully conserving her resources by coking her fuel output in by-product ovens to save the valuable tar, ammonia, gas, and benzol, the United States is literally throwing away these useful products to the value of millions of dollars annually by the continued use of the wasteful beehive oven.

In 1914 the total output of coke in the United States was 34,555,914 short tons, valued at $88,334,217. Of this 23,335,971 tons was made in beehive ovens, with an almost total loss of the by-products, and 11,219,943 short tons was produced in by-product ovens, with a recovery of over $17,500,000 worth of by-products, or approximately $1.55 for each ton of coke. As there were over 23,000,000 tons of beehive coke made in 1914, and as the yield of coal in coke is less in beehive ovens than in by-product ovens, the loss of by-products from coal made into coke in the beehive ovens in 1914 was not less than $40,000,000.

Program of Convention of Southeastern Section, National Electric Light Association.

For the annual convention of the Southeastern Section of the National Electric Light Association, to be held at Asheville, N. C., September 22 to 24, the following program of papers has been announced: "Accounting," by A. A. Wilbur, Columbus, Ga.; "Advertising and Its Direct Relation to the Central-Station Field," by J. J. McManus, Harrison, N. J.; "Electric Heating Devices," by W. H. Stearns, Pittsfield, Mass.; "Distant-Control Switchboard Design," by T. W. Fuller, Atlanta, Ga.; "Electric Power for Driving Textile Mills," by H. A. Orr, Anderson, S. C.; "Efficiency in Serving the Consumer," by J. H. Mohl, Cordele, Ga.; "The Sale of Energy to Municipally Owned Systems of Street Lighting," by W. Rawson Collier, Atlanta, Ga., and "High-Tension Systems and Their Operation," by W. E. Mitchell, Birmingham, Ala.

At the close of the first day's sessions a barbecue will be tendered the delegates by the Asheville Board of Trade. On Thursday evening a public-policy session will be held, the feature of which is expected to be an address by the Governor of the State. Entertainment and dancing will follow.

Novel Plan for Changing Transformer Oil.

At the Toppenish, Wash., substation of the Pacific Power & Light Company it became necessary to change the oil from three 200-kilovolt-ampere transformers to another bank of 333-kilovolt-ampere rating, just installed. As this work could not be done with transformers in use and eliminated the possibility of employing electric power, a simple and rather ingenious method was devised for executing the work by means of an automobile. One of the rear wheels of the car was jacked up, a three-inch belt run around the tire and over a pulley on the end of the motor shaft governing the oil regulation. With automobile engine running, the control of speed was readily obtained from the gas throttle. The result attests to the effectiveness of the idea: the oil was transferred in record time at a considerable saving of labor.

Swedish Water Powers.

The annual Year Book of the Swedish Chamber of Commerce in London contains an article on the subject of the utilization of water power in Sweden. Among the important power stations in Sweden are the following:

	Horsepower
South Swedish Water Power Company	27,000
Hemsjo Water Power Company	10,280
Yngeredsfors Water Power Company	16,250
Trollhattan (to be extended to 100,000-120,000 horsepower)	80,000
Gullspang-Munkfors Water Power Company	16,950
Guldsmedshytte Company	6,750
Virsbo-Ramnas Water Power Company	3,045
Untra Water Power Works (still under construction)	42,000
Alfkarleby Water Power Works (to be completed during the present year)	45,000
Horndals Ironworks Company	8,000
West Dal River Water Power Company	19,200
Graningeverkens Company	9,150
Klabbole	4,525
Finnforsen	9,400
Sikfors	5,000
Porjus	50,000

In addition to these there are numbers of water powers utilized for private industrial plants. Five of the largest of these aggregate 130,000 horsepower.

Digitized by Google

Government Exhibits at New York Electrical Show.

At the forthcoming New York Electrical Exposition the United States government will be represented on a larger scale than ever before, according to plans now being made. The War Department will demonstrate the manufacturing of rifles and sabers and the signal corps of the army will exhibit and operate a comprehensive wireless plant. The United States Navy will prepare a five-kilowatt wireless sending and receiving station, and the central generating station of a dreadnaught. The work on these exhibits is being done at the New York Navy Yard. The systems of communication and control of a modern battleship will also be shown, including telephones, fire alarms, light and bell signals, etc.

A complete "money-washing" plant will be installed and operated by the Treasury Department.

New York Municipal Telephone Service to be Investigated.

A special committee has been appointed by the mayor and controller of New York City, to investigate the telephone service to the municipality. The committee is composed of Putnam A. Bates, electrical engineer of the Fire Department and chief engineer of the Bureau of Fire Alarm Telegraph, chairman; Michael R. Brennan, superintendent of telegraph of the Police Department; Robert B. McIntyre, supervising statistician and investigator, and Chester M. Gould, assistant engineer of the Department of Finance.

It is intended to analyze the nature and different classes of service rendered by the telephone company, and to investigate such technical points as routing of leased wires, duct space allowed in subways, mechanical devices applied, and also practical questions bearing on the departmental use of the city's telephones.

Exploitation of Finland's Waterfalls.

The Petrograd Joint Stock Company for Transmission of Water Power has made application to the Governor of Vyborg for permission to exploit the water power from the waterfalls of Rouhialasky. It is proposed to build a dam reaching from one bank to the other, with five passages of 46 feet in width for the water currents, of a depth of 58 feet. According to the calculations of the Finland Hydrographic Bureau, the flow of water is 42,000 cubic feet per second, and can be directed through four passages. The project provides for the erection of nine aggregates of turbines of 10,000 horsepower each.

BOOK REVIEWS.

"Electricity in Coal Mining." By David R. Shearer. New York: McGraw Hill Book Company, Incorporated. Cloth, 84 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $1.50.

This is a brief and rather superficial volume which touches some of the high spots connected with the consideration of the use of electricity in coal mining. The author states in the preface that it is intended for the use of investors and operators in outlining methods of procedure, and also for the operating engineer. The latter, it is to be feared, would not get much out of such a book, but for the former there are numbers of valuable suggestions. Illustrations are given of a number of types of modern machinery, and especially of motor drive and the storage-battery locomotive. The book is divided into 13 chapters, to each of which but a few pages is devoted. The typography is good and the large type makes reading very comfortable.

"The School of Practical Electricity, Vol. I." By Oscar Werwath, assisted by George J. Kirchgasser, F. C. Raeth and W. E. Hennig. Milwaukee: Electroforce Publishing Company. Cloth, 410 pages (6½x10 inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $4.50.

This volume has been prepared for the student and is intended to be used either for home study or to accompany the lectures given in the School of Engineering with which the authors are associated. It also contains suggestions for laboratory problems and experiments. The treatment of the subject is simple and it should prove to be readable and easily understood by the average student, being especially suited to those who have not had elaborate preparatory work. A large number of problems are given which will help the student to test his knowledge of the subject by applying the information which he has absorbed. The illustrations are profuse and are in general well selected. The volume is divided into five sections, which treat separately of the following subjects: First Principles of Electricity; Theory of Direct Current; Electric Light Wiring; Magnetism and the Commercial Application of Magnets; Telephony.

The section on electric light wiring seems to be especially well written and is quite practical. It contains much information seldom found in textbooks and is illustrated with fittings and materials in every-day use. The last chapter in this section, however, which deals with the wiring of a residence, is rather brief and perhaps assumes too much information on the part of the student. The reviewer considers it very objectionable to use the symbol *C* for current, when the letter *I* has been adopted for this purpose not only by the American Institute of Electrical Engineers, but also internationally, and this is especially true in a volume intended for students, who should be familiarized first of all with standard practice. Alternating currents are not considered in this volume and there is no reference to motors or other machinery and apparatus, which it is stated will be considered in a second volume. Taken altogether this book should prove very helpful to the student of the subjects which come within its scope. An error in a formula on p. 116 has been corrected in the reviewer's copy and presumably in others also.

Municipal and Government Electric Railways in Ontario.

The formal opening of the London & Port Stanley Railway took place at London, Ontario, on July 22, in the presence of a score of members of the Canadian Parliament, a dozen mayors of cities, including Toronto, Hamilton, Stratford, St. Thomas and Windsor, and some 800 representatives of the various municipalities that are now using hydroelectric power. This road, which extends from London to Port Stanley on Lake Erie, a distance of 25 miles, is the first radial (or interurban) railway built under the supervision and control of the Ontario Hydroelectric Commission. The new road had for three weeks before its formal opening been carrying freight and passengers, the latter to the number of about 40,000 in that time.

As to the ability of the municipalities to handle radial railway lines successfully, Sir Adam Beck, chairman of the Hydroelectric Commission, made a statement to show that the financial position of the hydroelectric system was so good that the Commission has already this year a surplus of $50,000 to the credit of the 70 municipalities using its hydroelectric power, and that, too, after paying not only all the original expenses but sinking-fund payments as well, although it was not intended that the municipalities should be called upon for sinking-fund payments for a number of years.

As estimates have been prepared on the cost of constructing nearly 1,500 miles of roadbed for electric railways, and as several municipalities have voted in favor of building rural car lines, it is expected that there will be a rapid extension of the use of hydroelectric power when financial conditions become favorable to investments in new undertakings. As car lines are built it will be possible to extend the use of such power for agricultural and domestic purposes.

Digitized by Google

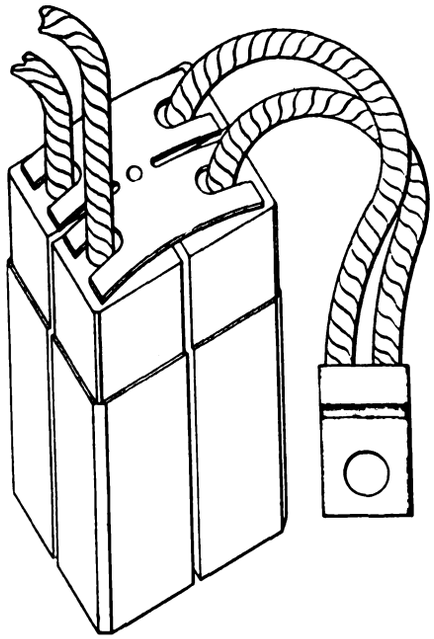
New Electrical and Mechanical Appliances

Schweitzer Multiplex Brush for Commutators and Collector Rings.

Commutation is such an old problem and one that has been discussed so fully and so often that for anything new pertaining to commutation to be justified in appearing at this time it must differ radically from what has existed previously, and accomplish what has not been accomplished before. The Schweitzer multiplex brush recently placed on the market by the Chemelectrical Company, 4327 Kenmore Avenue, Chicago, Ill., appears to fulfill both of these conditions. It is unquestionably ingenious and original, yet very simple. If it accomplishes what is claimed for it, its appearance is fully justified and will be welcomed by operating engineers.

In the endeavor to obtain the greatest output per unit of weight of material and the lowest possible losses, it has been necessary to resort to higher peripheral speeds, increased voltages between bars, and low-resistance brushes employing high current densities. As a result, the problem of picking up the current has changed from a simple one requiring only attention to a few mechanical details to a very serious and absorbing one. It is in this regard that the Schweitzer brush claims to meet the demands as no other brush on the market is able to do.

The Schweitzer multiplex brush consists simply of a brush subdivided into a number of sections (the accompanying illustrations show a four-section brush), each section being so arranged as to permit of movement radially away from the rotating element without affecting in any way the close contact of the remaining sections, except in so far as to increase their tension to a value such that the total pressure remains the same at all times. Between the various sections is placed a spacer or barrier of soft metal or of carbon, as the case may be, having a high specific resistance. The function of this spacer is to reduce the short-circuit current in the coil undergoing commutation and practically eliminate the circulating current in the brush by interposing a high transverse resistance radially through the brush. This barrier, besides assisting the commutation, enables a higher efficiency through the brush, since the circulating current is so largely reduced, which is in striking contrast to the great loss in efficiency accruing from the use of high-resistance brushes previously employed for this purpose because the internal resistance must be exorbitantly high to be comparable with the desired transitional resistance. While the brush has been designed, primarily, to enable intimate contact between commutator and brush to be maintained at all times and under all conditions, it is seen that it also acts as a decided aid to commute the current by reducing sparking, and extending the limi-

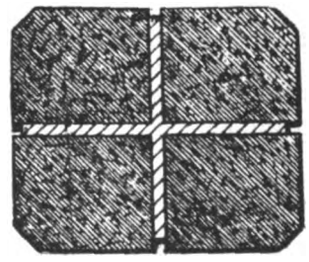


Typical Schweitzer Multiplex Brush.

tations imposed by commutation while permitting higher current densities in the brush for a given temperature rise.

Although accomplishing several functions at one and the same time, the brush is neither bulky nor complicated. The springs are integral one with another and the whole brush and holder is simple, rugged and strong. There is nothing that can become deranged more than is the case with the ordinary brush, and the manufacturer claims that considerably less attention is required of commutator and brushes where this brush is used, since the lower brush tension employed causes less dust and dirt to accumulate, less sparking and wear and tear generally. The better contact at all times reduces, even under the worst conditions, sparking, blackening, pitting and flat spots; frequently the overloading capacity of a machine may be increased, and flashing-over averted; the life of commutators is lengthened and the cost of brush renewals decreased; there is also a lower cost of labor.

The brush finds application for all conditions of collecting current and commutation. In some instances its need is vital, whereas in others it is simply beneficial. The Chemelectrical Company specially recommends this brush in all cases where commutation is unfavorable and unsatisfactory, as where dirt and foreign matter are encountered, for example, around coal docks, steel mills, etc.; for large-capacity rotary converters; for direct-current turbogenerators, where the peripheral speeds are usually two or three



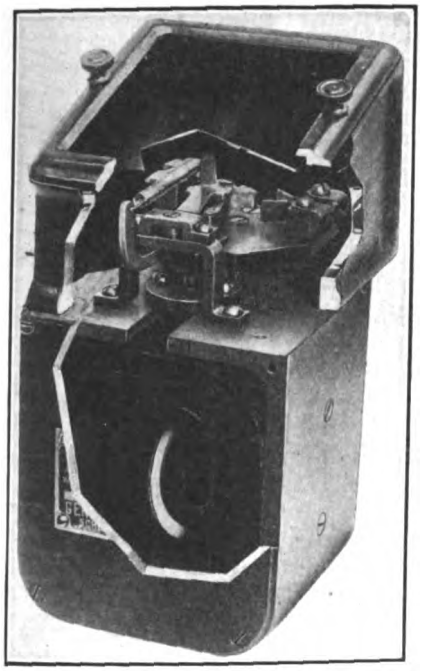
Cross-Section of Four-Part Brush.

times normal; and for railway service, where the conditions are extremely unfavorable to commutation and inspection is infrequent. Where reliability and immunity from commutator trouble is of paramount importance, inspection irregular and expensive, this brush will be found a good investment is the claim of the manufacturer. From its use it is stated that commutators will have longer life, fewer grounds will develop, and the cost of brush renewals, together with the labor cost of renewing them (a large item in railway service) will be reduced.

Relays for Protection of Single Alternating-Current Tie Lines.

Single-pole, double-throw relays of the type illustrated have recently been developed by the General Electric Company. These relays provide a simple and effective means of isolating trouble automatically on a single tie line joining parts of an alternating-cur-

Digitized by Google

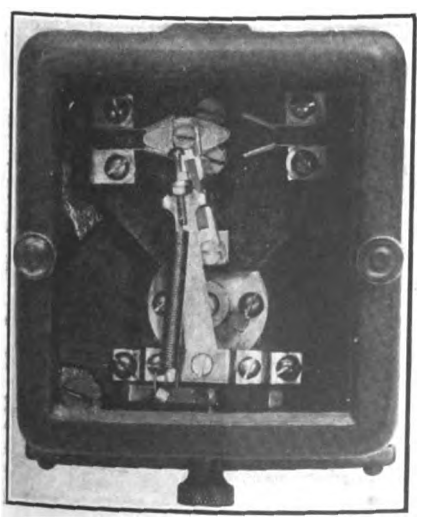


View Showing Interior of Reverse-Power Relay.

rent system. Two relays connected together by pilot wires are required on each end of a three-phase tie.

Under normal conditions, irrespective of the direction of the power, which may reverse at any time over the entire tie line, depending on the distribution of the load and the characteristics of the system, the relays have no effect on the oil switches. If, however, a short-circuit occurs in the tie line while power is being fed from one part of the system to the other, this power will go directly into the short, while the power in the tie between the short and the part of the system previously receiving power will reverse and also feed into the short. This will operate the contacts of the relay in the reversed portion of the line, which will cause the oil switches on both ends of the line to trip and isolate the line from the rest of the system.

The relays will not operate on overload, or on trouble on other lines unless accompanied by a reversal of power only on one end of the line which they are meant to protect. They will, however, operate on very little reverse power, even at low voltage and low power-factor, and are consequently of great value for the service recommended.



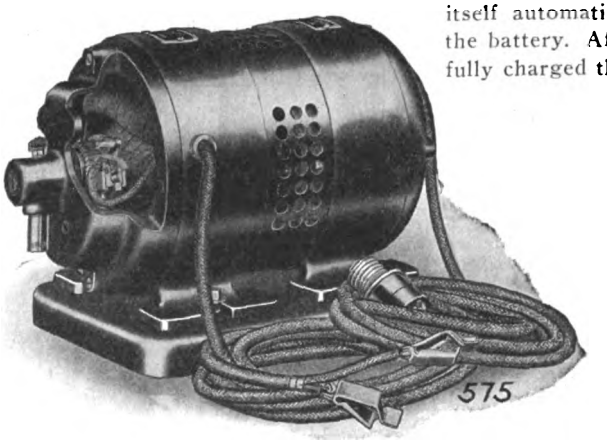
Top View of Reverse-Power Relay.

New Motor-Generator Set for Charging Automobile Batteries.

The Robbins & Myers Company, Springfield, O., has recently developed the motor-generator set shown herewith, for charging batteries for automobiles, motor boats, etc.

They may be operated from 110 and 220-volt direct-current circuits or 115 and 230-volt, 60-cycle alternating-current circuits.

Three sizes are made—80, 150 and 250 watts. The 80-watt size is suitable for private garage service, but it is sometimes used in public garages when the service is light and not more than one battery has to be charged at a time. The 150 and 250-watt sizes are for public-garage service.



Small Battery-Charging Motor-Generator Set.

The 80 and 150-watt outfits are light in weight and can easily be moved about; they are fitted with an oak base so they can be placed on the running board of a car without marring the finish. The 250-watt size is usually installed in a permanent position in the garage.

The 80-watt, 8-volt outfits will charge one three-cell, six-volt battery at a time, starting at a 10-ampere rate.

The 150-watt, 15-volt outfits will charge at the same time, either one 12-volt, or one six-volt, or two six-volt batteries in series, starting at a 10-ampere rate.

The 150-watt, 30-volt outfit and the 250-watt, 30-volt outfit will charge at the same time, either four six-volt batteries in series, or two 12-volt batteries in series, or one 12-volt and two 6-volt batteries in series, or one 24-volt battery, the 150-watt set starting at a five-ampere rate and the 250-watt set starting at a 10-ampere rate.

Eighty and 150-watt sets are regularly furnished with 10 feet of duplex cord and detachable plug on the motor side and with 10 feet of heavy duplex cable with universal lead-covered test clips on the generator side. These leads are substantially anchored to the frame of the machine.

The 250-watt sets have leads brought out of the frame through bushed holds. The ends of these leads are fitted with brass connectors. Four leads are brought out of the generator sides, two being the line leads and the other two intended for connection to the field rheostat.

The 80 and 150-watt outfits are equipped with wick oilers for lubrication. The 250-watt outfits have ring oilers.

To use, a plug on the motor cord is screwed into a lamp socket and the switch is turned. After the set has attained full speed, the generator terminals are connected. As the generators are shunt-wound, either clip can be connected to either terminal of the battery and the generator polarity will adjust itself automatically to the polarity of the battery. After the battery becomes fully charged the generator may be left floating on the battery without injury.

The 80 and 150-watt sets are designed so as to automatically give a tapering charge to the battery, and no rheostat is needed in the generator field.

The 250-watt sets are furnished with a rheostat in the generator field for adjusting the rate of charge.

The motors of all of these outfits will operate without injury on voltages 10 per cent higher or lower than normal. The motors can be thrown directly across the line; no starting rheostat is required.

Flush Receptacle.

Screw-Plug Flush Receptacle.

The accompanying illustration shows the new C-H No. 7642 screw plug receptacle with flush plate, which has been added to the specialties line of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This receptacle, which can be placed in wall

Digitized by Google

or baseboard, provides a better means for connecting a table lamp, fan, or heating appliance than does a chandelier or wall bracket. A spring contact in the receptacle insures good contact, even in places where there is jarring or vibration. Flush plate No. 7643 has a hinged lid which can be closed when the receptacle is not in use. No. 7644 plate is without lid. The approval of Underwriters' Laboratories has been obtained for this new receptacle and the rating given is 660 watts, 250 volts.

New Receptacles for Semi-Indirect and Similar Fixtures.

The two receptacles illustrated herewith are now being furnished as regular

New Fixture Receptacle.

equipment with Brascolites as manufactured by the Luminous Unit Company, St. Louis, Mo. They present a quite radical departure from present practice in that the use of pigtails is eliminated and thus the expense consequent to the making of a soldered and taped joint is also avoided.

The contact terminals are of the regu-

Two-Part Receptacle.

lar screw type but are inclosed or protected by porcelain which is a part of the receptacle body. An aperture is provided for the insertion of the wire and also for a screw-driver to operate the terminal screws. These receptacles are made in both medium and mogul sizes.

While these receptacles were first designed and exclusively used in the company's Brascolite semi-indirect unit, it is now the intention of the Luminous Unit Company to place them on the market

Two-Bulb Headlight, 15 and 4 Candlepower.

for use in all types of fixtures and for such service as they may be particularly adapted to by reason of their improved construction.

Westinghouse Electric Equipment for Ford Cars.

The latest addition to the list of Ford accessories is the Westinghouse starting and lighting system, with optional addition of ignition.

The starting and lighting system consists of a single unit that acts both as starting motor and lighting generator, in connection with a storage

Ignition Unit and Bracket.

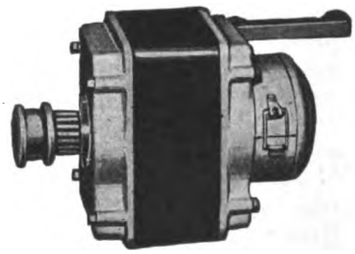
battery furnished as part of the equipment.

When the starting switch is closed the electric unit acts as a motor, drawing current from the storage battery, driving the engine at a speed of about 175 revolutions per minute. The engine picks up and drives the unit as a generator when the car reaches nine miles per hour on high gear, furnishing current for the lights and for charging the storage battery.

Tail Light, 2 Candlepower.

The single-wire (ground return) arrangement of wiring is used in the Ford equipment, all necessary wire and connections being furnished. Throughout there is only one wire instead of two, the frame of the car being used as the return circuit. The simpler system, it is claimed, gives greater clearance for insulation, ample size of contact parts, about half the number of connections and lower voltage loss, and reduces the liability of trouble due to short circuits, etc.

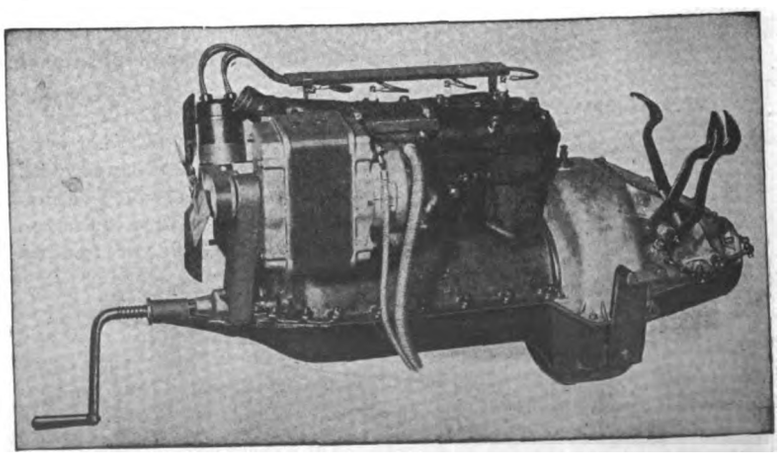
An inclosed Morse silent chain drives the electric unit positively from a special shock-absorbing pinion on the crankshaft. This comparatively low speed assures a long life for the bearings, brushes and commutator. The



Westinghouse Electric Unit Complete.

bearings are high-grade imported ball bearings, and the drive bearing is exceptionally large. The spockets are of high-grade steel, oil tempered.

The current supplied is regulated inherently by the windings of the electric unit, and does not depend on complicated controllers. The output of the generator is such as to keep the battery charged under normal operating conditions. At high speeds the charging current tapers off so that the bat-



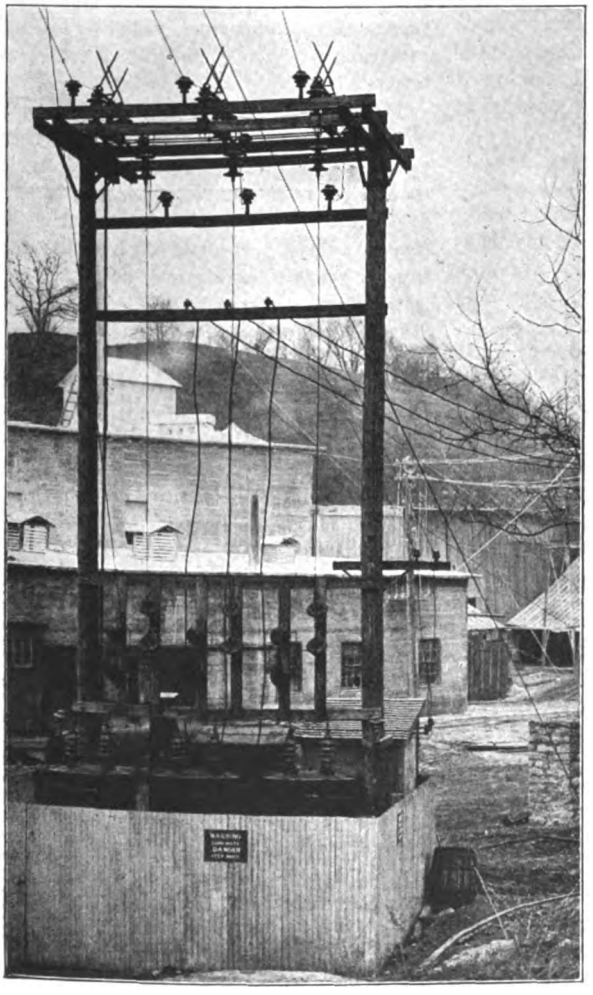
Westinghouse Starting, Lighting and Ignition Set Installed on Ford Engine.

Digitized by Google

tery does not overcharge when touring. There is nothing to adjust. The slight charging at full charge "gasses" the battery to prevent sulphation of the plates, as recommended by battery makers.

To prevent the electric unit from acting as a motor at low speeds, causing the battery to discharge wastefully, an automatic cutout disconnects the electric unit from the battery whenever the engine speed falls below the generating point.

No normal amount of heat, water, gasoline, or oil can damage the electrical apparatus. A special impregnation treatment of the windings renders them safe from these distinctive factors, and makes it impossible for vibration to shake them loose. A continuous temperature of 250 degrees Fahrenheit will not damage the windings.



Industrial Type 33,000-Volt Outdoor Substation.

The same care is used in designing and manufacturing the parts used in the Westingtouse equipments for Ford cars as in those designed for the highest-priced automobiles.

The Westinghouse vertical ignition unti contains interrupter (timer), ignition coil and condenser, and distributer, all in one unit. Current is derived from the battery.

A positive-acting circuit-breaker with platinum contacts, in the primary circuit, insures a spark in the cylinder at every power stroke, and at the same relative time in every cylinder. The perfect balance of the ignition coil and condenser reduces the sparking at the circuit-breaker contacts to a point where it does not injure the contacts, but gives a fat, hot spark at the spark-plug points.

Like the electric unit, the ignition coil and condenser are given an impregnation treatment that renders them heatproof and waterproof. They are inclosed in a tube of Westinghouse Bakelized Micarta, which protects them from oil and gasoline. The core of the coil is of special silicon-steel to increase the efficiency of the system and produce the hottest possible spark in the cylinder with the lowest possible lag in the coil.

To direct the spark to the proper cylinder is the sole function of the distributer in the Westinghouse ignition unit, the interrupter doing the timing. A flat-surface distributer is used which is easy to inspect and clean.

The Westinghouse equipment includes everything that a Ford owner needs for a complete electrical outfit. Every part of the equipment is fully guaranteed by the Westinghouse Electric and Manufacturing Company.

These equipments are shipped in such a way as to avoid repacking when only part of the full set is sold by the local distributing agent.

Low-Cost 33,000-Volt Substation.

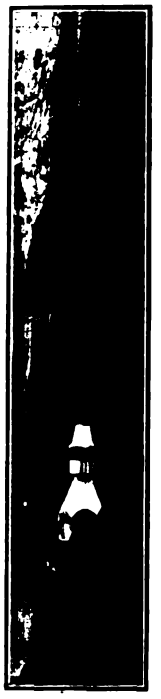
A low-cost industrial type of wooden pole outdoor substation is shown herewith. The high-tension three-phase air-break switch is mounted on two poles, the choke coils and carbon-tetrachloride fuses being mounted just about the transformers, which are at ground level.

The control switch is operated by means of a square vertical steel shaft, at the lower end of which is a locking type handle. This operating mechanism is permanently grounded, thus eliminating danger to the operator from static shocks.

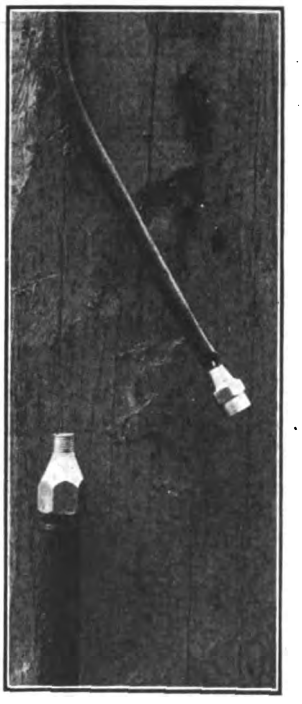
The high-tension switch, choke coil and fusing equipment is of the standard form manufactured by the Delta-Star Electric Company, Chicago, Ill.

Fargo Ground Connection.

The need for maintaining perfect ground connection on many circuits is calling for a reliable means of joining the ground wire to the ground or earth contact device. Frequently it is desirable to be able to test the ground wire and grounding device separately. Both these features are possessed by the new ground connection made by the Fargo Manufacturing Company, Poughkeepsie, N. Y. The accompanying illustrations show this connection closed for service and open for test.



Ground Connection.



Connection Opened for Test.

The joint between the ground wire and connecting device is on the conical compression principle, similar to that used in the Fargo type A ground point described in our issue of August 7, 1915. This compression joint is said to have several times the conductivity of the wire and the compression is so powerful as to form practically a cold weld, thus insuring the lowest possible re-

Digitized by Google

sistance. These connections are made for several different sizes of ground wires and ground pipes. The type A connection shown is particularly desirable where periodic testing of the ground connection is necessary. A modified form, known as the type B, employs the twisted double-wire compression principle. Both types eliminate the use of bolts and nuts.

Welding Defective Cores in Paper Mill.

The St. Croix Paper Company, Woodland, Me., was formerly throwing on the scrap pile all broken and defective paper cores or pipes used in the center of large rolls of paper. Much of this material was sold as junk at the best prevailing market prices. Many carloads of broken and defective cores had been disposed of in this manner before it was discovered that all of them could have been made as good as new by employing oxy-acetylene welding.

By using the Prest-O-Lite process of oxy-acetylene welding, broken cores are now repaired in nine minutes. No filling material is used as a method has been found for handling the welding operation so that sufficient strength can be obtained with the material flowed into the weld from the pipe itself. Occasionally, however, a small quantity of filler rod has to be added to insure a joint that will be as strong as the rest of the core itself. The two sections of pipe are prepared by simply cutting off in a machine with the regular cutting-off tool. The ends of the pipe are not beveled, as the extra metal is needed where filling rod is not added.

The cores are steel tubes three inches in diameter and average about fifty inches in length. During the welding operation, they are slipped over an iron arbor of the same diameter as the shaft on which the roll is designed to run, to insure perfect alinement with the longitudinal center.

As these cores accumulate very rapidly in the enormous production of the St. Croix Paper Company it is stated that enough material, heretofore scrapped, is now on hand to furnish several years' supply of new cores without making it necessary to draw on any new material at all.

Tests of welded paper cores indicate that the reclamation process does not affect the original strength in the least; the welded portions withstand rough handling during continual shipping, although frequently the original metal in the tube is broken.

Former methods at repairing these damaged cores were very unsatisfactory.

United States Light and Heating Company in Good Shape.

The stockholders of the old United States Light and Heating Company have received a final circular from the protective committee explaining the formation of the new United States Light and Heat Corporation and its acquisition of the old company's properties.

The new company has a $1,000,000 bond issue, of which $500,000 has been issued, $3,000,000 non-cumulative seven per cent preferred, which is to be held in a voting trust, and $4,000,000 common stock. Par value of both issues is $10. All debts of the old company have been paid with the exception of a few which are being contested.

More than 90,000 shares of stock were deposited with the committee by about 1,800 stockholders. Of this stock less than 100 shares of preferred and 2,500 shares of common stock failed to pay the assessment provided in the reorganization.

The new company is now operating the plant and several new contracts have been secured. In addition to this it is stated that in the near future the closing of two or three very large contracts, which will insure a heavy volume of business for several years to come, may be affected.

"It may be stated," the circular reads, "that should the new contracts discussed be secured, it is the belief of your operating staff that the actual net profits flowing therefrom, joined to your other business, would seem to make probable not only an early payment of dividends on the new preferred stock voting trust certificates, but discussion of applicable surplus earnings on the new common."

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

RECEPTACLES, Standard. — The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E, porcelain-shell receptacles.

Keyless, 660 watts, 250 volts.

Wall, cleat and concealed, catalog Nos. 50744, 61039.

Conduit box, catalog No. 9514.

For temporary decorative festoon work, catalog No. 4038.

Keyless, 1,500 watts, 600 volts, catalog No. 5012.

Listed July 22, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal-shell, closed or slotted bases.

Pull, 250 watts, 250 volts. For use with metal molding, catalog Nos. Mldg. 486, Mldg. 487, Mldg. 587.

Listed July 30, 1915.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. porcelain-shell receptacles.

Keyless, 1,500 watts, 600 volts, catalog No. 527, with special metal inclosing body and attached eight-inch shade holder.

When used with gas-filled incandescent lamps, this device must not be used in show windows or in other locations where flammable material is liable to come in contact with lamp equipment, and must, if within buildings, be connected to the circuit with conductors of standard slow-burning or asbestos covering.

Listed July 30, 1915.

SOCKETS, Standard.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

C. E. M., 660 watts, 250 volts.

Key, catalog No. 11051. Keyless, catalog Nos. 11061, 11062, 11063.

Zee, 660 watts, 250 volts.

Key, catalog Nos. 351, 352, 353. Keyless, catalog Nos. 360-363 inclusive.

Listed July 26, 1915.

SWITCHES, Surface Snap.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. (With metal covers.)

Four-way, 1 ampere, 250 volts, 10 amperes, 125 volts, catalog No. 2616.

Listed July 17, 1915.

THEATER APPLIANCES.—American Lighting Company, 747 Railway Exchange Building, Chicago, Ill.

Special fixture for use as a flood or spot-light, consisting of an adjustably mounted drum inclosing reflector and 1,000-watt gas-filled incandescent lamp. Provided with glass front or removable, non-flammable, gelatine slides.

Listed July 26, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

MANCHESTER, N. H.—The Manchester Traction, Light and Power Company has awarded a contract to the H. Wales Lines Company, Meriden, Conn., for constructing a 200-foot dam on the Pascoag River, in connection with extensive hydroelectric developments now under way. W.

SOUTHWICK, MASS.—This town is considering the installing of a street-lighting system. W.

NEW LONDON, CONN. — Shore Line Electric Railway Company has completed plans for a brick and concrete power station, 45 feet by 80 feet, to contain generating equipment which will add about 100 per cent to present output. W.

BUFFALO, N. Y.—The Lehigh Valley Railroad is planning the building of an extensive repair shop in connection with the erection of the new passenger and freight terminals. It is estimated that the shops will cost $250,000, and that electrical equipment will enter to a considerable extent in the fitting up of the machinery.

MARTINSBURG, W. VA. — Reorganization of the Martinsburg Power Company, as the Potomac Light and Power Company, is under way, with $1,000,000 authorized capital. It is given out that the company will expend about $100,000 for improvement of four dams and five plants.

WATERBORO, S. C.—Water works and electric light bonds amounting to $15,000 have been voted. Address H. W. Black, Jr., chairman of Board of Public Works.

COOLIDGE, GA.—Bonds amounting to $4,500 have been voted for extending and improving the electric light plant. Address the mayor.

TITUSVILLE, FLA.—An election will be held September 20 to vote on the question of issuing $35,000 in municipal bonds for purchasing the plant and other properties of the Titusville Electric Light Company. Address L. W. Doolittle, mayor.

NORTH CENTRAL STATES.

CLEVELAND, O.—The W. M. Pattison Supply Company has purchased a tract of land upon which a large warehouse will be constructed. The electrical equipment, it is understood, will be extensive.

CLEVELAND, O. — A mercantile building, eight stories high and costing over $100,000, is to be erected on Huron Road west of East Ninth Street. Goakes & Dettelbach handled the realty operations, and it is understood that there will be a number of contracts for electrical equipment.

COLUMBUS, O.—The Ohio Board of Administration, Columbus, O., of which H. S. Riddle, Columbus, is consulting engineer, will purchase for the Ohio Hospital for Epileptics, at Gallipolis, O., two 400-horsepower water-tube boilers, and two 400-horsepower stokers, and for the Institution for the Feeble-Minded, at Columbus, nine automatic side-feed self-cleaning stokers. Specifications are on file with the board. Bids will be received until September 10 at 2 o'clock p. m. L.

YOUNGSTOWN, O.—It has been announced that the Youngstown Sheet and Tube Company has practically decided upon the erection of another bar mill for the exclusive rolling of iron. It is expected that electrical equipment will enter very largely into the operations.

MONROE, IND.—Bonds to the amount of $4,000 have been voted to build a pole line from Decatur to Monroe. Address Martin Mylott, superintendent of water works.

SPRINGFIELD, ILL. — Business men here are contemplating the installation of an ornamental lighting system on Washington Street, from First to Tenth Streets, and on Monroe Street, from Spring to Tenth Streets. The matter is before the Board of Local Improvements.

BRELA, IOWA.—An electric light plant will be installed here. Address the town clerk.

JOLLEY, IOWA.—The Council is planning to secure a municipal light plant. Address the town clerk.

KANSAS CITY, MO.—The Federal Power Company will be organized with a capital of $4,000,000, to build a series of dams in the Niagara River to furnish electric power to Kansas City, Springfield and other cities of western Missouri. The company is being established by Kelly & Kelly, and C. E. Foote & Son, financial agents for the proposed company that is contemplated to build the dams, install the power plant and operate it.

ST. JOSEPH, MO.—Bond proposals for the issuance of more than a million dollars will be voted on September 23, including proposals for $75,000 for improvements of the local lighting plant. M.

ELLINWOOD, KANS.—The Council is planning ways and means to install a $15,000 electric light plant. Address the town clerk.

HOYT, KANS.—The Council is planning to secure a municipal electric light plant. Address the town clerk.

SOUTH CENTRAL STATES.

CLAY, KY.—The Clay Electric Light and Ice Company is contemplating the addition of a laundry plant to its operations.

ELIZABETHTOWN, KY.—The General Utilities Company has contracted with the Elizabethtown Milling Company to furnish electric power for the mill which is now using an engine. The Utilities Company will install a 24-horsepower motor and a 75-horsepower motor, which it is thought will be sufficient to run the mill.

HENDERSON, KY.—The municipal electric light plant will not be sold while the present administration is in power, according to Mayor Johnson. A new boiler house is to be built soon at the city's plant, to replace that damaged by a storm.

IRVINE, KY.—The Irvine Light Company, which is now equipping a new plant, expects to begin supplying service by September 1.

LANCASTER, KY.—Plans for the municipal electric light plant and water system, previously noted, include the installation of generators of 60 kilowatts and 120 kilowatts, and electric pumps for water works.

WARSAW, KY.—The Warsaw Electric Light and Ice Company, which has practically completed its plant here, will begin service about the last of the month. Many citizens have wired their homes in preparation.

COLUMBIA, TENN.—The Water & Light Company will improve lighting. Address City Engineer Weiss.

HENDERSON, TENN.—The municipal bond issue to construct an electric light plant, water works and sewer system, has carried. J. I. Galbraith is mayor.

LONSDALE, TENN.—An electric lighting installation is contemplated. Dr. H. E. Christenberry is mayor.

PULASKI, TENN. — An ordinance has been passed requiring all telephone, telegraph and electric light poles around the public square to be removed. The city has also voted to pay one-third of the expense of putting in a white way system of lighting.

MARSHALL, OKLA. — Bonds to the amount of $25,000 have been voted to construct an electric light and power plant. Address the mayor.

PURCELL, OKLA.—The city contracted to furnish Lexington, Okla., across the South Canadian River, with electric current both for street lighting and private use. Final action has been delayed however by hesitancy of the Purcell-Lexington Bridge Company to enter into a contract to carry the feed wires across its bridge.

WIRT, OKLA.—W. E. Gupton will organize a company to build an electric light and power plant.

DUBLIN, TEX.—The Dublin Electric and Gas Company will extend the street-lighting system here. D.

LOCKHART, TEX. — The local electric light, water works and ice plant has been purchased by W. B. Tuttle, and associates, of San Antonio, from J. A. Bachman, of Austin, and J. E. Jones, of Lockhart. The plant will be improved and enlarged. Frank E. Scovill is the new manager. D.

SKIDMORE, TEX.—The Texas Southern Electric Company contemplates constructing an electric trans-

Digitized by Google

mission system from Beeville to Skidmore. Address Fred C. Greer, Beeville, Tex.

VICTORIA, TEX.—The city will issue $40,000 in bonds for electric light plant construction. Address J. H. Flemings, mayor.

WESTERN STATES.

GLASGOW, MONT.—The council plans to install an $18,000 electric plant here. Address H. D. Palmer, city clerk.

ROUNDUP, MONT.—It is reported the City Council, owing to remonstrances filed by voters, has indefinitely tabled the proposition of installing an ornamental lighting system in this city, which was to have cost $10,000.

LEWISTON, IDAHO.—The Commercial Club is reported to be back of the proposition of constructing a municipal power plant on either the Clearwater or Snake Rivers, which would be capable of furnishing current for both lighting and power for this city. Robert S. Erb, president of the Commercial Club, is the moving factor in the project. O.

RUPERT, IDAHO. — According to recent reports, the City Council is contemplating the proposition of acquiring, improving and extending the local electric light plant and distributing system. O.

SALT LAKE CITY, UTAH. — A petition has been presented to the City Commission by Herbert S. Auerbach for the creation of a special lighting district to include the major portion of the business district of the city.

DEXTER, N. M.—The City Council plans to construct a municipal electric light and power plant. D.

FLORENCE, ARIZ.—Plans for an electric light and water system for this city have been submitted to the City Council by F. H. Ensign, of Phoenix. The estimated cost is $46,000.

ARTESIA, CAL.—At a recent election the proposition for the formation of a lighting district for Artesia was carried.

FRESNO, CAL.—Plans are under consideration for the installation of an electrolier lighting system in Courthouse Park, which, it is estimated, will cost $6,500.

SAN DIEGO, CAL.—Plans for an ornamental lighting system on lower Broadway, from California Street to the municipal pier, have been submitted to the City Council by Engineer Cromwell. The cost will be $4,839.

BEND, ORE.—At a recent election the voters refused to grant the electric light and power franchise sought by Steidl & Tweet, who proposed to compete in this field with the Bend Water, Light and Power Company. Charles R. Brown, of Chicago, president of the Bend Water, Light and Power Company, stated that his company, as a result of the defeat of the franchise, will proceed with extensions and improvements necessitated by the rapid growth of the town. From reports it is learned these extensions will be made at once. O.

FRIEND, ORE.—The Friend Mill and Improvement Company has been granted a permit by State Engineer John H. Lewis, for the use of waters of Jordan Creek, same to be used in irrigating about 1,000 acres of land lying in Wasco County, near this place. The company purposes constructing a small electric power plant, which will cost in the neighborhood of $7,000. O.

HAINES, ORE.—It is reported the local flouring mills are to be equipped with new electrical machinery at an early date. M. Moeller, of Baker, Ore., owner of the plant, states same will be ready for operation some time this fall. O.

BELLINGHAM, WASH.—The mayor and city comptroller have been instructed by the City Council to enter into a contract for furnishing current with the Whatcom County Railway, Light and Power Company, which is a subsidiary of the Puget Sound Traction, Light and Power Company, of Seattle, and is managed by Leslie Coffin. The council has also voted to install a new street-lighting system this fall. O.

OLYMPIA, WASH.—The Board of County Commissioners, of Thurston County, at a recent meeting, granted a franchise to George Tilden, Hoge Building, Seattle, to construct, operate and maintain electric power lines in Thurston County. According to plans heretofore announced, Tilden will erect a hydroelectric power plant on the Skokomish River, in Mason County, and will transmit the current generated throughout southwestern Washington, serving the small towns as well as the larger ones with current for both light and power. O.

SOUTH BEND, WASH.—The Willapa Power Company, serving this city and contiguous territory, will shortly begin the first unit of a proposed hydroelectric power plant on the South Fork, which will supply all necessary electricity for local consumption. The company at present obtains its current from a local mill plant. The company is composed of local capital.

SUMNER, WASH. — The Puget Sound Traction, Light and Power Company, Seattle, has announced its intention of installing a new lighting system in the immediate future.

FINANCIAL NOTES.

The Federal Telephone & Telegraph Company has filed a mortgage of $25,000,000. It operates an independent telephone system in Rochester, Buffalo and western New York.

At the annual meeting of American Public Utilities Company retiring directors were re-elected with the exception that Walter H. Lippincott replaced Henry S. Morris, of Philadelphia. Willis J. Ripley, who has been assistant treasurer, was elected treasurer. Other officers were re-elected.

Dividends.

	Term	Rate	Payable
Cent. Miss. Val. Elec. pf.	Q	$1.50	Sept. 1
General Elec.	Q	2 %	Oct. 15
Louisville Traction pf.	S	2.5 %	Oct. 1
Louisville Traction com.	Q	1 %	Oct. 1
No. Ohio Traction	Q	1.25%	Sept. 15

Reports of Earnings.

CONSUMERS' POWER OF MICHIGAN.

	1915	Per cent gain over 1914
July gross	$ 305,310	18.17
Net earnings	198,176	20.90
Surplus after charges	107,712	56.87
Balance after preferred dividends	74,212	91.95
Seven months' gross	2,126,068	9.65
Net earnings	1,441,347	12.22
Surplus after charges	779,366	23.33
Balance after preferred dividends	544,866	26.14
Twelve months' gross	3,602,490	8.43
Net earnings	2,373,897	17.80
Surplus after charges	1,236,593	36.38
Balance after preferred dividends	845,093	48.46

CLEVELAND ELECTRIC ILLUMINATING.
(Central States Electric Corp. Subsidiary.)

	1915	1914
July gross	$ 311,643	$ 291,489
Net after taxes	152,010	140,847
Balance after interest, preferred dividends and amortization	116,580	105,107
Surplus after depreciation	85,415	75,957
Seven months' gross	2,585,581	2,540,097
Net after taxes	1,352,132	1,182,650
Balance after interest, preferred dividends and amortization	1,104,118	928,440
Surplus after depreciation	818,558	670,785
Twelve months' gross	4,301,428	4,262,682
Net after taxes	2,089,966	2,006,324
Balance after interest, preferred dividends and amortization	1,670,078	1,585,493
Surplus after depreciation	1,239,934	1,159,234

CITIES SERVICE COMPANY.

	1915	1914
July gross	$ 297,626	$ 271,637
Net after expenses	283,255	262,675
Balance after interest	242,422	221,842
Surplus after preferred dividends	111,589	85,009
Twelve months' gross	4,003,722	3,543,737
Net after expenses	3,850,143	3,446,468
Balance after interest	3,360,143	3,125,477
Surplus after preferred dividends	*1,766,147	1,703,352

*Equivalent to 11.84 per cent on common stock.

MONTREAL LIGHT, HEAT & POWER.

	1915	1914
July gross	$ 474,879	$ 460,903
Net after taxes	255,186	233,992
Surplus after charges	214,577	198,316
Three months' gross	1,509,506	1,454,166
Net after taxes	831,888	768,125
Surplus after charges	709,892	662,812

ALABAMA POWER COMPANY.

	1915	1914
July gross	$ 86,014	$ 45,645
Expenses and taxes	35,390	23,508
Net earnings	50,624	22,140
Twelve months' gross	900,599	456,169
Expenses and taxes	371,009	281,274
Net earnings	529,590	174,895

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 23	Aug. 16
American Tel. and Tel. (New York)	121	122¾
Commonwealth Edison (Chicago)	135	135
Edison Electric Illuminating (Boston)	230	233
Electric Storage Battery common (Philadelphia)	62¾	62½
Electric Storage Battery preferred (Philadelphia)	62¾	62½
General Electric (New York)	168	171
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	4⅝	4½
Massachusetts Electric preferred (Boston)	33¾	33¼
National Carbon common (Chicago)	140	145
National Carbon preferred (Chicago)	119¾	119¾
New England Telephone (Boston)	131	132
Philadelphia Electric (Philadelphia) (ex-dividend)	24¼	24¼
Postal Telegraph and Cables common (New York)	70	76½
Postal Telegraph and Cables preferred (New York)	66¾	66¾
Western Union (New York)	69⅞	71
Westinghouse common (New York)	111⅛	112⅝
Westinghouse preferred (New York)	135	137½

Digitized by Google

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 17,976. ELECTRIC MOTORS.—An established firm in Norway informs an American consular officer that it desires to represent American manufacturers of electric motors.

NO. 17,979. ELECTRICAL SUPPLIES, ETC.—An American consular officer in the Netherlands states that a firm in his district desires to represent American manufacturers of electric motors, telephones, geometrical and other technical instruments.

NO. 18,006. ELECTRICAL SUPPLIES.—An American consular officer in China reports that he has been requested to supply catalogs and full information relative to electrical supplies. Correspondence may be in English.

NO. 18,031. INCANDESCENT LAMPS.—An American consular officer in France writes that a business man in his district desires to represent American manufacturers and exporters of incandescent lamps. Correspondence is preferred in French.

NO. 18,032. ELECTRIC LAMP SOCKETS.—An Italian manufacturing company informs an American consular officer that it is in the market for 60,000 screw sockets per month. Contracts for a year or longer will be entered into. Reference is given. It is stated that samples are being forwarded. When the samples arrive they will be exhibited at the branch offices of the Bureau.

NEW INCORPORATIONS.

SPILLVILLE, IOWA.—The Spillville Electric Light Company has been incorporated with a capital of $10,000.

SUPERIOR, WIS.—The Ross Electric Company has been incorporated with a capital of $10,000, by Leslie G. Ross, F. J. Goodwin and R. I. Tinton.

NEW YORK, N. Y.—Daylite Electric Corporation; electrical fixtures. Capital, $1,000. Incorporators: Walter H. Strong, Max D. Boiko and Abraham M. Fisch.

BOSTON, MASS. — The Rendle-Stoddard Company has been incorporated for the purpose of waterpower development, with a capital of $50,000. The incorporators are James B. Rendle and Clayton Stoddard.

PORTLAND, ME.—The Allen Electrolytic Cell Corporation has been incorporated with an authorized capital of $50,000 The directors are Messrs. Freeman, E. N. Gibson and Charles N. Drummond, all of Portland.

CORTLAND, N. Y.—The Southwick Electric Company has been incorporated with a capital of $5,000, to deal in electrical supplies, etc. The incorporators are Charles H. Moss, Lee Southwick and Edith Phillips.

NEW YORK, N. Y.—The New York Switch and Panel Board Company, Incorporated; to manufacture switchboards and other electrical goods. Capital, $25,000. Incorporators: J. Walter Smith, Frederick Weierman and John F. P. Young.

SUMMIT, N. J.—The Commonwealth Electric Company has been incorporated with a capital of $500,000. Carroll P. Bassett, Frank C. Kimball, Stephen W. Borden, H. Marsh Shorrock, all of Summit, and Fred R. Drake, Easton, Pa., are incorporators. A.

WELLESLEY, MASS.—The Fuller Electrical Appliance Company has been incorporated and will engage in the manufacture of electric specialties. The incorporators are: F. A. McClaskey, president; L. D. H. Fuller, M. D. Maher, C. L. Maher and H. A. Weitz.

LANCASTER, O.—S. S. Wilson and Roy Ballinger, promoters of an automatic electric lighting system, with S. K. Weirick, J. J. Klise and W. P. Nolder, have just taken out from the office of the secretary of state incorporation papers for the Automatic Lighting and Power Company. The capital stock is $50,000.

NEW PUBLICATIONS.

COMMERCIAL TREATIES.—The National Foreign Trade Council has published a brief by Carman F. Randolph entitled, "Commercial Treaties of the United States." This has been prepared under the direction of the Foreign Relations Committee and considers the conditions which will obtain and the responsibilities which will fall upon the United States on account of the present war.

ALBERTA LIGNITE.—The Canadian Department of Mines has published bulletin No. 331 entitled "Results of the Investigation of Six Lignite Samples Obtained from the Province of Alberta," by B. F. Haanel and John Blizard. This report covers 110 pages and gives the results of tests made upon gas producers using this fuel, as well as of boiler tests. The report is accompanied by tables and illustrations.

GUIDE BOOKS.—The United States Geological Survey has prepared two guide books of the Western United States which are designated as Bulletins Nos. 611 and 612. The first is material referring to the route of the Northern Pacific Railroad to the Pacific Coast and the second the Overland Route, and both include side trips to Yellowstone Park. They contain useful and interesting information for the public, but are concerned chiefly with geological features along the respective routes. They may be obtained from the Superintendent of Documents, Washington, D. C., for $1.00 each.

PERSONAL MENTION.

MR. G. W. MILLIKEN, superintendent of the Arkansas Valley Railway, Light & Power Company, at La Junta, Colo., has been re-elected secretary of the La Junta Merchants' Association.

MR. DONALD M'DONALD, vice-president and general manager of the Louisville Gas and Electric Company, who has been spending some time at Hot Springs, Va., where his family is spending the summer, has returned to Louisville.

MR. M. L. HIBBARD, general manager of the Union Light, Heat & Power Company, Fargo, N. D., was recently re-elected a member of the Board of Directors of the Merchants Auxiliary of the North Dakota State Fair Association, and Mr. W. P. Chestnut, new-business manager of the company, was elected secretary-treasurer of the Auxiliary.

MR. JAMES H. BETTS, sales manager of Betts & Betts Corporation, New York, announces his candidacy for the office of congressman for New York in the fourteenth Jovian administration. Mr. Betts has been an active worker in the Jovian Order for a number of years. He was formerly a statesman-at-large and is now statesman for New York.

MR. M. B. WHEELER, general manager of Cummings & Company, Incorporated, jobbers, Galveston, Tex., is enjoying a season of hard work and meeting with considerable success in bringing his company to a leading position as a distributor of electrical and automobile accessories, sporting goods, etc. Mr. Wheeler, who for many years was connected with the Tel-Electric Company has many friends in the electrical business who will be glad to know of his continued success.

MR. W. C. WHITNEY BEATTIE will hereafter be located at the New York office of the American Rotary Valve Company, 30 Church Street, in capacity of industrial engineer. Mr. Beattie, who became connected with the company last spring, is regarded as an expert in motor and control application, and in the electrical equipment of driven machinery. He was for several years director of the Sprague Electric Works' New York office, printing machine equipment division.

MR. WILLIAM D. AINEY, of Montrose, Susquehanna County, has been appointed chairman of the Public Service Commission of Pennsylvania by Governor Brumbaugh. Mr. Ainey, who was appointed a commissioner in the spring of 1915, has been acting as chairman, being the junior in the commission. The newly appointed chairman has served as a United States congressman, and was a member of the House Committee on Foreign Relations. He was born at New Milford, Pa., and is a graduate of Mansfield Normal School and Lehigh University. He was district attorney of Susquehanna County for two terms until elected as a congressional representative.

MR. V. C. GILPIN announces a departure in the selling of electrical merchandise which he expects will make an immediate appeal to both the electrical manufacturer and dealers throughout the country. The new business is styled "Gilpin, V. C. Company, Brokers in Electrical Merchandise," with offices at 110-112 West Fortieth Street, New York City. He purposes securing from the various manufacturers of electrical material, a list of their slow-selling, obsolete types, dead stocks, mill-ends, overproductions, etc., listing them under respective headings, showing net cash prices and mailing them to his customers. He expects to have his first list ready for mailing about September 10.

MR. THOMAS C. RINGGOLD, for many years well and favorably known in the electrical industry and formerly general sales manager of the Central Electric Company, Chicago, has made an important connection in an entirely new line. Mr. Ringgold has recently been appointed superintendent of agencies of the Kerner Incinerator Company, of 124 Biddle Street, Milwaukee, Wis. and is busy establishing branch offices and appointing district agents. While this work will take him

Digitized by Google

away from the electrical field, his wide knowledge of the business will stand him in good stead in the new connection, as he will have to do to a considerable extent with building contractors and the architectural fraternity. The Kerner incinerator is a recently perfected device for entirely removing in an economical and efficient manner all house refuse, and is finding immediate popularity in high-class residences in every part of the country.

MR. PIERRE L. MILES, sales manager of the electrical department of the Globe Stove and Range Company, Kokomo, Ind., started in the electrical business with the master mechanic of the Cleveland Electric Railway Company some six years ago. In 1908 he entered the employ of the Cleveland

P. L. Miles.

Electric Illuminating Company in the executive offices. Later on he entered the sales department and after considerable experience in various divisions took charge of advertising and appliance sales. His work at this time attracted a great deal of attention, and in 1912 he was offered a position with the National Electric Lamp Association, Cleveland, O., spending the major portion of his time with this organization traveling to different parts of the country studying the new-business methods of various progressive central stations. Early in 1915 he took charge of the house-wiring, advertising and appliance departments of the Indianapolis Light and Heating Company, initiating one of the most successful campaigns which this aggressive organization has undertaken. He then joined forces with the Globe Stove and Range Company. This organization has enjoyed a prominent position in the coal and gas stove business for many years and is now entering the field with a complete line of electrical stoves and ranges. Mr. Miles is alert and active, has made many friends in the electrical industry, is an affable and magnetic salesman and has already done much to establish the popularity of his new connections. He has entire charge of marketing the electrical product, and for the time being will make his selling headquarters in the Commonwealth Edison Building, Chicago, Ill.

DATES AHEAD.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Portland, Ore., September 8-11. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting. Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

International Engineering Congress, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building San Francisco, Cal.

American Mining Congress. Eighteenth annual convention, San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn., Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denever, Colo.

American Electric Railway Association. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention. Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Kuhlman Electric Company, manufacturers of transformers, is moving its plant from Elkhart, Ind., to Bay City, Mich., into a modern factory. The company should be addressed at Bay City from this date.

Columbia Lamp Division of the National Lamp Works of General Electric Company, St. Louis, Mo., has removed its offices to Suite 1201, Title Guaranty Building, 706 Chestnut Street.

The P. & B. Manufacturing Company, Milwaukee, Wis., manufacturers of electrical fittings and heating appliances, announces that A. Hall Berry, 87 Warren Street, New York City, is acting as sole agent for the Sun Ray electric heating pad.

The ADAPTi Manufacturing Company, Cleveland, O., has ready for distribution catalog No. 105, effective September 1, giving full descriptions and prices on ADAPTi boxes. This apparatus is listed in complete units assembled to make the various types most commonly used and that are well known to the trade. A perusal of this catalog constitutes a liberal education in interesting conduit fittings. Copies of the catalog will be supplied to those interested upon request.

W. R. Ostrander and Company, New York, N. Y., announces that the National Board of Fire Underwriters has recently approved an Ostrander bell for service on 50 to 250-volt circuits. This bell is of the vibrating type, and is manufactured in sizes from 2.5 to 24-inch gongs, and is especially designed for fire alarm, railroad and school signals. The Ostrander bell circular will be mailed upon request.

The Turner Electrical Supply Company, Birmingham, Ala., it is announced, has been formally transferred to Young & Vann, who will conduct the business in the future. It is

Digitized by Google

understood that Oscar Turner and John Turner have severed all connections with the business and are arranging for activities in another line. The Turner Electrical Supply Company, formerly the Southern Wesco Company, is one of the largest business concerns of this kind in Birmingham, dealing in all kinds of electrical supplies and automobile accessories.

The New Process Gear Corporation, Syracuse, N. Y., by negotiations closed between T. G. Meachem, vice-president of the company, and the officers of the Union Typewriter Company, has acquired ownership of the Monarch Typewriter plant, Syracuse, N. Y. The buildings of the Monarch plant cover two acres, and the surrounding land which adioins the property of the New Process Gear Corporation includes an additional three acres. The main building is five stories high, is of brick and slow-burning mill construction, with a frontage of 480 feet and extending back 350 feet. After alterations the Monarch plant will be used as a job, gear and spur and transmission gear department, and the present plant will be devoted exclusively to the manufacture of automobile differentials. It is the intention of the New Process Gear Corporation to have more than 1,000 employees at work before spring, at which time the additional five-story building now being erected on property purchased recently will be completed and equipped.

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., announces that it has received the following among recent orders: Johnstown Traction Company, Johnstown, Pa., one 300-kilowatt, 60-cycle, alternating-current, self-starting rotary converter; one 300-kilovolt-ampere, three-phase, 22,000-volt transformer and two-panel switchboard. Toledo Railway and Light Company, Toledo, O., one 1,500-kilowatt, six-phase, 25-cycle, commutating-pole rotary converter and three 500-kilovolt-ampere transformers. City of Cleveland, O., two 1,000-kilowatt, 270-volt direct-current, six-phase, 60-cycle, synchronous booster converters, alternating-current self-starting; six 365-kilovolt-ampere, 11,000-volt transformers and 12-panel switchboard. Philadelphia Suburban Gas and Electric Company, one 500-kilowatt, 600-volt, direct-current, three-phase, 60-cycle, alternating-current, self-starting rotary converter: three 110-kilovolt-ampere, 13,200-volt transformers. Metropolitan Street Railway Company, Kansas City, Mo., one 3,000-kilowatt, 575-volt, direct-current, six-phase, 25-cycle, commutating-pole rotary converter; three 1,000-kilovolt-ampere, 6,600-volt, air-blast transformers; one blower outfit for the above transformers and three-panel switchboard. Commonwealth Edison Company, Chicago, Ill., one 4,000-kilowatt, 600-volt direct-current, six-phase, 25-cycle, commutating-pole rotary converter; one 4,200-kilovolt-ampere, three-phase, 25-cycle, air-blast transformer (9,000 volts to rotary voltage); one switchboard for control of this apparatus. Pittsburgh Railway Company, Pittsburgh, Pa., four 1,800-kilowatt, 600-volt, direct-current, six-phase, 60-cycle, commutating-pole rotary converters; twelve 625-kilovolt-ampere 11,000-volt transformers; one 33-panel switchboard to control the above apparatus; also three motor-generator sets with 1,000-kilowatt, 550-volt, direct-current commutating-pole generators and three-phase, 60-cycle, 10,000-volt synchronous motors and direct-connected exciters. St. Louis, Rocky Mountain & Pacific Railway Company, Raton, N. M., one portable substation complete, containing one 300-kilowatt, 250-volt, direct-current, commutating-pole generator with one 450-horsepower, three-phase, 60-cycle, 2,300-volt synchronous motor as a motor-generator set; three 100-kilovolt-ampere, 44,000-volt outdoor transformers and a two-panel switchboard.

Record of Electrical Patents

Issued by the United States Patent Office, August 17, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,150,007. Electrical-Impulse Transmitter. W. Aitken, assignor to Relay Automatic Telephone Co., London, England. Self-contained for automatic telephone system.

1,150,009. Telephone Set. W. P. Andrick, assignor to General Acoustic Co., New York, N. Y. Receiver has several windings respectively connected with several transmitters.

1,150,010. Centrifugal Switching Device. S. L. Armstrong, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Details of centrifugal weight device.

1,150,017. Vapor Rectifier. D. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Rectifying circuit in evacuated container inductively connected with exterior circuit.

1,150,019. System for Electrical Distribution. J. B. Dyer and G. A. Johnstone, Anderson, Ind. Regulation of storage-battery system.

1,150,021. Molding Electrodes. G. Favier, Suspension Bridge, N. Y. Electrodes have concentric zones of material increasing in porosity toward the center.

1,150,022. Coil Wedge. A. B. Field, assignor to Westinghouse Electric & Mfg. Co. Coil-retaining wedge for open-slot dynamo-electric machine.

1,150,023. Secondary or Storage Battery. B. Ford, Philadelphia, Pa. Containers made in sections and respectively connected to plates of opposite sign; details of insulation, plate supports, etc.

1,150,028. Photographic-Studio-Lighting Apparatus. E. Goldensky and P. H. Bartlett, Philadelphia. Lamps at intersections of lazy-tongs frame can be compacted or dispersed to vary light intensity.

1,150,032. Starting Ignition System for Internal-Combustion Engines. O. Heins, New York, N. Y. Special starting ignition circuit controlled by cranking means.

1,150,035. System of Control. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Electromagnetic control of resistances respectively in series and shunt with motor.

1,150,043. Dynamo-Electric Machine. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Supports for armature coil ends.

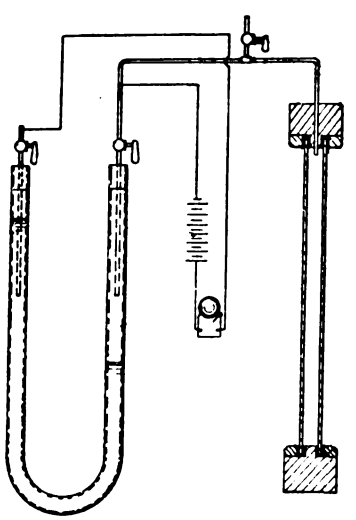
1,150,049. Laminated Structure. F. S. Martin, assignor to Westinghouse Electric & Mfg. Co. Plates of core structure have magnetic retaining strips imbedded in and welded to them.

1,150,053. Display Apparatus. C. G. Miller, assignor to Underseller Co., New York, N. Y. Electric motor-driven advertising device.

1,150,054. Electric Signaling Apparatus. E. G. Missbach, assignor to Siemens & Halske Aktiengesellshaft, Berlin, Germany. For sending combination signals.

1,150,055. Telephone System. H. W. Munsell, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Particular arrangement of relays in link circuit.

1,150,066. Pocket Flashlight. F. M. Rosenfeld, assignor to Import Sales Co., New York, N. Y. Has clip for preventing loss from pocket and serving as switch.



No. 1,150,204.—Burglar Alarm.

1,150,067. Supporting Structure for Trolley Conductors. W. Schaake, assignor to Westinghouse Electric & Mfg. Co. Steadying arm for catenary line.

1,150,081. Method of Making Electrical Apparatus. S. Trood, assignor to Westinghouse Electric & Mfg. Co. For casting head about insulated coil of soldering iron.

1,150,101. Method for Cleaning Articles. E. L. Couch, assignor to Couch-Dean Corporation, Hartford, Conn. Article is positioned upon an electrode and placed in an electrolytic circuit.

1,150,110. Automatic Signal-Operator. E. R. Gill, assignor to Hall Switch & Signal Co., New York, N. Y. Sender normally and automatically sending rapid succession of impulses has operation interrupted by key-controlled arrester.

1,150,111. Coherer. E. R. Gill, Yonkers, N. Y., assignor to T. M. Campbell. Particular structure of terminal bodies forming cavity between them in which are located the coherable particles.

1,150,112. Plug Switch. W. S. Hadaway, Jr., and E. E. Rose, assignors to Westinghouse Electric & Mfg. Co. Telescoping cylindrical shells respectively carry co-operating plug and socket members.

1,150,116. Battery-Charging System. J. O. Heinze, Detroit, Mich. Arrangement of magnets in shunt circuits about dynamo for controlling circuit connections.

1,150,117. Treatment of Water and Other Liquids by Ultra-Violet Rays. V. Henri, A. Helbronner and M. von Recklinghausen, assignors to R. U. V. Co., New York, N. Y. Liquid flowing through chamber subjected to rays emitted from mercury-vapor lamp and flow of liquid is reduced when lamp current is larger than normal.

1,150,118. Art of Lighting. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. A wave-transforming reflector comprising translucent sheet carrying a fluorescent coating and backed by a reflecting surface.

1,150,150. Machine for Electrically Welding the Links of Chains, Rings or the Like. M. R. Ryan, Bridgeport, Conn. Details of machine for resistance welding.

1,150,169. Electric Motor. S. C. Bryant, assignor to Bryant Zinc Co., Chicago, Ill. Arrangement of solenoids, etc., to form motor for operating signal pendulum.

1,150,170. Headlight. F. Buchanan, Syracuse, N. Y. Particular provisions for adjusting lamp along focal axis of reflector.

1,150,204. Electrical Alarm System. A. Julian, Seattle, Wash. Compressed air between double windows holds alarm circuit open. (See cut.)

1,150,239. Combined Automatic Burglar and Fire-Alarm System and Telephone Service. O. Asmussen, Brooklyn, N. Y. Terminal station for interconnecting main lines of systems described, is controlled from central, and any subscriber can be locked out at will by central.

1,150,266. Telephone Transmitter. W. Harrison, Brooklyn, N. Y. Sound waves projected against arc in transmitter circuit and means provided for subjecting the arc to a varying magnetic field to amplify the sound-wave effect.

1,150,267. Apparatus for Transmitting Sounds. W. Harrison. Sound waves directed into hollow electrode forming a

Digitized by Google

terminal for arc in transmitter circuit, thus subjecting position particularly sensitive to ionization to the action of varying ionizing force.

1,150,270. Support for Incandescent-Lamp Filaments. H. W. Jackson, assignor to Westinghouse Lamp Co., New York, N. Y. Particular structure of resilient support maintaining metal filament under tension.

1,150,271. Electric Reduction of Zinc Ores. W. McA. Johnson, assignor to Continuous Zinc Furnace Co., Hartford, Conn. Treatment of complex zinc ores including sulphur, lead and calcium or barium.

1,150,272. Method of Telegraphic Transmission. C. Kinsley, Chicago, Ill. Relates to printing electrical signals transmitted at high speed.

1,150,275. Single-Piece Shell for Electric Light Sockets. H. W. Lawrence, Denver, Colo. Integral shell having groove extending from open end to key-hole for guiding switch mechanism in assembling.

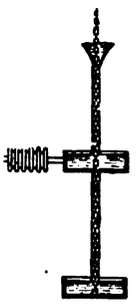
1,150,307. Normally Closed Cab-Signal Circuit. P. J. Simmen, San Francisco, Cal. Signal circuit includes two signals, one or the other of which is operated by wayside devices.

1,150,308. Mechanism or Apparatus for Controlling, Retarding, and Arresting the Motions of Engines or Vehicles When Traveling. P. J. Simmen. Devices in the cab for controlling the locomotive speed are operated by wayside means.

1,150,309. Means for Controlling the Movement of Vehicles. P. J. Simmen. Retarding means controlled by speed governor on locomotive in conjunction with wayside devices.

1,150,313. Electric Fan. C. P. Banzhof, B. G. Stauffer, and C. F. Stauffer, assignors of one-fourth each to said parties and one-fourth to L. W. Horting, Lancaster, Pa. Is rotatable automatically at different speeds to produce gusts of wind.

1,150,316. Electrical Relay. A. F. Sykes, New Barnet, England. Stream of liquid is part of electric circuit and has its conductivity changed by varying proportion



No. 1,150,590.—Electrolytic Arrester.

of conductivity jet introduced into the stream.

1,150,326. Electromagnetic Recording Apparatus for Telegraph Circuits. A. H. Annand, Buenos Aires, Argentina. Details of electromagnetic tape perforation.

1,150,344. Fuse. A. F. Daum, Pittsburgh, Pa. Details of refillable plug fuse.

1,150,350. Projection Apparatus. C. F. Dussaud, Paris, France. Particular structure of incandescent lamp and arrangement of lenses.

1,150,356. Circuit-Controller. T. T. Gaff, Washington, D. C. Periodically interrupted circuit for actuating an indicator is thermostatically controlled.

1,150,370. Electrolytic Cell. H. C. Jenkins, London, England. Particular arrangement of electrode and devices for drawing off liquid and gaseous products.

1,150,372. Lineman's Climber. C. M. Jones, Carrollton, Miss. Details of device having leg-engaging and heel-engaging parts.

1,150,377. Automatic Trainstop. J. H. K. McCollum, Toronto, Ont., Canada. Operation of brakes controlled by condition of signaling system.

1,150,390. Electric Water-Heater. R. C. Sage, Arrowrock, Idaho. Connections and support of resistor coils in metal water chamber.

1,150,391. Lamp. A. J. Sanford, assignor to A. H. Heisey & Co., Newark, O. Standing lamp with special structure of conductor conduit, lamp support, etc.

1,150,392. Spark Plug. I. H. Sare, Sentinel, Okla. Structural details of plug having spreader ring.

1,150,395. Telegraphic Transmission. C. Schou, Holte, Denmark. Structure of contactor for automatic transmission.

1,150,413. Illuminating Attachment for Telephones. J. Berry and D. T. Odineal, Lexington, Va. Lighting circuit controlled by telephone hook.

1,150,416. System of Distribution. L. E. Bogen and L. C. Nichols, assignors to Allis-Chalmers Mfg. Co., Milwaukee, Wis. For operating rotary converters from polyphase circuit.

1,150,426. Electric Heater. W. S. Hadaway, Jr., New Rochelle, N. Y. Manner of securing heating resistance to heated member.

1,150,427 and 1,150,428. Electric Iron. W. S. Hadaway, Jr. First patent, application of above to flatiron with provision for confining the heat. Second patent, details of structure in which resistor is welded to heated plate.

1,150,429. Electric Heater. W. S. Hadaway, Jr. Cast metal heating surface has heat-conducting resistor carrier imbedded therein.

1,150,431. Electric Iron. A. E. Heineman, Los Angeles, Cal. Spring-pressed rotatable handle tends to open circuit but can be latched in closed-circuit position.

1,150,434. Lamp Socket and the Like. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Means for locking two-part casing and base against relative rotation.

1,150,436. Aerial Propeller. A. A. D. Lang, London, England. An electrically deposited metal sheathing covers end of blade and unites with metal band in a groove encircling the blade.

1,150,453. Automatic Time Cutoff. A. J. Richardson, Long Beach, Cal., assignor of one-half to J. Lyle. Details of time-operated switch mechanism.

1,150,463. Ignition Device for Explosive Engines. H. R. Stuart, assignor to Robbins & Myers Co., Springfield, O. Means for separately exciting magneto during starting.

1,150,486. Brush-Holder. C. O. Bregstrom, assignor to B. F. Sturtevant Co., Boston, Mass. Brush box adjustable to receive brushes of different sizes.

1,150,494. Signal System. J. P. Buchman and F. B. Wiegand, Cleveland, O. Circuit details of railway block system.

1,150,519. Motor Cabinet. N. H. Holland and N. C. Durand, assignors to New Jersey Patent Co., West Orange, N. J. For phonographs; incloses driving motor and resistance controller therefor.

1,150,520. Magneto-Electric Generator. N. M. Hopkins, assignor to Electric Tachometer Co., Philadelphia, Pa. Structure of device of inductor type.

1,150,528. Sash Holder and Burglar Alarm. C. C. Lott, Hattiesburg, Miss. Details of device controlled by window sash for closing bell circuit.

1,150,530. X-Ray Tube. R. H. Machlett, New York, N. Y. Particular structure and arrangements of tube, cathode, anode and cathode shield.

1,150,542. Automatic Balancing and Steering Device. C. T. Ryland, Sonoma, Cal. Tilting of vehicle controls operation of motor and its connection to steering post.

1,150,545. Current Control for Motor Vehicles. B. F. Schmidt, Exeter, Cal. Ignition system has alternative electrical sources, the switch for connecting them being interlocked with spark-advancing and retarding means.

1,150,552. Focusing Device for Electric Lamps. J. C. Stearns, Worcester, Mass. For adjusting lamp along focal axis of reflector.

1,150,562. Electrically Controlled Vaporizer for Internal-Combustion Engines. W. F. Vose, assignor of 49 one-hundredths to T. J. Kimbel, Bloomington, Ill. Engine controls electromagnetic valve regulating fuel supply to mixing valve.

1,150,569. Fuse. W. C. Banks, assignor to N-W Equipment Co., New York, N. Y. End caps of cartridge wedge the fuse-gripping members.

1,150,590. Electrolytic Lightning-Arrester. G. Giles, Fribourg, Switzerland. Comprises chain of aluminum links in solution which forms insulating film on surfaces of links when they are subjected to difference of potential. (See cut.)

1,150,642. Process of Manufacturing Condensation Products From Formaldehyde and Phenol. H. Stockhausen, Crefeld, and R. Gruhl, Charlottenburg, Germany. Consists in heating formaldehyde with phenol until liquid product is formed, mixing this with ferric chloride to form plastic, moldable mass, and heating the mass.

1,150,652. System of Electrical Distribution. E. F. W. Alexanderson, assignor to General Electric Co., Schenectady, N. Y. Polyphase devices are operated from single-phase source through phase converter.

1,150,670. Treatment of Refractory Metals. G. Gmür-Zehnder, Aarau, Switzerland. Electric furnace employed for producing pure malleable and ductile tungsten by fusing the metal to fluid state by radiant heat and then rapidly cooling by cold blast.

1,150,676. Electric Apparatus for Motor-Vehicles. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Dynamo-electric machine connected with engine shaft is mounted in front of automobile radiator.

1,150,697. Insulator. Z. W. Meely and G. A. Lewis, Rayland, O. Pin type; has head and base sections adapted to receive wires between them.

1,150,698. Switch. A. E. Newman, Sheguindah, Ont., Canada. Circuits successively closed through commutator and brush, with provision for removing brush from commutator or placing it in contact therewith.

1,150,706. Thermal Switch. M. C. Ryan, Phoenix, N. Y. Contacts carried by pair of arched bars one of which carries coil heat from which springs bar to separate contacts.

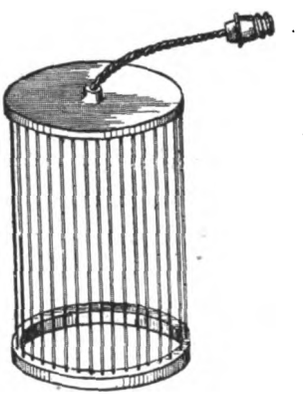
1,150,738. Incandescent Electric Lamp. J. H. Birch, Gatliff, Ky. Special arrangement of concentric filaments and reflector on bulb.

1,150,765. Telegraphic-Tape Perforator. O. Hoenack and H. Hoenack, assignors to R. H. Sellers Co., New York, N. Y. Key-controlled, magnetically operated punches.

1,150,786. Apparatus and Method for Producing Nitric Acid. H. D. Rankin, assignor to Rankin Process Co., Phoenix, Ariz. Current from high-tension, induction coil supplied to terminals on reciprocating and rotating head in compressed-air chamber to produce electric flame therein.

1,150,796. Searchlight Firearm. E. S. Ward, assignor to Oregon Electric Gun Co., Portland, Ore. In a gun carrying battery, lamp, etc., lens tube extending along barrel is adjustable and push controlling lamp circuit may be adjusted to be operated by hammer cocking.

1,150,798. System of Railway Signals. E. C. Wood, assignor to Submarine Signal



No. 1,150,835.—Insect Trap.

Co., Waterville, Me. In block system, presence of locomotive in one block changes resistance of circuits in adjacent blocks, thereby furnishing warning in those blocks of proximity of locomotive.

1,150,799. Method for Indicating a Ship's Approach and Means Therefor. E. C. Wood, assignor to Submarine Signal Co. Approaching body of magnetic metal disturbs magnetic field of submerged device, thereby producing an indication.

1,150,829. Signaling System. H. C. Wilson and C. R. B. Claflin, assignors to Atlantic National Bank, Providence, R. I. System having a transmitter and several receivers has "answer-back" to insure operation of all of the receivers.

1,150,835. Electric Trap. J. Satinover, Montreal, Quebec, Canada. Insects are electrocuted on oppositely charged alternate bars of cage. (See cut.)

Patents Expired.

The following United States electrical patents expired on August 23, 1915.

609,421. Device for Attaching or Detaching Electric-Lamp Bulbs. C. G. Edwards, Albert Lea, Minn.

609,466. Alloy of Iron and Titanium and Process of Producing It. A. J. Rossi, New York, N. Y.

609,639. Electromedical Apparatus. R. H. Wappler, New York, N. Y.

609,640. Burglar Alarm. D. L. Wartzenbuit, Kutztown, Pa.

609,702. Manufacture of Fluid for Impregnating Fibers for Incandescent Lighting. G. B. Puchmuller, Schoneberg, Germany.

609,732. Apparatus for Signaling on Locomotives. F. A. Chectham, Rastrick, and R. Bostock, Brighouse, England.

609,745. Diaphragm for Electrolytic Purposes. W. G. Luxton, Liverpool, England.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 10. CHICAGO, SATURDAY, SEPTEMBER 4, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.
608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
The Fall Electrical Trade and Lighting Number..... 393
American Electrical Exports During the First Year of the War 394
Recent Progress in Magnetism..... 394
Competition in Rural Districts..... 395

DEPARTMENTS:
Electrical Construction 431
National Association of Electrical Inspectors..... 436
Public Service Commissions..... 438
New Electrical and Mechanical Appliances..... 440
Current Electrical News..... 445
Record of Electrical Patents..... 449
Electric Vehicle Section..... 451

LEADING ARTICLES:
Mazda C Lamps and Illumination Progress.—By H. H. Magdsick 397
The Luminous Arc Lamp.—By R. B. Hussey and S. C. Rogers 399
The Present Status of Arc-Lamp Carbons.—By V. A. Clarke 406
Modern Arc Lamps.—By C. E. Stephens..... 409
How Is Business?..... 413
Inspecting Goods After They Are Received; The Buyer's Rights and Liabilities.—By Elton J. Buckley..... 416
The Outlook in Other Industries..... 417
International Association of Municipal Electricians..... 428
Wiring and Conduit Work at the Panama-Pacific Exposition.—II—By A. A. Willoughby..... 432
Educational Value of Sociability Runs.—By A. Jackson Marshall 458

MISCELLANEOUS:
Electrical Exports for June and for the Fiscal Year 1914-1915 396
Louisville Electrical Interests Working for Electrical Prosperity Week 396
Plans Perfected for New England Section, N. E. L. A. Convention 396
Features of Important Swedish Hydroelectric Plant..... 412
An Electrical Contractor Who Practices What He Preaches 431
Electrolysis Mitigation in Springfield and New Elyria, O... 435
Electric Vehicle Association of America Convention..... 451
Electric Vehicle Association Handles Many Sales Prospects 451
The Battery-Service System..... 454
Chicago Section, Electric Vehicle Association to Hold Annual Meeting October 5..... 456
Electric Makes 1,500 Miles in Fourteen Days..... 456

Copyright, 1915, by Electrical Review Publishing Company, Inc.

THE FALL ELECTRICAL TRADE AND LIGHTING NUMBER.

This is a time of the year when practically everyone engaged in the electrical industry is interested in two mutually interdependent subjects. Summer is on the wane, the vacation period is about over, shorter hours of daylight make the subject of electric lighting of prime importance.

The systems of lighting are here. So great have been the improvements in the sources of illumination, and to such a high degree have efficiencies been carried, that it becomes a question of analysis of the conditions to be served and determination of the various factors of economy, stability of service and facility of operation. The electrical engineer today can come pretty near to deciding upon exactly that system of electrical illumination that will best meet all of the requirements of any installation.

Is the time with regard to conditions of business right for an expectation of large increase in the utilization of electrical sources of illumination? Is the time right for the rehabilitation of old systems, for the extension of the present equipment and for the installation of new material?

To make available as complete a review of the present status of the art of illumination and to answer as far as is humanly practicable the question as to present conditions, the "Fall Electrical Trade and Lighting Number" of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN has been prepared.

The leading manufacturers of electrical illuminating apparatus and materials have contributed an up-to-the minute study of the objects and results of their investigations and development. Many well known leaders in the manufacture of electrical material of every description and equally prominent distributors have contributed their opinions regarding the outlook.

Realizing how closely the prosperity of the electrical industry is bound up in the prosperity of other industries, we have invited the editors of the leading trade publications of the country to discuss the conditions of business obtaining in their various industries, with a forecast of the probable demand of these industries for

Digitized by Google

the utilization of electrical energy and electrical apparatus and supplies.

The human interest indicated in these messages from the manufacturers and jobbers, and the wealth of information revealed by the editors of the trade journals, we venture to believe, will make this issue of value to our readers. We commend to their thoughtful consideration all that is presented herewith.

We gratefully acknowledge the invaluable assistance that has been given to us in the preparation of this material, and we trust that the expressions of optimism running through each contribution may be shortly reflected in a material improvement in activities. If there is a realization of only a part of the opportunities apparently at hand, the murmurings of better business will grow into a riot of sound, and the country will awake to the bugle call of a new prosperity.

AMERICAN ELECTRICAL EXPORTS DURING THE FIRST YEAR OF THE WAR.

The world-wide upheaval in financial, commercial and industrial circles resulting from the gigantic European war has had many curious effects on international trade. While the most marked, of course, has been the almost complete cessation of exports by Germany, Austria and Turkey, there has also been a shrinkage in the foreign commerce of their opponents, an increase in the trade of several neutral countries, and a decrease in imports of nearly all the nations of the globe.

To us most interest attaches to the effect on the foreign trade of our country. An accurate measure of the war's influence on this is obtainable from a study of the Government report on our foreign commerce for the fiscal year ended June 30 last, which includes the first eleven months, or practically the first year, of the war. The most striking fact brought out by this report is that our total exports of domestic and foreign merchandise reached the highest value ever attained in any preceding fiscal year, amounting to $2,768,589,340, or over 12 per cent above the record established in 1912-1913. At the same time the total imports amounted to $1,674,169,740, or over 11 per cent less than the record total of the preceding fiscal year.

While the electrical exports, as shown in detail on another page of this issue, show a decrease in total value as compared with the two preceding years, the reasons for this are easily understood. The monthly totals in the early months of 1914 reflected an almost world-wide depression in foreign trade which culminated in August with the breaking out of the war and made the electrical total of that month the lowest for several years. Since that time there has been a gradual picking up in electrical shipments, April and June each showing totals of over $2,000,000, and the June total being an increase of more than 40 per cent over that of the preceding year. This improvement is due chiefly to shipments of electrical war supplies, and partly to the fact that supplies of electrical materials are becoming exhausted in countries that formerly imported them chiefly from the belligerents.

Although the total value of the electrical exports reported for 1914-1915 was about 21 per cent below that of 1913-1914, in the case of some individual classes there was an increase. This was notable with metal-filament lamps, which increased over 115 per cent; batteries also increased over 41 per cent. The comparative monthly figures, of course, show fluctuations in both directions of all the electrical classes, but it is noteworthy that in the case of insulated wires and cables there has been a decided increase each month since last March over the corresponding period of a year ago. This total increase for the last four months of the fiscal year was about three-fourths of a million dollars or 185 per cent.

A large part of these increases are due to exceptionally heavy shipments to the entente allies. How long these will continue is problematical, depending chiefly on the continuence of the war. As was pointed out in these columns recently, electrical shipments, like those of so many other classes of merchandise, are still considerably below normal to most of the neutral countries. However, hopes of future improvements in shipments to these countries are natural, because it is reasonable to expect that the agitation for the extension of our foreign trade which is being taken up co-operatively by our governmental and commercial agencies is to bear fruit in a steadily increasing measure.

RECENT PROGESS IN MAGNETISM.

Magnetic phenomena have for many years defied to a large extent the efforts of research students to determine their fundamental nature. Most of the experiments which have been made indicated that magnetic properties depended not upon the atoms of which any body was composed, but rather upon the molecules or groups of molecules. There are several reasons for this point of view. In the first place alloys composed of non-magnetic elements, such as the Heusler alloys, may exhibit magnetic properties. In the second place other alloys of magnetic elements, such as one of the nickel-steel alloys, may be non-magnetic.

A recent experiment performed by Compton and Trousdale at Reed College presents reasons for a different point of view. This view is based upon experiments made upon crystals of magnetite and hematite by the aid of X-rays. In the issue of December 5, 1914, we called attention to the work of Bragg and others in examining crystal structure by the aid of X-rays. When this method is applied to the magnetic minerals just mentioned, in the magnetized and unmagnetized state, it transpires that there is no relative motion of the atoms in changing from one condition to the other. If magnetism were a moleculer phenomenon it would be expected that the molecules or groups of molecules would change their orientation under the influence of a magnetic field. Since this

Digitized by Google

does not appear to take place in the present experiment, it has been concluded that the magnetic properties of these substances must depend upon the individual atoms rather than upon the molecules or groups of molecules.

Other experiments, however, in addition to those mentioned above, seem to conflict with this conclusion. An alloy of iron and cobalt has been found which is more magnetic than pure iron and this would not be expected if the property were an atomic one.

The experiments of Weiss and his deductions therefrom indicate that complete magnetic saturation cannot be achieved except at the absolute zero of temperature and he was thus lead to undertake experiments at exceedingly low temperatures in co-operation with Onnes. If the magnetic properties are atomic in their nature rather than molecular it is not easy to see why temperature should have the effect which it is known to have. Years ago Curie showed that the co-efficient of magnetization is inversely proportional to the absolute temperature.

Experiments of Weiss indicate, moreover, that at least a group of atoms must be involved in magnetic phenomena and that in certain substances they seem to be rigidly bound together, whereas in others they may have independent motion.

Experiments described by Righi in Italy last winter serve to amplify the electron theory as applied to metals and to explain the action of a magnetic field as applied in the ordinary electric motor. Righi showed that if an evacuated glass vessel be subjected to a magnetic field and the residual gas ionized, the bombardment of the ions would set in rotation a delicately mounted rotor whose axis was parallel to that of the field. This is due to the fact that the electrified ions describe helical paths in a uniform magnetic field. The direction of the motion would depend upon the electrification of the ion. If the rotor is made one of the electrodes the effect of one set of ions may be observed alone and the effect may be much augmented.

By making the wall of the inclosure itself constitute the rotor, conditions are made analogous to the case of a metallic conductor in which electrons are imagined to be circulating. In a magnetic field these electrons would describe motions similar to those of the ions above mentioned and rotation of the conductor would result in a similar way. Thus the torque produced by a magnetic field acting upon a current-carrying conductor is explained upon the basis of the electron theory, an achievement which had not been possible before.

An experiment which is almost the converse of this has been carried out by Barnett. He has demonstrated that a steel rod when rotated experiences magnetization, the strength of the magnetizing field being proportional to the angular velocity. While this result was forecasted some years ago, it was not until the past year that definite results of this kind were obtained.

COMPETITION IN RURAL DISTRICTS.

There is hardly a central-station manager, at least among the smaller companies, who does not clearly remember the keen competition encountered from the small gasoline engine. Even today, despite efforts of enthusiastic motor and power salesmen, the gasoline engine has not been entirely replaced although the inherent advantages of the electric drive with central-station service are seldom questioned.

Such competition is, however, rapidly diminishing principally because of the activities of the power companies in purchasing the engines from prospective motor users, especially where the question of resale value of the old equipment enters into the transaction Usually the central station disposes of the gasoline engines, obtained in this manner, to the farmers in the vicinity without difficulty.

It may be premature to state that this practice simply results in removing competition in one direction and establishing it more firmly in another, but this has been the experience in at least a few instances. It is not difficult to dispose of really serviceable gasoline engines to the farmers. They are fast appreciating the advantages of power-driven farm equipment and in the household also are depending largely on gasoline engines or electric motors for the performance of the numerous operations in rural districts.

Central-station companies are practically all agreed that the extension of lines to serve rural customers is inevitable. As the saturation point is reached in the urban communities it will be necessary to look to the outlying districts for a large share of business in the future. At the present time, however, it is difficult to decide upon a consistent policy in regard to line extensions that will insure the utility a fair return on the investment, at the same time offering the customer continuous service at a price he can afford to pay.

Who shall pay the first cost of the line? Shall energy be metered on primary or secondary side? What voltage shall be used? What system of billing and collecting shall be employed? These are much mooted questions which are being deeply pondered by central-station managers, and in the meantime the farmers are clamoring for service.

It would, of course, be idle to urge central stations to build lines to serve farmers at a loss simply to prevent the installation of competing equipment but a situation, for which the utility companies are largely responsible, is arising which will work serious hardships on them in the future.

There are many phases to the question of serving farmers but none that is impossible of solution. In order to hasten the extension of lines to the rural communities, some sacrifices may have to be made, but on the other hand, the substitution of other power agencies for electrical energy and motor equipment in fields where eventually business for the latter will be solicited, is sufficient justification for any immediate reasonable loss.

Digitized by Google

Electrical Exports for June and for the Fiscal Year 1914-1915.

From the official monthly report on the foreign commerce of the United States, issued by the Bureau of Foreign and Domestic Commerce, are obtained the following data on the electrical exports for last June and for the fiscal year ended June 30, 1915.

For the four classes for which the number of electrical articles shipped is reported, there were exported in June the following: Electrical fans, 3,781; arc lamps, 137; carbon-filament lamps, 74,689; metal-filament lamps, 385,773. The following table gives the detailed figures for the several electrical classes reported for last June and for the corresponding month of a year ago:

Articles	June, 1915.	June, 1914
Batteries	$ 113,950	$ 58,521
Dynamos and generators	191,464	199,955
Fans	48,106	22,717
Insulated wire and cables	253,247	74,294
Interior wiring supplies, etc. (including fixtures)	70,915	51,354
Lamps—		
Arc	1,826	3,952
Carbon-filament	11,432	3,094
Metal-filament	78,536	15,719
Meters and other measuring instruments	41,214	.....
Motors	283,923	231,003
Static transformers	70,543	75,392
Telegraph instruments (including wireless apparatus)	1,522	26,962
Telephones	44,342	69,717
All others	836,061	617,757
Total	$2,047,081	$1,450,437

The above total for June, 1915, exceeds that of June, 1914, by over 41 per cent.

For the 12 months of the fiscal year ended last June the electrical-export totals were as follows:

Month	Electrical Exports
July, 1914	$1,415,360
August, 1914	1,024,010
September, 1914	1,548,468
October, 1914	1,494,792
November, 1914	1,644,723
December, 1914	1,620,563
January, 1915	1,773,938
February, 1915	1,683,567
March, 1915	1,661,671
April, 1915	2,055,375
May, 1915	1,802,209
June, 1915	2,047,081

In the following table are given the electrical totals for the fiscal years since 1908-1909, when the last electrical-export depression reached its lowest point:

Fiscal Year	Electrical Exports
1908-1909	$12,524,391
1909-1910	14,742,395
1910-1911	18,727,455
1911-1912	20,169,362
1912-1913	26,772,816
1913-1914	25,060,844
1914-1915	19,771,757

Directors of Associated Manufacturers of Electrical Supplies to Meet.

A meeting of the board of governors of the Associated Manufacturers of Electrical Supplies, 62 Cedar Street, New York City, will be held at the Hotel Biltmore, New York, on the evening of September 9, at eight o'clock.

Louisville Electrical Interests Working for Electrical Prosperity Week.

Leading members of the Louisville electrical fraternity are working right ahead on their preparations for Electrical Prosperity Week, and are meeting at least once each week at luncheon meetings to discuss projects as they develop in this connection. It is stated that the plans are becoming more and more elaborate as they develop, and that everything points to a big occasion during the latter part of November and the first of December. The intention is to embrace everybody and every interest in the city, so far as they can be prevailed upon, in the celebration of the occasion.

Louisville's Jovians also are discussing the matter of an exhibition at the State Fair. Some time ago it was suggested that arrangements be made for establishment of a permanent electrical hall at the permanent grounds, which are in Louisville, and the movement was set going in a modest way. It became evident, however, that success was not in view this year, and the plans now are to wait until after the present fair, and then work for establishment of the electrical hall next year.

Plans Perfected for New England Section, N. E. L. A., Convention.

The seventh annual convention of the New England Section, National Electric Light Association, at Mt. Kineo, Maine, September 14-17, promises to be one of the most valuable and interesting to date. A large number will leave Boston at 8 a. m., September 14.

The features of power installations in large mills and relation of regulating commissions to the central-station industry will have the fore, and it is expected that several leading manufacturers, members of public service commissions of all the New England states and the Governor of Maine will be present. The discussion of the mill power question by the manufacturers themselves is an interesting innovation. Representatives of the United Shoe Machinery Company and the Arlington Mills, Lawrence, Mass., are booked to speak. In addition, Messrs. Applegate, of the Hartford Company; Arthur, of the Boston Edison; Gray, of the Narragansett Company; Harriman, of the Connecticut River hydroelectric companies; Spike, of Cambridge; West, of the Tenney Company, and Eells, of Augusta, will present the central-station side.

Renting of motors for factory use, and standardizing of voltages for mill service will be presented by G. F. Parsons, of C. D. Parker & Company, Boston, and D. M. De Bard, of the Brockton Edison Company.

Electrical Prosperity Week will be forecasted by Manager J. M. Wakeman of the Society for Electrical Development; a report on electric-vehicle progress will be rendered by E. S. Mansfield, of Boston; a joint report on co-operation between central stations and contractors will be presented by W. L. Mulligan, of Springfield, and developments in type C Mazda lamps will be described by H. Schroeder, of the Edison Lamp Works, and C. A. Dean, of the Cambridge company. The election of officers and other business occurs on Friday morning, September 17.

President E. W. Lloyd, of the National Electric Light Association, will attend a part of the convention.

Sporting events will include golf, tennis and mountain climbing. Several manufacturers have donated prizes to winners in a tennis tournament. Other prizes may also be offered.

List of New Radio Stations Announced.

The Bureau of Navigation of the United States Department of Commerce announces a list of six additions made to the land stations of the country in the radio service and 16 additional ship stations, since its last bulletin on the subject was issued. Of the land stations, the one of longest range is at Tolovana, Alaska, which has a normal reach of 300 nautical miles. The station is located in longitude 149:30 west and latitude 65 north; the wave lengths are 300 and 600 meters, the latter normal, and the system is Telefunken, with 1,000 sparks per second. It is operated by the Alaska Wireless Telegraph Company.

Of the new ship stations, the largest are the Ossipee and Tallapoosa, each operated and controlled by the United States Coast Guard, Treasury Department, with range of 300 miles, and the Roosevelt, operated and controlled by the Bureau of Fisheries of the Department of Commerce, with a similar range.

Historic Harrison Street Station in Chicago to Be Dismantled.

The sale by the Commonwealth Edison Company of its old Harrison Street generating plant to the Union Station Company marks the passing of what was in its day the most celebrated power station in the country. In 1895, shortly after its construction, the plant had a total capacity of 6,000 kilowatts, making it at the time one of the largest plants in existence. In late years the building has been used as a substation. The plant will be dismantled and the building torn down to make room for the new railroad station to be erected in the vicinity. The sale price was $1,300,000.

Digitized by Google

MAZDA C LAMPS AND ILLUMINATION PROGRESS.

By H. H. Magdsick,

National Lamp Works of General Electric Company.

When multiple gas-filled incandescent lamps were placed on the market, they at once came into use in large numbers, demonstrating that an extensive field existed for the higher candlepower units that had not been provided for adequately by other forms of illuminants. The manufacture of the Mazda C lamps introduced many new problems. Their early use in large quantities under all conditions served to show in the shortest possible time any weaknesses such as would be expected to develop in a new product. These early faults were overcome through the use of new materials and the redesign of various parts, such as the change to the pear-shape bulb, the use of heat deflecting disk, etc. These refinements produced a superior lamp and, together with further study of gases for use in the bulb, enabled the manufacturers to make advances in efficiency, notably in the smaller sizes. The line of multiple and series lamps has been gradually extended to cover most of the commercial and industrial requirements and the entire range of street-lighting circuits, with the result that several million have already been placed in service. As has always been true in the incandescent lamp industry, increasing production brought a decrease in cost.

The Mazda C lamps quickly brought about a considerably higher standard in the commercial, industrial and street illumination fields and made practicable several new lighting applications. The high efficiency and the availability of the larger units gave a great impetus to high-intensity lighting for outdoor display purposes. Light as an attractive force is now employed on a far greater scale than ever before. This tendency no doubt contributed to the adoption of increased illumination as the new lamps were generally introduced in stores and offices. Partially and totally indirect systems multiplied and on every hand there was evident a growing attempt to meet the more obvious requirements of good lighting. Decorative effects received more consideration as it became less costly to utilize some of the light in obtaining the desired appearance of units and interiors. In industrial plants the chief result of the less expensive light production was likewise the use of higher intensities so as to provide the best possible working conditions, for the value of lighting as a factor in production and the safety of the workmen and its relatively low cost had already become well established in the minds of many factory managers. The Mazda C lamp has hastened the replacement, already far advanced by the vacuum lamp, of the older illuminants which were not only less adaptable to specific locations and less capable of efficient utilization, but also higher in operating cost.

The gas-filled lamps made practicable the employment on a large scale of light modified to meet special requirements in commercial and industrial applications. Light of a sunlight color value is now supplied for entire shops or departments of a store at little increase in the cost of illumination. North-sky daylight is reproduced at an efficiency such that the extended use of the units in service has proved them a practical success for locations in industrial plants and in stores where exact color discrimination is required.

The value of known constant artificial illumination in photography had long been recognized, for by its use the work might be carried on more rapidly and at all hours of the day or night. However, artificial lighting had had only a limited application among photographic studios because the systems available were costly, lacked the necessary flexibility and control of light, or failed to duplicate the results secured under daylight. The gas-filled lamp met the requirements of the photographer and came into extended use. The light was modified by screening out some of the luminous rays but leaving the radiation which is most active on the photographic plate. Thus was reproduced in inexpensive units, permitting full control of the intensity, direction and diffusion of the light, a photographic daylight which gives the correct relative brightness values to the various parts of the scene.

Modified light of the Mazda C lamp was found equally effective in meeting the severe requirements of motion-picture production. Such installations in the studios of leading producers have demonstrated the higher quality of pictures secured with this light which renders relative brightness values correctly, can readily be directed and diffused as each setting demands, and dimmed or altered at will during the scene, and mixes with daylight so perfectly that it can be used to supplement the latter at any time without special precaution. As the motion-picture art progresses, there is a growing appreciation of the large contribution that lighting can make to the effectiveness of the scene. There is more total actinic radiation per watt from the mercury-vapor and arc lamps, which formerly were alone used in this field, than from the usual Mazda C lamps at rated efficiency. However, the camera is in operation for only a few minutes at a time and for but a short total period each day. It has, therefore, been found practicable to make provision for burning the lamps at a higher voltage during the intervals of exposure and thereby greatly increasing the actinic radiation. The use of the largest lamps in this manner combined with the more efficient control of light secured with the incandescent lamps overcomes the deficiency in actinic value which would otherwise be found. The investment required for the incandescent installation, which is but a fraction of that for the older systems, is another consideration which is contributing to the growing use of the gas-filled Mazda lamps for this service. Because of the short period of burning each day, the fixed charges form a large proportion of the total cost of lighting.

Concentrated filament lamps of the gas-filled type are in demand for projection purposes. At first they were applied only to the smaller lanterns but the lamps are gradually being adapted to the larger projection apparatus as well. This type of lamp has also brought "flood lighting" to a state of development where it may be applied profitably to monumental public buildings and business structures in every city. Compact, inexpensive but highly efficient weatherproof projectors have been designed for the lamps. At a low initial investment and with a moderate cost of operation any structure in its entirety may now readily be made to stand forth in a flood of light from concealed sources.

In street lighting the Mazda C lamp has met with conspicuous success. Considered merely on the basis of initial efficiency of light production, it would not have been so generally adopted instead of the highest efficiency arc lamps. But there are other considerations which have led to the conclusion that the most effective illu-

Digitized by Google

mination would be obtained at the lowest total cost with the Mazda system. Some of the more important of these follow:

Low Initial Investment.—The first cost of the Mazda C lamp and equipment is less than that for other systems, hence, the fixed charges, which are each year becoming a more important part of the cost of supplying street-lighting service, are reduced. In the case of the thousands of alternating-current inclosed carbon arcs still in service, the change to Mazda units could be made at so moderate an expenditure that far greater illumination could be furnished to the city without necessitating an increase in rates.

High Power-Factor.—The power-factor of the Mazda circuits is much higher than with other modern series lighting equipment. With the latter, for each watt delivered to the lamp from 30 to 40 per cent greater capacity is required in generating apparatus, transformers, regulators, etc. The fixed charges on this added equipment form a considerable part of the cost of supplying energy to such circuits.

Adaptability.—Improvements in the efficiency of the modern arc lamps have tended toward higher candlepower units, which did not serve the requirements most advantageously in all locations. The incandescent lamps are available in so many sizes that the proper unit may be installed to meet each condition, the various sizes of lamps burned in series on the same circuit, and changes made in individual lamps from time to time as the requirements alter. The lamps may be operated in an endless variety of fixtures for overhead or post construction, so that any desired decorative effect may now be obtained.

Control of Light.—With the aid of the Holophane prismatic refractor and other accessories, the generated light flux may be utilized to produce the most effective illumination. The intensity near the horizontal is thus also under control and may be reduced to minimize what is perhaps the most important element of glare under street-lighting conditions. This control of light may be retained even in ornamental fixtures. Furthermore, the light is steady and the candlepower of the lamps falls off only slightly from the initial value during their normal life.

Superior Operating Characteristics.—The Mazda system greatly simplifies maintenance. With it, also, safety may be insured by the use of individual two-circuit transformers with grounded secondaries, which insulate the lamp circuit from the high voltage of the series line. By placing the transformer on the pole, where pendant lamps are used, much of the open-circuit trouble is eliminated.

Future Developments.—The experience of past years indicates that increased efficiency and decreased cost of lamps may be anticipated. Thus, during the past year, the efficiency of high-current Mazda C series lamps has increased 10 per cent and the price has been reduced. The cost of operating Mazda street-lighting circuits therefore becomes less year after year. The increase in efficiency releases capacity which allows the addition of further units to the same circuits or permits the use of higher candlepower lamps where they may be demanded.

Service Performance.—Reports of installations in all parts of the country indicate that the life of the Mazda C series lamps has somewhat exceeded the rating of 1,350 hours. In fact, from the first these units have proved most satisfactory for all classes of street lighting.

These considerations explain the wonderful progress of the gas-filled incandescent lamp in street illumination. They suggest why the city of Chicago has been able to provide more effective lighting with Mazda C lamps than with modern arcs at a saving of nearly $20 per year per lamp in cash costs and fixed charges and is able to extend widely the use of a limited inexpensive power supply. These factors also led to the recent adoption of the incandescent lamp for Cleveland's great "White-Way" system after months of study and trial of the most modern lamps of every type.

Press Congress of the World Formed.

The Press Congress of the World, an international organization, to meet triennially at the world's capitals, and to embrace workers in every department of journalism in all countries, was formed at the International Press Congress which met July 5 to 10, 1915, at the Panama-Pacific International Exposition, in San Francisco. A brief constitution was adopted and officers were selected, two vice-presidents from each nation, an executive committee, a secretary-treasurer and a president. The office of the president was made the permanent headquarters of the Congress. The invitation of the Government of New South Wales to hold the first meeting of the Press Congress of the World in Sydney, Australia, in March-April, 1918, as presented by Niel Nielsen, Commissioner from New South Wales, was accepted.

The Congress, opened by an address by William Jennings Bryan, and responded to on behalf of the Congress by John Clyde Oswold, president of the Federation of Trade Press Associations, was large in number, important in personnel and program. The Honorary President was Virgilio Rodriguez Beteta, of Guatemala, editor *Diario de Centro America*. The enrollment was 957 delegates, accompanied by 1,230 visitors, a total of 2,187 persons in attendance. This enrollment represented 29 nations and 46 states of the United States. Of the delegates 697, or three-fourths, were from outside California and 123 from outside continental United States. The trade press of the United States was actively represented by Mr. Oswold as noted above; an address, entitled "The Service of the Trade Press," was presented by Charles W. Price, editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, and an address was presented by B. B. Herbert, editor of the *National Printer-Journalist*.

The constitution provides that the organization shall be known as the Press Congress of the World. Its object is to advance by conferences, discussions and united effort the cause of journalism in every honorable way. The sessions of the Congress are to be open to the consideration of all questions directly affecting the press, but discussions of religion, politics and government policies will not be permitted. Workers in every department of journalism in every country who are engaged in promoting the highest standards and the largest welfare of the press are eligible to membership. The officers shall be an honorary president, a president, two vice-presidents, secretary-treasurer, an executive committee, consisting of the president, secretary-treasurer and five additional members chosen from the vice-presidents. These officers, with the exception of the honorary president, to be chosen by the executive committee, shall be elected at each session of the Congress. The vacancies shall be filled by the executive committee upon recommendation of the countries affected. The time and place of meeting shall be determined by the executive committee. The constitution may be amended at any meeting under provisions to be established by the executive committee.

The officers elected are: President, Walter Williams, Dean of the School of Journalism, of the University of Missouri, Columbia, Mo., U. S. A.; secretary and treasurer, A. R. Ford, secretary, Dominion Press Gallery, Toronto, Canada; and the vice-presidents.

A new street-lighting system was recently completed and put in service in Niagara Falls, Ont. There are 101 gas-filled tungsten lamps rated at 500 watts, 1,000 candlepower. The lamps receive 20 amperes through individual compensators.

Digitized by Google

THE LUMINOUS ARC LAMP.

By R. B. Hussey and S. C. Rogers.

Street Lighting Section, General Electric Company.

The earliest form of electric light was the open-burning carbon arc which was first made experimentally more than one hundred years ago, and up to the present time this is still the only commercially available light source where a very high intensity is required, as in the case of high-power searchlights.

The open-burning carbon arc was superseded in common street-lighting practice in this country a number of years ago by the relatively less efficient, but more reliable enclosed carbon arc lamp. This in turn was replaced by the flame carbon and the magnetite or luminous arc lamps. Since all four of these have been so extensively used throughout the United States for street lighting, it may be of interest to note some of their points of similarity and difference.

The source of light of the open carbon arc was a small area on the bottom of the upper carbon, known as the crater. This in itself would give a distribution of light as shown at the left of Fig. 1, but since the lower carbon obstructs a considerable amount of the light beneath, and since a little is added from both the lower carbon tip and the arc stream, the resulant distribution is as shown on the right of Fig. 1. The direct-current enclosed carbon arc burns in a similar manner, but as the ends of the carbon are nearly flat and the arc is of greater length, the light distribution is somewhat altered, resulting in a distribution curve as shown in Fig. 2. In the case of the flame carbon and luminous arcs, the light is emitted almost exclusively by the arc stream, which is in the form of a luminous column, giving a distribution of light as shown in Fig. 3 and Fig. 4. In all of these there is a burning up or vaporization of one or both of the electrodes which must be replaced at greater or less intervals according to conditions. The arc that has stood best in present-day service and bids fair to continue for a considerable time as a superior street-lighting unit, is the so-called luminous arc or magnetite arc.

The term "magnetite arc" was early applied to this lamp because of the fact that at that time a considerable proportion of natural oxide of iron or magnetite was used in the composition of the negative electrode.

It was found desirable to use iron oxide in some form as a medium, as this material was not only cheap and easily obtained, but provided a solid conducting tip even after having been melted. A small amount of chromium oxide was also found desirable as a restrainer and steadier, and while these materials would give a good arc as far as operation and steadiness are concerned, the efficiency could not be raised to any practical value. It was practically necessary to use titanium in some form in order to arrive at any commercial light efficiency. In addition to these constituents, a very small quantity of flux is generally used for the purpose of steadying the burning of the arc.

An arc drawn between such an electrode as negative and a solid metallic positive appears as a brilliant fan-shape, starting from a very small, highly luminous point at the surface of the cathode and spreading out as it approaches the anode (Fig. 5). The arc appears to be composed of a central zone or core which is highly luminous and of a pale bluish color. This core presumably acts as the principal conductor of the current. Immediately surrounding this is a thin white envelope of the highest luminosity, which is in turn surrounded by a large, diffuse envelope of a lower degree of luminosity and of a yellowish color. The net result in color is a most excellent white, approaching very closely to the color of clear sunlight. The efficiency of this arc is high, showing conservative values of 13 lumens per watt at 4.0 amperes; 18 lumens per watt at 5.0 amperes, and 24 lumens per watt at 6.6 amperes. In normal operation, both ends of the arc move slowly over the surfaces of the respective electrodes, but the light, although subject to variations in intensity, does not show the surges or distinct maximum and minimum points as in the case of the enclosed carbon arc lamp. While it is doubtless possible that electrodes could be produced that would give satisfactory operation over a very wide range of current and potential, the most satisfactory operation has so far been obtained at current strengths between four and seven amperes and with potentials across the arc of 60 to 90 volts.

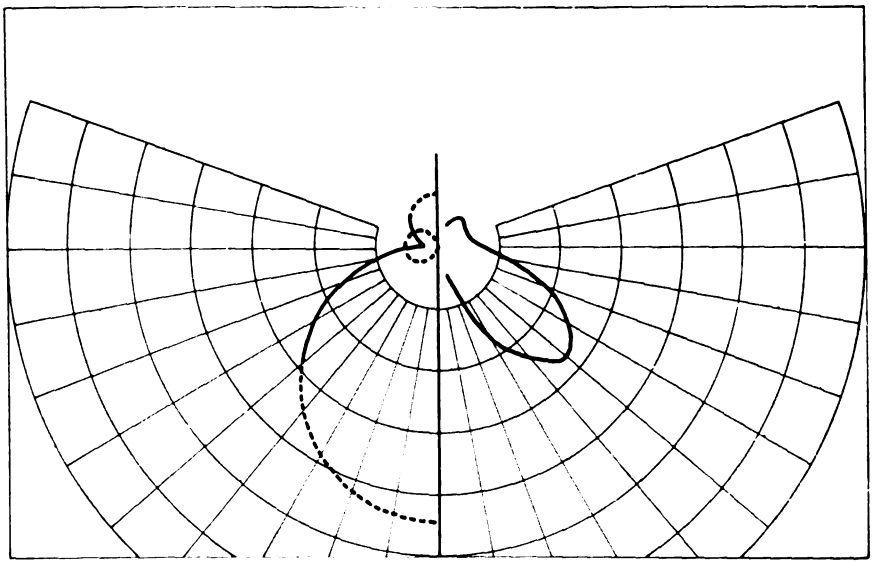


Fig. 1.—Distribution of Light with Open Carbon Arc.

In the adaptation of an arc of this type into a commercial lamp, many new problems were encountered.* One of the first of these was the question as to whether the positive or negative electrode should be uppermost. It was found upon experiment that in order to make the arc luminous throughout its entire length, it was necessary to provide a circulation of air in the direction of the arc blast, i. e., from cathode to anode, as other-

*See G. E. Review, Vol. XIV, 1911, Page 578.—"The Design of Luminous Arcs," by C. A. B. Halvorson, Jr.

Digitized by Google

wise the arc would be brightly luminous for not more than half its length, the remainder being of a pale blue color.

A forced or artificial draft downward was tried, but proved unreliable and the arrangement was then adopted of placing the positive or relatively non-consuming electrode above and the negative below. In this way, the natural upward circulation of heated air was utilized with no tendency to make any portion of the arc non-luminous.

Another difficulty encountered was that of the fumes given off by such an arc. In the early carbon arc lamps, both open and enclosed, the products of combustion were entirely gaseous, but, with an arc of this type, a considerable quantity of metallic oxides are given off which must be carried away from the arc chamber. This is done by providing a central chimney, at the lower end of which the arc burns, while the upper end is left open for the fumes to escape.

Another limitation which was early found to be quite important was that the materials used as electrodes had a distinct rectifying effect, so that such an arc could not be practically operated on alternating current. Furthermore, in order to maintain a satisfactory arc, a considerable steadying factor must be introduced with the result that the luminous arc is now operated most efficiently on direct-current series circuits and its greatest field appears to be in this direction. Because of this feature lamps were at first used on Brush arc generator circuits and later on rectified circuits, using series mercury-arc rectifiers.

Many different materials have been tried for the upper or positive electrode, the desired properties being that the electrode should remain conducting at all times and should burn away very slowly and not be expensive. Owing to its high heat conductivity, copper has been largely used for this purpose, although at high temperatures the copper oxidizes rapidly and must be sheathed with iron, which, although it burns away more rapidly directly in the arc, is not oxidized badly at temperatures slightly lower. The positive electrode adds relatively a very small amount to the light of the arc.

The earliest lower or negative electrodes contained magnetite with the addition of rutile or titanium oxide. This was soon replaced by ilmenite which is an ore composed of the oxides of iron and titanium. As this ore contains a little more titanium than was desired, a small quantity of magnetite was added to maintain the desired relative proportions of iron and titanium. For the chromic oxide content, a suitable ore was found in chromite, which is a mixed oxide of chromium and iron. These different ores, magnetite, ilmenite and chromite, are first separately ground and carefully purified, using a water table and magnetic separator. Each lot of ore prepared is carefully analyzed and from the results of the analysis the exact proportions of each constituent that will be required are determined. Next, a large ball mill is loaded with the proper quantities of the purified ores, together with a relatively small amount of flux, and the whole ground to a certain degree of fineness, also determined by experiment. It has been found that the best results are obtained when the particles of mixture are neither too fine nor too coarse. When sufficiently ground the mixture is loaded into iron tubes of the required size and sealed with small iron caps and packed for shipment.

The figures given above for efficiencies of the magnetite arc are for the older or long-life electrode, but within the last two years a new electrode has been marketed that gives a considerably greater amount of light. With this electrode, efficiencies of 20 lumens per watt may be obtained at 4.0 amperes; 28 lumens per watt at 5.0 amperes, and 32 lumens per watt at 6.6 amperes.

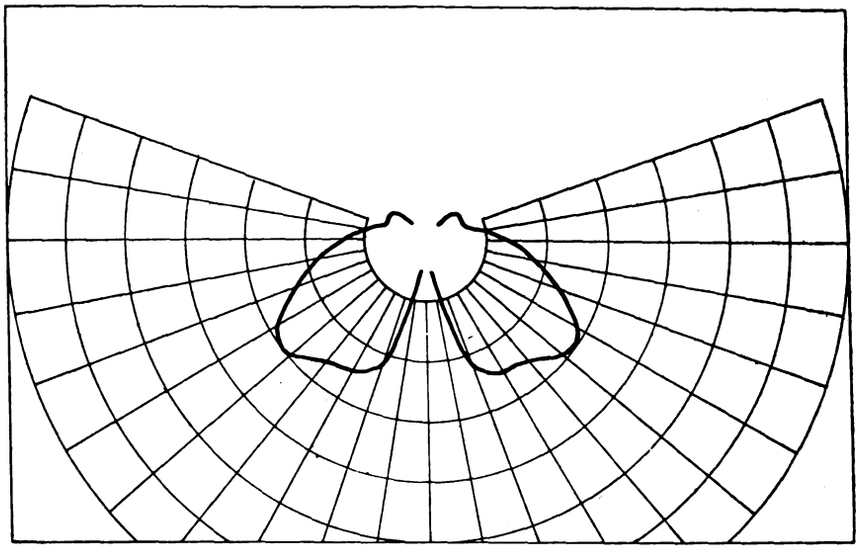


Fig. 2.—Distribution of Light with Enclosed Carbon Arc.

Wherever an asymmetric distribution of light is desirable, as, for instance, to increase the intensity of light up and down a street, flat electrodes can be furnished that will increase the light in the required directions. This result is obtained because there is less light obstructed by the electrode in that direction. This type of electrode also makes possible the operation of arcs of lower voltages, thus 4.0-ampere arcs may be operated at 68 volts (272 watts) where a few more lamps per circuit are wanted or the increase in lamp ca-

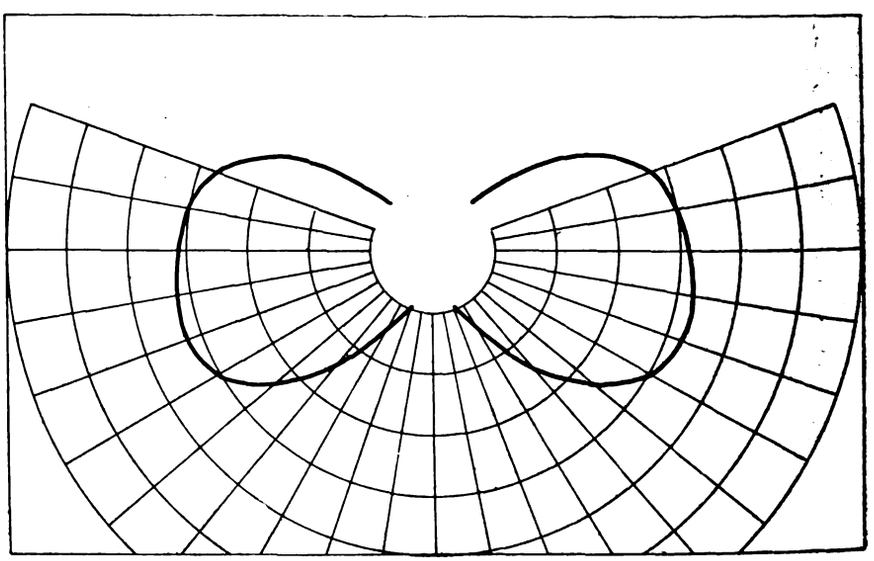


Fig. 3.—Distribution of Light with Enclosed Flame Carbon Arc.

Digitized by Google

pacity may be utilized at more central points where a high intensity of illumination is required, this result being accomplished by lamps adjusted to as high as 90 volts. This may be done on existing lamps with little or no expense and since the burning life of the electrode is dependent almost wholly on the current, the trimming schedule will not be affected. This, it is readily seen, provides a system of reasonable flexibility.

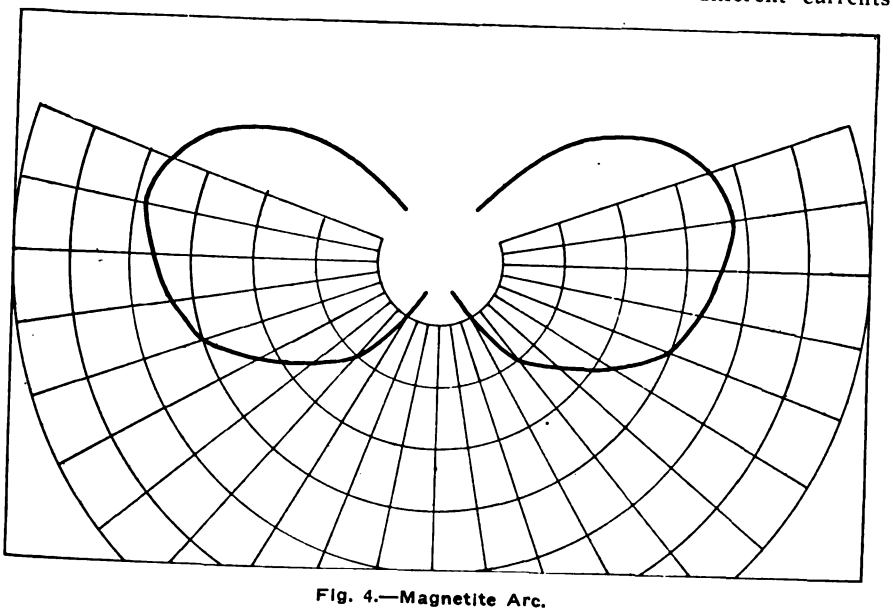


Fig. 4.—Magnetite Arc.

At the present time there are two distinct types of luminous arc lamps, pendent and upright for mounting on ornamental standards and brackets.

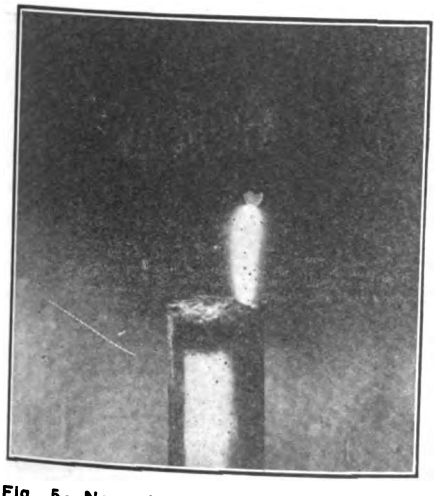


Fig. 5.—Normal Four-Ampere, Luminous Arc with Bead on Positive.

Commercial pendent luminous arc lamps are manufactured to operate on 4.0, 5.0 and 6.6-ampere direct-current series circuits and are known as Form 3, Form 6 and Form 17 lamps. There are more than 200,000 Form 3 and Form 6 lamps in operation today. There has been exploited commercially within the past year, the Form 17 lamp, which combines the advantages of both the Form 3 and the Form 6 lamps and other improvements as well (Fig. 6). The Form 3 lamp was designed for either 4.0 or 5.0 amperes and the Form 6 for 5.0 or 6.6 amperes, whereas the Form 17, with different windings, is used for all currents. This in itself is a great improvement, enabling as it does central stations serving different circuits with different currents to standardize the design of lamp and carry the same parts for all lamps with the exception of the windings.

The mechanism of the Form 17 luminous arc lamp is very simple and needs little explanation. It is without floating parts and when the lamp is out of circuit its electrodes are separated by a fixed distance. When the current is thrown on the starting magnet brings the lower electrode into contact with the upper electrode, thus allowing the current to flow through the series magnet, thereby opening the circuit of the starting magnet at the cutout contact, allowing the lower electrode to fall, striking an arc. The lamp is then burning with the lower electrode resting on its stop and the series magnet holding the cutout contact open. As the lower electrode is slowly consumed, the voltage across the arc rises and when this arc voltage has reached a predetermined limit, the shunt coil (which is bridged across the arc) cuts the starting coil into circuit again, feeding the lower electrode and bringing it into contact with the upper and starting the arc as before.

The series magnet is of low resistance and causes a drop of only a volt or two (depending upon the current) between the terminals of the lamp and arc when the lamp is in operation. The lamp is so designed that only two single adjustments are necessary, the adjustment of the shunt armature to feed the lamp at the proper arc voltage and the setting of the stop for the lower clutch to determine the proper length of arc.

The upper or positive electrode usually consists of a bar of hard-drawn copper enclosed in a steel or brass sheath, and when it is consumed it may be readily removed from the holder and replaced by another. The mechanism for holding this electrode is very simple and produces a wiping contact whenever the lamp feeds and thus insures starting under all conditions.

Luminous arc lamps are trimmed at intervals from 110 to 350 hours, depending upon the current and electrode used. This makes the trimming incidental to cleaning, for best practice now shows that all street lamps should be cleaned at least once a month. This infrequent trimming, together with the low cost of electrodes, means a *very* low maintenance cost per year. Taking into consideration the high efficiency of the luminous arc lamp, an intensity of illumination per dollar is obtained which is not equaled by other illuminants.

The distinctive pearl-white color is unexcelled and unapproached by other illuminants on the commercial market at the present time.

One of the latest developments in auxiliaries for these lamps for street lighting has been the adaptation of a prismatic refractor in place of a metal reflector. The prismatic refractor consists of two truncated conical glass globes, open at the top and bottom, fitting inside one another and forming a single unit which is smooth on both

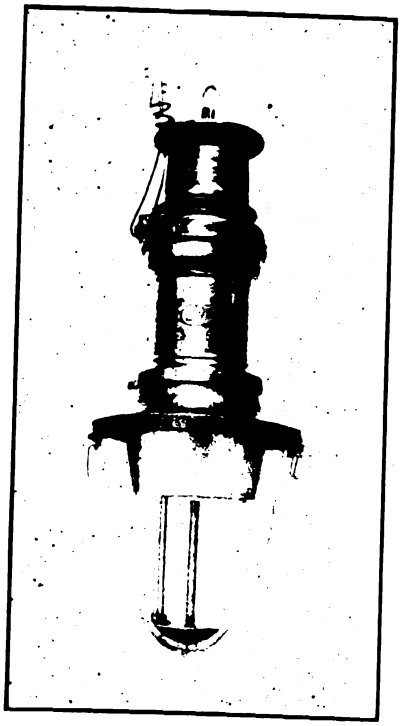


Fig. 6.—Form 17, Luminous Arc, with Prismatic Refractor.

Digitized by Google

inside and outside surfaces. The inner section is girdled by a succession of horizontal prisms which intercept all the available light rays given off from the arc above the horizontal and deflect them downward at an angle of 10 degrees below the horizontal (as shown in the vertical section in Fig.

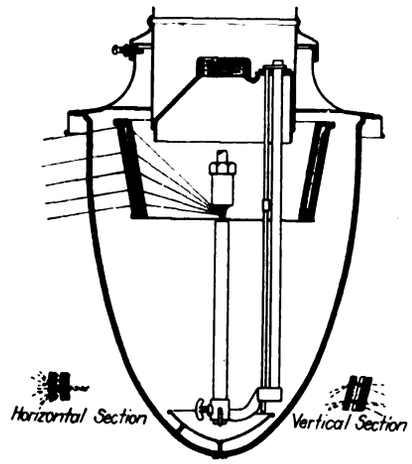


Fig. 7.—Luminous Arc Lamp, with Prismatic Refractor, Showing Distribution of Light.

7), which is generally accepted as the most useful angle for the lighting of highways and large areas. The inner surface of the outer section is lined with a series of vertical prisms which serve to diffuse the light (as shown in the horizontal section of Fig. 7). By the use of this prismatic refractor, the maximum candlepower values at 10 degrees below the horizontal are

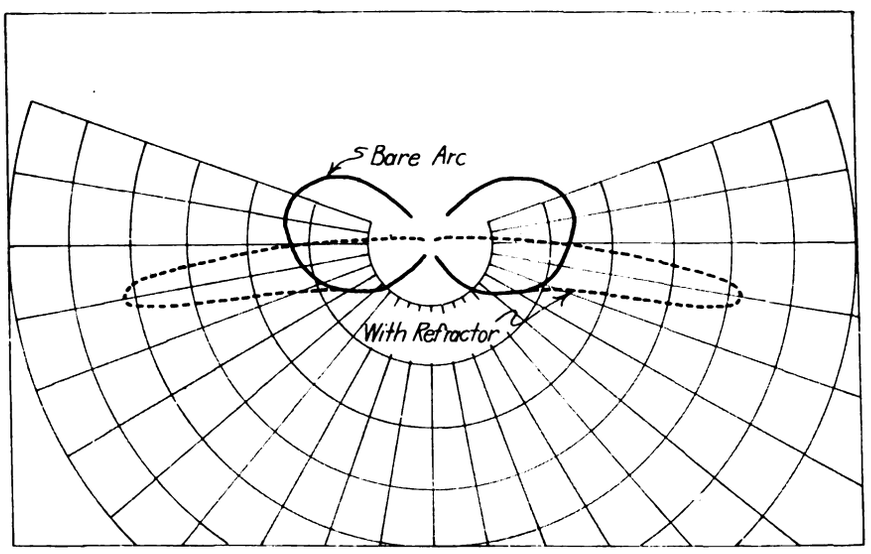


Fig. 8.—Luminous Arc Lamp, Equipped with Prismatic Refractor—Distribution of Light.

increased approximately 50 per cent (Fig. 8). Approximately the same effect can be produced by a single reflector of 46 feet in diameter or by a biplane reflector of 51 inches in diameter or a triplane reflector of 26 inches in diameter (Fig. 9). These latter equipments, while very efficient in light redirection. are more unwieldy than the prismatic refractor which is only 11 inches in diameter and so have not been standardized.

The prismatic refractor equipment is usually recommended when the road surface provides a high specular reflection and when the lamps are to be spaced at 300 feet or more apart. Lamps thus equipped will be more effective when suspended at a height of 25 feet or more above the road surface. (See Fig. 10, where this type of lamp is shown spaced 600 feet apart.) When the surface of the road is dark and of a diffusing character, the same lamp without a prismatic refractor, but with a diffusing globe and reflector is to be recommended, this equipment raising the intensity of light underneath the lamp and aiding vision which in this case is largely dependent upon the silhouette principle.

The ornamental luminous arc lamps are made for the same currents as those previously described; viz., 4.0 5.0 and 6.6 amperes, direct-current, series circuits. In these lamps, which by the way are not inverted, the mechanism has been placed beneath the arc instead of above it. The mechanism of these lamps is mounted on an ornamental pole and separated from it by a high-voltage insulator and is properly protected from the weather by an ornamental casing (Fig. 11). An absolute cutout is placed in the base of the ornamental pole so that the lamp may be disconnected from the line when trimming is necessary, the latter being accomplished through the opening at the top of the globe.

Nearly all mechanical and electrical parts are interchangeable with those of the pendent type. This in itself is a great advantage. It is, of course, obvious that both types of lamps may be operated on the same circuits. The diffusing glassware of the ornamental luminous arc lamp is dignified and aristic, there being at the present time two distinct shapes, the well known standard with slightly concave sides and the nearly spherical or Washington type.

The Washington type globe consists

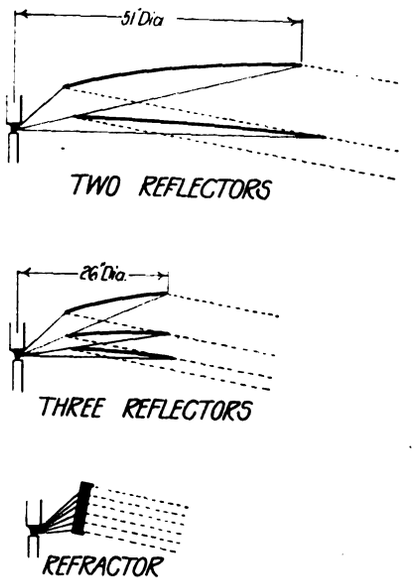


Fig. 9.—Comparison of Distribution with Different Reflectors.

of two hemispherical metal-ribbed frames, holding segments of diffusing glass, there being 12 sections in all. The glass segments are inserted from the inside of the frame and can readily be replaced while in position on the pole. Different densities of glass may be used, so that various effects may be produced as desired, as for instance, a light glass on the side toward the street and a denser glass toward the sidewalk and residences. When the lamp is in operation the glass becomes a luminous surface, radiating a powerful yet soft light without glare.

Very pleasing and striking results may be obtained by raising the voltage of lamps at intersectiong streets and by equipping with the Washington type globes. This, by its increased amount of illumination and individuality of appearance, calls attention to these locations. Such an arrangement may also be used to mark places of distinction, such as squares, parks, etc. This also enables the main streets to be of one intensity, by using a higher voltage, and the side streets of another intensity, with a lower voltage, and this range of intensity may be accomplished on the *same* circuit by using different electrodes or varying the arc voltage or by the combination of both.

When either the long-life or high-efficiency electrodes are used, an increase in arc voltage will give a

Digitized by Google

Fig. 10.—Night Illumination, Nahant Road, Nahant, Mass., with Form 17, Luminous Arc Lamps Equipped with Prismatic Refractor—Height, 25 Feet; Spacing, 600 Feet.

slightly greater than proportionate increase in candlepower. Keeping the current and voltage the same and changing from a long-life electrode to a high-efficiency electrode will yield an increase of 35 per cent to 60 per cent in the light, depending upon the particular current. If, however, the change from long-life electrode to high-efficiency electrode be made, and the arc voltage be increased at the same time, an increase in illumination of from 75 per cent to 100 per cent may be obtained.

For boulevard and park lighting the ornamental luminous arc lamp gives excellent results mounted on 18-foot ornamental poles with a spacing of from 250 to 500 feet, depending on the character of the road surface. The intensity of illumination is ample for both pedestrians and automobilists.

In many cases the use of these lamps makes the natural scenic attractions visible by night, at the same time providing a dignified though inconspicuous unit that harmonizes well with the surroundings.[1]

For residential street lighting, however, particularly those streets lined with low branching shade trees, a lower mounting height is preferable, a 14.5-foot pole, with a Washington type equipment, making a most acceptable arrangement. A residential street thus lighted produces a soft, pleasing effect without glare or discomfort to residents or passers-by.

In good practice, in intensive or "White Way" lighting, high-candlepower lamps of this type are used, and in order to attain the desired result must be spaced closely, averaging about 100 feet apart on each side of the street. In this type of lighting, the illumination of building fronts is quite as important as the illumination of the street surface, and therefore the distribution and color of light from the ornamental luminous arc lamp is ideal, the cornices, facades and other architectural details being brought out as well by night as by day.

On account of these features, this unit was selected for the main street and decorative lighting of the San Francisco Exposition.[2]

Sufficient intensity of illumination on the street surface due to the high efficiency of the luminous arc has made possible the commercial utilization of the upward light. The upward light in the angles just above the horizontal is of great importance in illuminating buildings on the farther side of the street. It can be readily seen that if the upward light be wholly suppressed, dark shadows will be produced on the building fronts, giving an unfinished

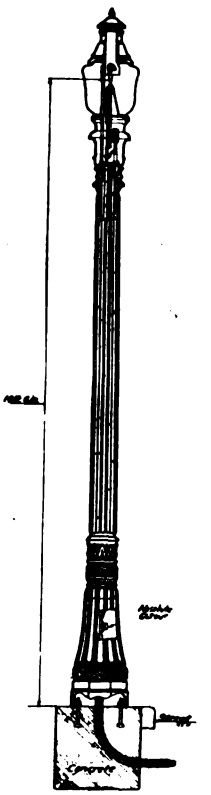


Fig. 11.—Sectional View of Form 10, Ornamental Arc Lamp, Mounted on Lynn Design Post.

effect to the street and causing a dismal and depressing effect on the eye, particularly when the light sources themselves are screened from view. Intensive lighting with the ornamental luminous arc lamps is produced with a minimum amount of glare and the effect of the lighted units upon the eye at night is more pleasing and can only be obtained by good diffusion with low intrinsic brilliancy (Fig. 12

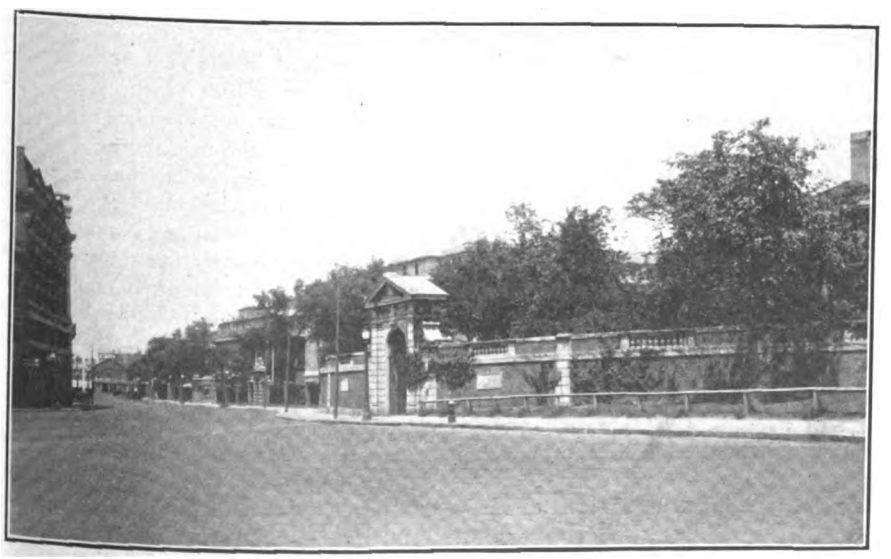


Fig. 12.—Day View, Form 10, Ornamental Luminous Arc Lamp, Harvard University, Massachusetts Avenue, Cambridge, Mass.

1 See G. E. Review, Vol. XVII, 1914, Page 212.—"An Example of a Wooden Arc Lighting System Applied to the Lighting of Boulevards," by G. N. Chamberlin.

2 See G. E. Review, Vol. XVIII, 1915, Page 579.—"Illumination of the Panama-Pacific International Exposition," by W. D. A. Ryan.

Digitized by Google

and Fig. 13). The lamps especially recommended for this type of work are the 5.0-ampere and 6.6-ampere with either long-life or high-efficiency electrodes.

It is now a well known fact that for a merchant to obtain trade, he must have good show-window lighting, but the best display lighting is of little avail if he is unable to get people on the street. Therefore, it is evident that the streets must be well lighted to bring the people into the street at night. This is accomplished by the intensive or so-called "White Way" lighting, which although originated but a few years ago, has already proved its worth and is rapidly being extended in all parts of the country.

At first the contention was made that a bright light outside a store window detracted from the lighting therein and in consequence the display of goods lost much of its effectiveness. This is still so where contrast is lacking between the illumination on the street and that in the show window. In that case, the goods look unattractive and have little life or distinctive feature, but when the ornamental luminous arc lamp, with its *pearl white* light, is used in contrast to the soft color of window display lighting, there is a marked difference in the appearance of the goods displayed and these results can only be accomplished by the use of the ornamental luminous arc lamp.

In conclusion, the pendent and ornamental luminous arc lamps are light sources of most excellent color and high efficiency and have been developed through systematic and consistent research and brought to a position second to none as street-lighting units, suitable for all clases of street lighting and are particularly recommended for boulevard and intensive or "White-Way" illumination.

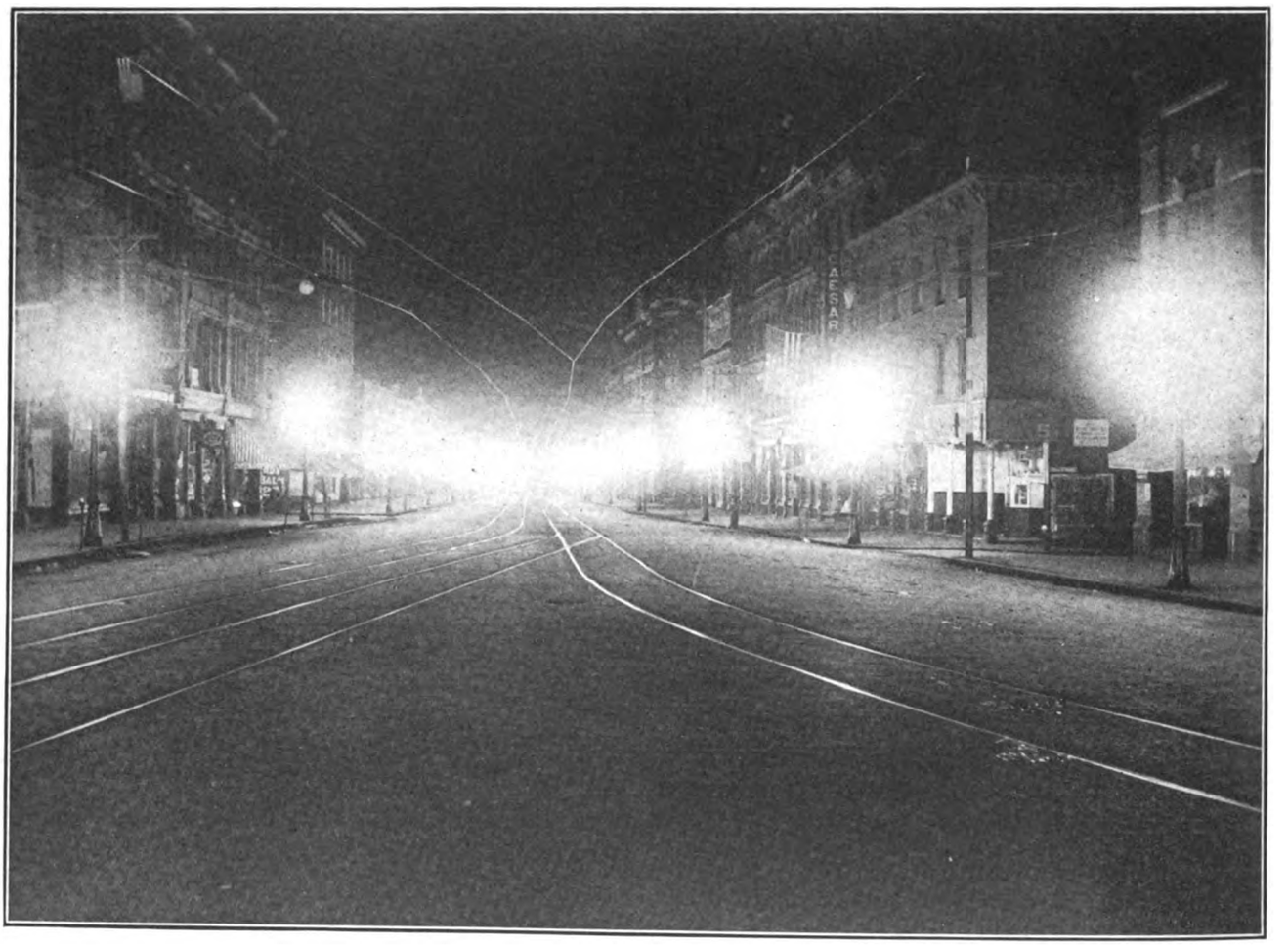


Fig. 13.—Night Illumination, Central Street, Lowell, Mass.—Form 10, 6.6-Ampere, Direct-Current, Ornamental, Luminous Arc Lamps.

Calculation of Strength of Electric Currents When Measured by Rayleigh Current Balance.

Probably the most accurate method for the determination of the value of the strength of an electric current in absolute measure is by means of the Rayleigh current balance, in which the current to be measured is passed in series through two parallel circular coils of unequal radii, one of which is suspended from the beam of a balance. The distance between the planes of the coils is varied until the force of attraction between the two coils is a maximum, and the value of the force is obtained by adding weights to the other arm of the balance until its equilibrium is restored. Since the maximum force obtainable depends on the ratio of the radii of the coils alone, and not on their individual dimensions, it is only necessary to determine further the ratio of the radii of the coils, and this may be done with great accuracy by electrical means.

The constant of the instrument, that is, the maximum force per unit current for the coils in question, has been obtained in the past by interpolation between values of the force, calculated for various assumed distances of the coils, in the neighborhood of the critical value for which the force is a maximum. For, although the general formulas of Maxwell and Nagaoka give the value of the force for any two given coils at any assumed distance with great accuracy, no formula has been heretofore published for calculating at what distance the force becomes a maximum. To supply this lack there is derived in a paper just published by the Bureau of Standards entitled "The Calculation of the Maximum Force Between Two Parallel, Coaxial, Circular Currents," a formula which gives the critical distance as a function of the ratio of the radii.

Digitized by Google

General Electric Company Veterans Celebrate.

The General Electric Quarter Century Club of the Schenectady works held its first outing Saturday, August 28. The excursion was made to Lake George over the Delaware & Hudson Railroad, by special train and steamer. Many of the men who have made history in the electrical industry were present. The following interesting account of the celebration is published as reported in the Schenectady (N. Y.) *Gazette* of August 30:

"The party had a 70-mile trip to the Hague on the steamer, dinner being served on board. Accompanied by the General Electric band of 40 pieces, under the leadership of C. F. Roth, the party of 248 persons enjoyed the outing under weather conditions which left nothing to be desired. Of those in the party, 206 were members of the Quarter Century Club, ranging in age from Joseph Tullus, who is 74 years old, to Alderman William Dunn, who recently acknowledged a record of 38 years. G. E. Emmons led the party in length of service, his relations with the General Electric Company dating from 1881.

"As its name implies, the Quarter Century Club is composed of men and women who have been in the service of the company 25 years or more. The electrical industry had its first substantial beginning in the decade of the eighties, though its chief development followed after 1890. Those who were venturesome in the industrial world at that time became pioneers in a new field of work and the pioneers of that earlier time are the Quarter Century Club men of today. The representative character of the club membership is indicated by the fact that 70 office and factory departments were represented on Saturday's excursion, from the executive department of the company to the specialized departments of the Schenectady works organization. A more democratic gathering than the excursion party would be hard to find. Men of all departments met on an equal basis of service. Friends of long standing from the office and factory departments shared the common pleasures of the day. Three women members of the club were accorded the warmest welcome. Three members from the Pittsfield works and one from the New York office were present with the party.

Average Age Only 52.

"Special significance attaches to the fact that the average age of the 206 club members who attended the excursion was 52 years. The 'old fellows' were in a minority as to numbers, if not in years. A fine esprit de corps was apparent throughout the day which reflected the working strength of the General Electric organization. The best of good fellowship prevailed from the 'all aboard' of the conductor, the start in this city, to the 'Auld Lang Syne' of the band as the party was separating at the union station for the return home.

"The presence of President E. W. Rice, Jr., and C. A. Coffin, chairman of the board of directors, was missed by the members of the excursion party. Both are members of the Quarter Century Club and both regretted being unable to share in the outing.

"Additional interest attaches to the fact that while the Schenectady works' organization has 250 men of the club, as many more are to be found in the district offices and the other works of the company at Lynn, Pittsfield, Harrison and Fort Wayne. All told the club has over 500 members, who have been a vital part of permanent organization of the General Electric Company during the past 25 years. In recognition of this loyalty, the company made the excursion a complimentary occasion, this circumstance being greatly appreciated by all who were present.

Those Present.

"The following men attended the excursion, representing the departments named:

"Martin Anderon, G. W. Anthany, F. J. Arthur, W. S. Ashdown, H. L. Baltozer, G. Bathrick, L. G. Banker, J. B. Barr (New York office), A. F. Batchelder, C. Baumgartner, J. Beck, W. G. Benning, George Bernhard, Charles Benth, E. S. Beyer, James Birkel, J. T. Bliss, A. Bolander (Pittsfield), James Bostock, C. Brede, A. L. Bretton, J. H. Briggs, J. J. Briggs, A. Brinkman, J. T. Broderick, Fred Brown, John Bunk, J. W. Burdick, W. C. Buschmann, C. F. Butterfield, D. C. Campbell, W. G. Carey, M. Carroll, F. Coates, A. Collins, O. R. Clark, J. H. Clune, J. Cokeley, C. Collins, William Consaul, J. M. Coon, W. J. Coughlin, George Cowlam, Stephen Danaher, J. Y. Daniels, D. C. Davis, W. M. Deming, A. J. Dettbarn, J. A. Donne, W. F. Dress, William Dunn, Job Duck, A. Dugglin, G. E. Emmons, Dana Fabray, L. D. Fairchild, C. H. Fetter, Luke Flannigan, L. Ford, A. Fowler, C. Fransen, Garrett Frederick, J. F. Freese, J. H. Fryer, F. H. Gale, F. N. Geddis, H. Geisenhoner, W. Gommerman, W. A. Goodrich, H. W. Gould, E. Hagan, J. J. Hahn, H. Hart, O. Held, John Hennessey, J. D. Heron, G. M. Hewlett, A. Hilton, Henry Hochuli, Jacob Hochuli, Joseph Insull (Pittsfield), George Iverson (Pittsfield), G. A. Iverson,, Leonard Ives, N. C. Jeffes, P. W. Jensen, Daniel Jewett, Nicholas John, W. F. John, H. L. Kann, T. P. Keating, P. J. Kelley, J. W. Kellogg, Edwin Keenholtz, G. W. Ketchum, G. Kindberg, Anna Klemm, Peter Kirsch, Eugene Klotz, Robert Knapp, J. T. Krug, F. Krug, Patrick Lane, G. Lange, E. La Rochelle, W. A. Lee, F. Loucks, C. E. Luckhurst, A. A. Lundgren, W. H. Lynch, J. McCruddden, T. McCullough, George McDonald, John MacHaffie, J. McKeown, V. McKinney, T. A. McLoughlin, J. H. McMahon, H. Macholz, William Madigan, J. F. Madgett, C. W. Marcley, J. F. Martin, W. J. Marx, H. J. Metz, Sr., John Miller, Joseph Miller, J. I. Mitchell, J. I. Monz, W. T. Moody, Henry Mueller, B. L. Myers, J. D. Myers, A. Neuber, F. J. Newton, George Oetting, C. A. O'Neil, F. W. Peper, C. F. Peterson, Charles Peterson, E. J. Platto, Daniel Posson, M. E. Pratt, E. D. Priest, G. Pross, A. A. Putnam, Christian Rach, A. Richter, John Riddell, Fred Righton, John Riley, J. M. Robertson, Mr. Robinson, A. Rockmer, A. L. Rohrer, A. G. Rolfe, W. G. Rothwell, C. A. Rowe, P. Sauter, W. Saxby, H. L. Schermerhorn, Wm. Schleyer, B. Schulen, F. W. Schulte, Henry Schwab, C. Schwenker, C. Schrafford, J. C. Shannon, R. Sherman, A. Shook, A. Southard, M. Sower, James Spence, Samuel Stein, John Stewart, S. B. Stewart, C. B. Stevens, E. B. Stevens, Leonard Steberg, W. H. Swanker, T. E. Tandy, H. E. Tannis, William Tannis, John Taylor, A. E. Tenney, Julius Tounier, Joseph Tullins, Arthur Turrian, Fred Van Patten, H. A. Van Patten, L. Vogel, D. O. Vrooman, John Waldron, E. G. Waters, F. H. Watson, Dora E. Weaver, J. I. Weller, F. W. Whitmyre, J. B. Wicks, J. H. Wilkie, R. P. Wilkie, A. M. Williams, Linnie Williams, G. H. Winckler, D. O. Youlen, Jacob Zeigler.

"Departments represented: Accounting, general office, accounting, works, advertising, armature, assembling, blacksmith, brass foundry, brushholder, carpenter, coil winding, commutator, compensator, contactor control, container, controller, cost, credit, general office, drafting, engineering, executive, experimental, induction motor, inspection, iron foundry, locomotive, machine, mailing, marble, marine sales, mechanical mica, millwright, motor, moulding, payroll, polishing, porcelain, power station, purchasing, punch press, railway, receiving, record, repair, rheostat, rigging, sales screw machine, searchlight, shafting, shipping, socket, standardizing laboratory, steam fitting, stock, supply, switch, switchboard engineering, switchboard punching, switchboard detail, testing, tool, transportation, treasury, general office, turbine, winding and supplies, wire and cable.

"The officers of the club are:

"President, A. L. Rohrer; vice-president, John Riddell; secretary, Frank Arthur; treasurer, H. W. Leland; trustees, E. S. Beyer, John Waldron, D. O. Youlen."

Butte Church Uses Electric Sign.

An electric sign is to be displayed over the entrance to the Grace M. E. Church in South Butte, Mont. It measures six by two feet and in large lighted letters will be the following inscription: "Grace M. E. Church."

In view of the plans being made by many electrical manufacturers to send traveling representatives and special agents to South America, an article on the high cost of living in Buenos Aires, Argentina, in *Commerce Reports* for July 6, is interesting. No man with a family can live in Buenos Aires in the style to which he should be entitled by his business activities on less than $5,000 per year. It cannot be said that every commercial man in Buenos Aires draws that salary, but by whatever less than this sum he is compensated, by so much must he restrict his expenses and lose in the social and business scale. The conclusion reached by those who know Buenos Aires well, and who are able thereby to make intelligent comparison with the cost of living in the large cities of the United States, is that a salary of $5,000 there, while it may seem ample, is moderate.

Digitized by Google

THE PRESENT STATUS OF ARC-LAMP CARBONS.

By V. A. Clarke.

National Carbon Company, Cleveland, O.

Arc carbons are nearly unique in the electrical industry in that they depend absolutely upon another electrical product to make them valuable. The development, indeed, of lighting carbons has gone hand in hand with that of arc lamps and a resume of this kind must necessarily deal with the results obtained, as evidence of development, rather than with the details of manufacture of either carbons or lamp, which would interest no one except the manufacturers of these particular lines.

Fig. 1 traces graphically the history of carbon-burning arc lamps for series street lighting from its earliest beginnings until the present. First of all, was the direct-current, pure-carbon, open arc, improved in lamp mechanism and electrode until it reached the efficiency shown. This type of lamp has been practically abandoned in this country, because of its high cost of operation, due to short electrode life, although its illuminating value was good. Both this and the magazine type, inclined-feed flame lamp are still extensively used abroad, because of their high light-giving efficiency as compared with enclosed arcs. In many localities the cost of power is higher than that in the United States and the labor item for efficient maintenance is comparatively much lower, making it economical to still operate these lamps.

The open arc was replaced in this country by the enclosed carbon arc, both alternating-current and direct-current. Although somewhat inferior to the replaced open arc from the standpoint of illuminating values, the case of operation from the station point of view—long life and low carbon cost—outweighed the feature of better illumination. Nearly all the street lamps in the country were at one time of this type and millions of carbons were consumed by them every year. It is interesting to note that in spite of the inroads of magnetite, flame arc and tungsten lighting, nearly 80 per cent as many enclosed arc carbons were sold last year as in the day of their supremacy. Fifteen years ago open arcs were doomed, yet in spite of all the advertising given the later types of lamps and the magazine articles dealing with them, open-arc carbons are still used today in considerable quantities. This simply proves that any complete departure from any one type is exceedingly gradual because each lamp has certain recognized advantages not always to be found in any other.

Inclined-Feed Flame Lamp.

The next development in arc lighting was the short-burning inclined-feed flamer, burned as an open arc. In this type of arc lamp the highest commercial efficiency has been attained. In England, where the magazine type of lamp has reached its highest development, efficiencies as low as 0.18 watt per mean lower hemispherical candlepower are reached in commercial practice. The magazine lamp unfortunately has never found favor on this side of the water. A new departure in street arc lamps can shortly be expected in a type of lamp retaining all the unequaled light-giving qualities of the inclined-feed, open-arc lamp but adapted to American practice. Such a lamp already has been developed beyond the laboratory stage. If it fulfills expectations it will create a strong sentiment in its favor.

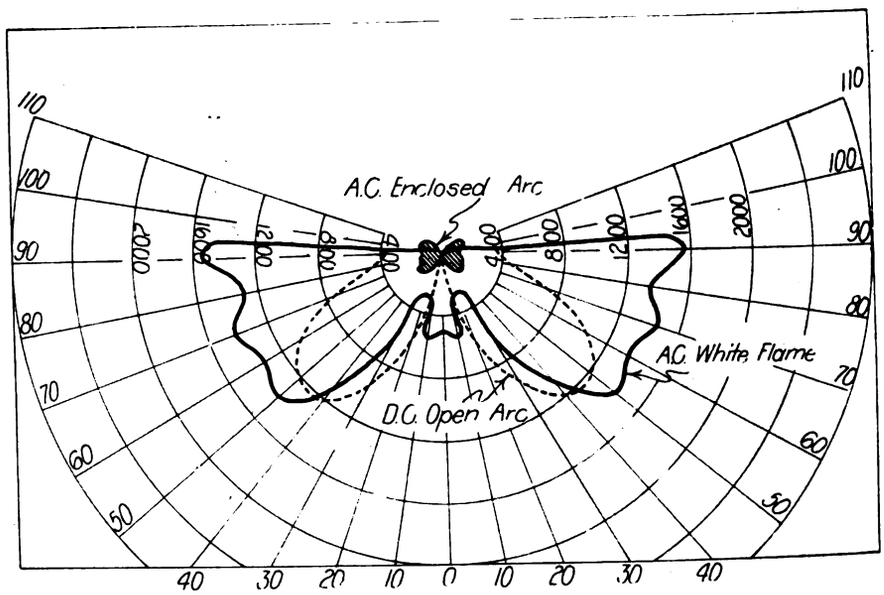


Fig. 1.—Distribution Curve of Alternating-Current White-Flame Arc.

Long-Burning Flame Lamp.

The long-burning flame arc lamp, as perfected by the large lamp manufacturing companies, marks the highest development of the arc lamp for street lighting purposes up to the present time. As fast as brought out, these lamps were given to the domestic carbon companies for the development of suitable carbons to burn in them. This has been successfully accomplished, so that we may have no hesitation in feeling that our lamps and carbons are surpassed by no foreign articles of the same type. In some quarters there has been a demand for carbons of foreign manufacture, due perhaps to an instinctive feeling that foreign goods are always better than those made in America. This feeling is being dispelled by the American manufacturers, who have demonstrated again and again to unbiased customers that their carbons are as reliable, as good in color value, as high in candlepower, as efficient and less expensive than the imported ones.

As a street illuminant the chief advantage of the white flame arc is, of course, its high efficiency. For this reason, its use will be dictated in new installations where the cost of power is the deciding factor. Its next great advantage is in its distribution, its natural maximum candlepower being in a plan 20 degrees to 30 degrees below the horizontal, the plane of maximum usefulness for street lighting. In this it is approached by no other lamp but the magnetite. Other advantages are its attractive color, its low intrinsic candlepower with no glare and its availability in large units, which recommend it for large area and "white way" lighting.

The best from any light source can only be attained by intelligent maintenance. If the flame arc lamp is treated as a piece of producing machinery in-

Digitized by Google

stead of a necessary evil, the cost of its maintenance can be made a profitable proposition. It is sometimes difficult, however, to obtain men who will give the lamps conscientious attention.

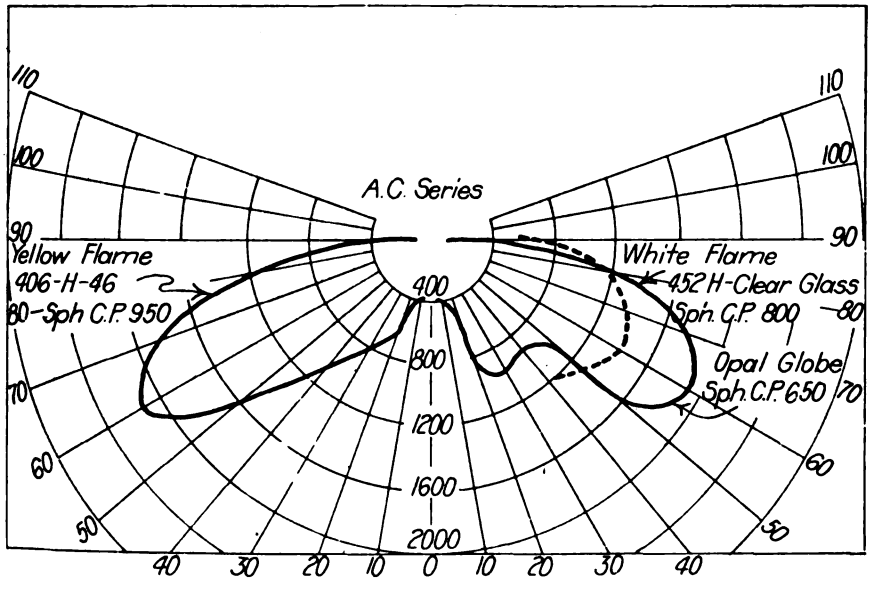


Fig. 2.—Alternating-Current Series Street Lamp with Clear and Opal Glassware.

The demands for responsible maintenance men are exorbitant in some cities—so much so that the constant friction engendered has been allowed to weigh against the broader use of this type of lamp. Under these conditions complaints have sometimes arisen which, on investigation, have proved to be in no degree attributable to the lamps themselves or to the carbons.

A so-called disadvantage of the white flame lamp is the bugaboo of globe deposit. A quotation from the report of the electrician of perhaps the largest flame arc installation in the country will suffice to show how greatly this fear of globe deposit has been exaggerated:

"The arc showed a 6 per cent decrease in candlepower at 15 degrees below the horizontal after being in service one trim. The subsequent deposit upon the slight initial etching of the inner globe was easily removed; and there was no further decrease in candlepower at the end of the third trim.

"The following values of candlepower are the average of 100 readings taken at 15 degrees below the horizontal with the lamp rotating at four revolutions per minute, and with an average terminal pressure of 55 volts. (Note—15 degrees is not the position of maximum light emission.)

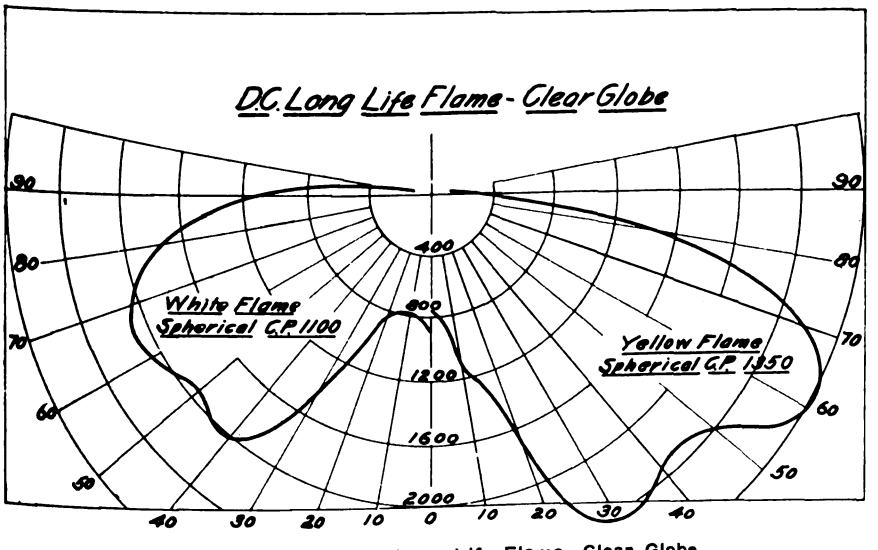


Fig. 3.—Direct-Current Long-Life Flame—Clear Globe.

Conditions.

New clear inner globes, line Alba outer globes; new National carbons, 1,055 candlepower; same equipment near end of first trim, globes undisturbed, 987 candlepower. Same equipment near end of third trim with globes cleared as well as possible, 997 candlepower.

"At the end of the first trim an indelible etching[1] of the inner globe had taken place; but this had very little effect on the candlepower as the etching was concentrated at the lower point of the globe; and therefore was not in the path of the light at the angle used. At the end of the third trim there was a heavy deposit over practically the same area as the etching at the end of the first trim; but this deposit was easily removed with a dry cloth, leaving the inner globe in the same etched condition as before."

Many actual service tests performed by the company in which the writer is employed, indicate that properly maintained lamps, even under the most severe operating conditions will not drop more than 20 per cent within six months, including the fresh deposit remaining in the lamp at the end of the last trim. Experience has shown that when the loss of light due to deposit exceeds an equivalent energy cost of 30 cents, it is economical to replace the globe. In general, this is necessary two or three times a year.

In Fig. 1 is shown the distribution curve of an alternating-current series white flame lamp, fully equipped with heavy opal glassware for "white way" lighting. The globe has distorted the natural distribution to some extent, throwing more light closer to the horizontal. It has been suggested that refractors be used, which, while lowering the total available light some 10 or 20 per cent will redirect some of the lower rays in a direction still more nearly horizontal. Under these conditions a beam efficiency of 15 degrees below the horizontal of 0.14 watt per candlepower can be obtained.

Fig. 2 shows these alternating-current series street lamps with clear and light opal glassware, where the inherent good distribution is evidenced. No flame arc is as intrinsically efficient on alternating current as on direct current, a fact immediately apparent by a comparison of Fig. 2 and Fig. 3. Below is a table, taken like the above distribution curves, from lamps in actual service, which represents the efficiencies of the flame lamp ordinarily used in street lighting practice.

Yellow Flame Lamps.

For lighting of large areas, where utility is the first consideration, the

1 This is an irridescent effect rather than a true etching.

TABLE I.
Long Life Flamers—Clear Glassware.

	White.		Yellow.	
	A.C. Series.	D.C. Mult.	A.C. Series.	D.C. Mult.
Arc watts	385	425	385	425
Terminal watts	450	715	450	715
Terminal watts÷Maximum bear C.-P.	0.225	0.325	.195	.223
Terminal watts÷M.H.S. C.-P.	.281	0.325	.236	.265

Digitized by Google

yellow flame arc has no equal. This fact is attested to by the great number of installations in railroad terminals and yards, docks, piers, and industrial establishments. The claim of the carbon manufacturers that this light has superior smoke and dust penetrating properties is corroborated by many of its users. Its color is oftentimes an advantage, since it is a well known fact that the eye is most sensitive in yellow light, except at very low intensities.

Searchlights.

The war raging in Europe has amply demonstrated the necessity of high power-searchlights in warfare. More work has been done, in consequence, on the carbons for these lamps during the past year than on probably any other. A distinct departure from past practice in the operation of searchlights has been the employment of very greatly increased current densities through the use of smaller negative carbons. By this means, greater candlepower is developed and less light is trapped between the carbons.

A new type of searchlight has recently been developed along entirely new lines. Instead of utilizing pure carbon electrodes in both lamp terminals as formerly, the positive is made of a small carbon tube filled with a white flaming material. Due to the enormously high current density at which this lamp is operated (600 amperes per square inch), a small pocket is formed at the positive crater, in which the volatilized flaming material is maintained at an intense heat, and is correspondingly highly luminous. In this lamp a maximum candlepower of 85,000 is obtained at 45 degrees without a reflector. (See Fig. 4.)

Projectors for Stereopticon and Moving Picture Machines.

It apparently required a war, cutting off foreign carbon shipments, to convince the moving-picture operators that American carbons are as good as, if not better than, the foreign article. Rather unsatisfactory in the early stages, projectors were the source of endless experimentation and expense by domestic manufacturers until no carbon satisfying the need of the country was obtained. Now that foreign carbons are nearly unobtainable, we are awakening to the fact that we have at our very doors a product just as satisfactory in every way at a lower cost.

The most recent advance in this field has been the substitution of special flame carbons on alternating-current circuits. These have been found to operate noiselessly, entirely eliminating the annoying humming of the old carbons. The life obtained is practically the same, but 15 to 20 per cent more power is required to operate them for equal candlepower. The light from these carbons is at the same time soft and non-glaring.

Photographic Lamps.

A most promising new field for the arc lamps appears to be that of photography. For this purpose the carbon manufacturers have developed a white flame carbon of high efficiency and remarkably good color, which has proved satisfactory in every way. It has found especial favor among the profession on account of its speed, cheapness and reliability in duplicating results. It was first used in photo-engraving establishments, especially for newspapers, where intense light and high speed are requisites, and has since been widely used for blue printing, etching and copy work. Rather extensive comparative tests between flame and enclosed arc carbons were made and published by the writer about a year ago. These showed that at the photographically low current of 13 amperes, the two arcs were equal in photographic intensity, but at 25 amperes the flame gave double the actinic light of the enclosed at the same current, or six times the

Fig. 4.—New Flame-Type Searchlight Carbon.

power of the enclosed at its usual rating of 6.6 amperes on 110-volt direct-current.

Commercial photographers soon saw its value and employed it in their special photographic lamps. Its use is not confined to these lamps; any direct-current, enclosed arc lamp can be easily converted to burn flame carbons with an efficiency equaling that of these special lamps. The National Carbon Company has done much work along these lines and will be glad to offer any suggestions or advice as to how this may be done. For portrait work, the use of a suitable cabinet or screens enables the operator to obtain the best results.

Very recently a studio has been fully equipped with flame arcs, depending solely on them as a source of light. The proprietor is engaged in commercial and advertising photography, including advertising moving picture films. The service obtained from this studio has exceeded expectation, since daily commercial photographic problems are readily solved that under any of the old methods of lighting would have been exceedingly difficult.

An entirely new field is in the use of red flame carbons for special color work involving the photography of red objects, where the carbons have given much satisfaction. Orthochromatic and panchromatic plates are, of course, used. Other new developments in photography are the taking of moving-picture films by white flame arc light exclusively and the use of this same light source under special conditions in the making of photo-micrographs.

Special Uses.

The special developments in arc lighting belong almost exclusively to the white flame carbon. In textile industries the dyes are tested for constancy of color by exposing dyed cloth to sunlight for a certain length of time. With white flame carbons designed for the purpose, the same effect can be produced in from 10 to 20 hours as would require an exposure of 50 hours to July sunlight. It ordinarily requires two to three weeks to obtain this.

More or less allied to this subject is the manufacture of certain special chemicals requiring the action of strong light. This same carbon has proved to be vastly more powerful than any other light source, including daylight. Any further mention here would encroach upon a detailed paper soon to be published covering this work.

The men who are most closely in touch with the arc lamp situation prophecy that great strides in the art of illumination will be made in the near future through arc lamps, far surpassing in magnitude any of the more recent developments in other light sources. Even now, new spheres of usefulness are being discovered almost daily for the flame arc lamp and its adjunct, the carbon electrode.

Noise and Smoke Nuisance in Philadelphia Subway Excavation Will Be Avoided by the Use of Electricity.

In spite of the fact that the excavation of the City Hall section of the Broad Street subway in Philadelphia, which will be started September 13, will necessitate the use of large shovels, dredges and derricks both day and night, the occupants of the office buildings and stores in the neighborhood scarcely will be disturbed by their operation. Transit Director A. Merritt Taylor has stipulated with the contractor that all such machinery must be electrically operated, which means the virtual elimination of the noise and smoke nuisance invariably associated with steam derricks and dredges. The use of the latter during the building of the Market Street subway caused great complaint, office work being interrupted by excessive noise, and buildings blackened by smoke.

The practicability of the use of electric power in digging and dredging work was demonstrated on the contract for the relocation and reconstruction of sewers for the delivery loop.

Digitized by Google

MODERN ARC LAMPS.

By C. E. Stephens.

Engineer, Westinghouse Electric & Manufacturing Company

The development of the modern arc lamp has been characterized by more activity, more radical innovations, and the way has been strewn with more relics than almost any other type of electrical apparatus. At some periods development has been retarded for decades, while at other periods, progress has been made with rapid strides.

Many histories of arc-lamp development have been published. Assuming, therefore, that the various steps in the development of the modern arc lamp are reasonably well known, we shall give here some of the more important details of construction, and performance of two modern types, viz., the metallic flame and the flame-carbon arc lamps.

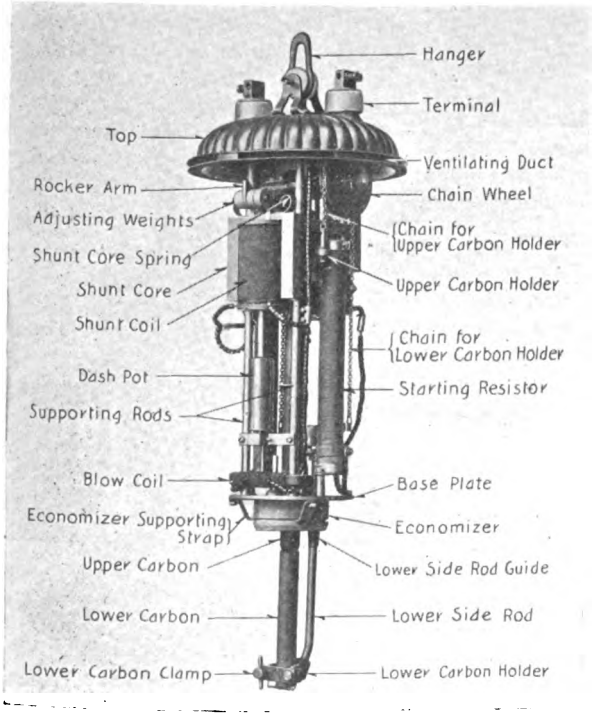


Fig. 1.—Mechanism of Flame-Carbon Lamp.

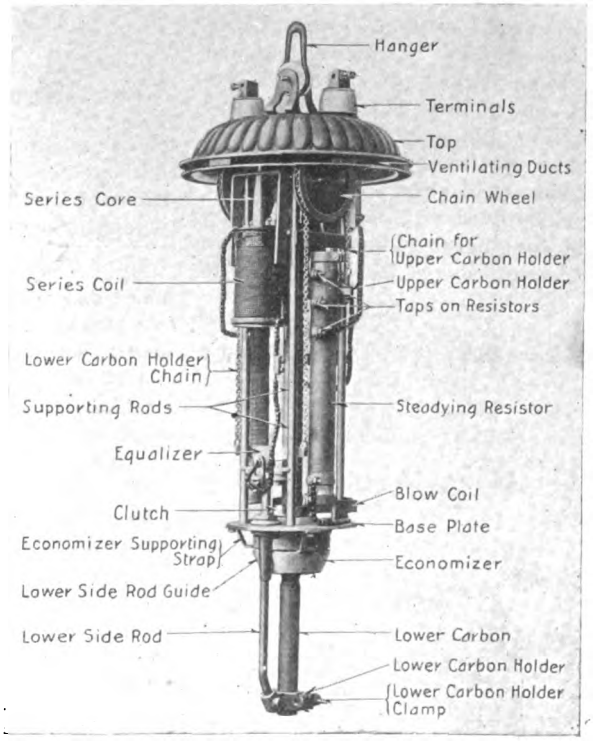


Fig. 2.—Flame-Carbon Arc Lamp Mechanism.

General Theory of Lighting.

The earliest historical form of illuminant is the flame. The heat of the flame comes from the union with oxygen of the various compounds in the combustibles. In every flame some of the compounds are in a gaseous state. Solid or liquid combustibles are broken up by the heat of combustion into solid and gaseous compounds. If enough air is mixed with the gas formed all the combustible compounds are rapidly consumed and a non-luminous flame results. Thus the alcohol flame is merely non-luminous, as are also the flames of the oxyhydrogen and the Bunsen burners. If there are more solid compounds in the combustible than the air supply will burn rapidly, these solids will burn more slowly, and will, therefore, glow, thus the light given off from a burning piece of wood or a tallow candle. A non-luminous flame can be made luminous by the introduction of some foreign substance. If a piece of copper wire is held in a Bunsen gas flame it becomes heated and a green flame results. The Welsbach gas burner uses this principle.

If the substance being heated is of a certain character a combination of colors is obtained that produces white light at the proper temperature. If, however, the substance be some of the known metals certain of the colors will be more pronounced; that is, not all substances give off the same color when heated to the same temperature in a flame. In the Welsbach burner certain metallic compounds are spread upon a thin web of heat resisting material. These compounds, when heated to the high temperature of the gas flame, give off a much greater amount of light than would be given by the carbon particles.

Arc Lamps.

If two pieces of a conducting material called electrodes be connected in an electrical circuit of sufficient voltage, with the ends touching, and these ends be then separated slowly, an electrical spark will be seen between them. When the electrodes are pressed closely together the contact between them is good and the electrical resistance at the point of contact is relatively low, but when they are separated slightly contact is made through a few minute projecting points of the electrode; these, because of their high resistance, become very hot. The intense heat causes the points of the electrodes to change into vapor, and the vapor, which is conducting, bridges the gap between the electrodes, and current follows. As they are separated farther the bridge of conducting vapor called the "arc stream," follows and the arc is formed.

Flame-Carbon Arcs.

It has been mentioned that the arc stream supplies very little of the light of an arc lamp and that the energy consumed in it is therefore lost. Non-luminous flames can be made luminous by the introduction of some foreign substances. In the later forms of arc lamps this has been accomplished by

Digitized by Google

impregnating the carbons with some mineral salt. The light from the arc stream of the carbon arc is purplish in color, but since it comprises such a small proportion of the total light from the lamp its effect is scarcely noticeable except when colors are being matched. If salts of metals such as sodium, strontium, barium, titanium and calcium are introduced into the carbons when the electrodes become vaporized into the arc stream, some of these salts will also be vaporized into the stream. This makes the arc stream luminous. The different salts give different colors; thus copper gives green; sodium gives yellow, and strontium gives scarlet. While white light is the most desirable for illumination the penetrating qualities of the white light are not as good as of yellow, and hence is not used to any great extent except for street lighting. Lamps that use impregnated carbons are called flame-carbon lamps. The efficiency of these lamps varies with the salt used. As the impregnated salts when burned are converted into solids again, they deposit upon the globe, if used in an inclosed arc. Hence the flame arcs were formerly inherently open arcs and their electrodes were very short-lived.

The long-burning flame-carbon arc lamp is so designed that the fumes do

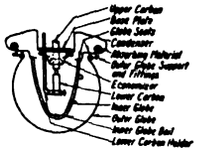


Fig. 3.—Lower Mechanism of Flame-Carbon Arc Lamp.

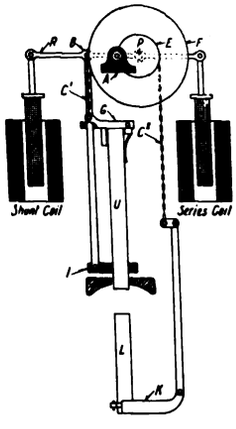


Fig. 4.—Focusing Mechanism.

not condense upon the part of globe surrounding the arc, but the lighter fumes rise and are deposited in a condensing chamber located just above the globe, while the heavier fumes are deposited upon the lower part of the globe. Practically none of the light is absorbed by the globe, and the light distribution is very even. The lamp is almost entirely inclosed and the carbons have a life of about 130 hours.

Application.

The flame-carbon arc lamps are adapted for all standard commercial circuits. They give excellent and efficient light distribution for streets, park and boulevard lighting, and for railroad yards and other large open areas where large candlepower units are best suited.

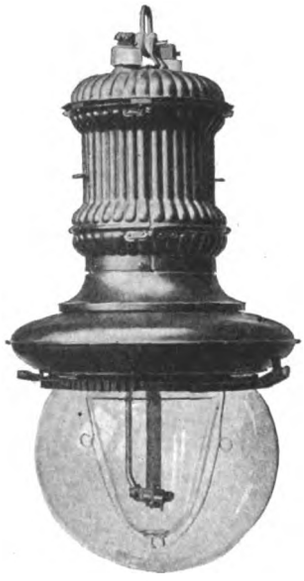


Fig. 5.—Flame-Carbon Arc Lamp.

General Construction.

The flame-carbon arc lamp is divided into two compartments, separated by a strong base plate, as shown in Figs. 1 and 2. All the regulating parts of the mechanism are in the upper compartment and the arc is in the lower, which is again subdivided into two chambers.

In addition to forming a separation between the upper and lower compartments the base plate supports all the parts of the lower compartment. The lower compartment consists of the arc and the condenser chambers, and the enclosure between the outer and inner globes. (Fig. 3.) These sections must be practically air tight in order to secure a long carbon life. The arc chamber is formed by the inner globe seating accurately on the surface of a casting forming the outer rim of the condenser. The fumes from the arc rise into the condenser chamber, where the solid matter is deposited, and the gas freed from suspended substances. Sticks of consuming material for absorbing the glass-etching gases of the arc are placed in the condensing chambers.

The lower compartment also contains an inverted piece of heat-resisting material above the arc which is called the economizer. This piece shields the upper part of the lamp from the heat of the arc, provides a suitable pocket for the heated gases, and offers a good reflecting surface.

On the base plate of the lamp is fastened a blow coil, which generates sufficient magnetic field to neutralize the blowing effect on the arc caused by the current passing through the side rod. As the blow magnet is in series with the arc, the blowing effect will be practically neutralized though the current may vary.

Mechanism.

A mechanism is required to feed the carbons in o der to obtain constant and reliable operation and to regulate the arc length. A long-burning lamp requires a mechanism that will feed the carbons very slowly. It is also desirable to provide a focusing mechanism, which feeds both carbons at such a rate that the arc is kept approximately a constant distance below the economizer. This is accomplished by attaching the chains leading from the upper and lower carbon to wheels having different diameters. Fig. 4 shows this arrangement diagrammatically on a series lamp with only one set of wheels, chains, etc., shown.

Regulation.

Regulation of the arc is obtained by the use of the rocker arm principle, changes in voltage and current turning the rocker arm about the fulcrum *A*, Fig. 4. It is of great importance that

Fig. 6.—Lamp with Globe Lowered and Mechanism Covers Open.

there be a minimum friction during the regulation. This is accomplished by eliminating the usual guide rods for the upper carbon holder and using the clutch rod for this purpose. Referring to Fig. 4 it will be noted that the upper carbon holder *G* is guided by the two clutch rods. There is no relative motion between them, because the clutch rod, when dripping the carbon is moved by this see-saw action at

Digitized by Google

TABLE I.

Lamp.	Amperes at Terminals.	Globe. Outer.	Globe. Inner.	Volts. Arc.	Volts. Terminal.	Watts, Terminal.	Power Factor Terminal, Per cent.	Electrical Efficiency Lamp, Per cent.	Curve.	M. L. H. Candlepower.	Watts per M. L. H. Candlepower.	M. S. Candlepower.	Watts per M. S. Candlepower.
A.C. Series	10	Clear	Clear	49	55	445	81	88	A	1400	0.317	769	0.58
A.C. Series	10	Alba	Clear	49	55	445	81	88	B	890	0.5	630	0.70

the same time the carbons are regulated. Feeding of the carbons occurs when, due to carbon consumption, the clutch rod has been lowered enough to cause the clutch to assume a horizontal position and to rest on the economizer. This releases the grip of the clutch on the carbon. The carbons then come together until the shunt coil is sufficiently weakened to allow the series coil to pull the clutch rod up so that the clutch grips the upper carbon again.

Fig. 7 shows a typical distribution curve for this type of lamp and table I. shows the electrical performance of the series burning lamp for alternating-current circuits.

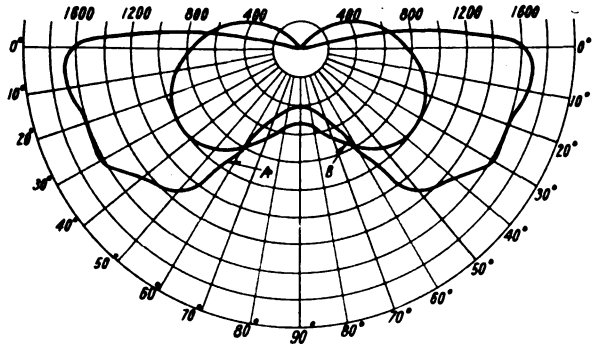


Fig. 7.—Distribution Curve of Flame-Carbon Arc Lamp.

The flame-carbon arc lamp represents the latest development in high candlepower light sources. From the standpoint of the illuminating efficiency, maintenance cost and superior lighting effect, the flame-arc lamp stands well above any other type of illuminant.

Metallic-Flame Arcs.

The metallic-flame arc combines the principles of the carbon arc and the flame-carbon arc and gives light from both the arc stream and the electrodes. In this type of lamp the positive electrode is a metallic button and the negative electrode is a rod made of metallic oxides. The resistance of these oxides is comparatively high, and for this reason a metal wire is inclosed in the oxide electrode. The metallic-flame arc differs from either the carbon or flame-carbon arc in that in the metallic-flame arc the negative electrode is hotter and burns away faster, while in the carbon and flame-carbon lamps the reverse is true. The metallic-flame arc lamp will operate on direct current only.

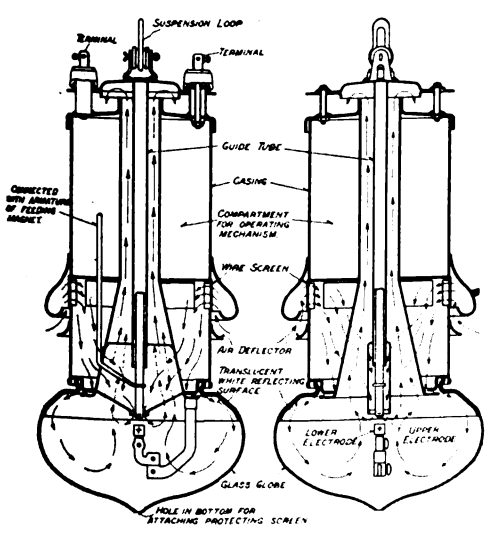


Fig. 8.—Diagram of Metallic-Flame Arc Lamp.

Theory of Metallic-Flame Arc.

There is no carbon used in the electrodes of the metallic-flame arc. Iron oxide, when projected in the arc stream forms a conducting path through which current will pass even more readily than through carbon paper. So iron oxide is used to supply this conducting path. However, an electrode of iron oxide, although giving a stable arc, does not furnish a very bright one, and some other material must be employed to make the arc more efficiently luminous. Oxides of titanium serve this purpose. These have a tendency to volatilize very fast and hence tend to decrease the life of the electrode. An oversupply also tends to make the arc unstable. An oxide of chromium is, therefore, added to prevent the electrode from wasting away so rapidly. From the foregoing it is seen that to give proper service a combination of these three materials must be used that will give the best results, considering efficiency, stability, satisfactory operation, and life of electrode.

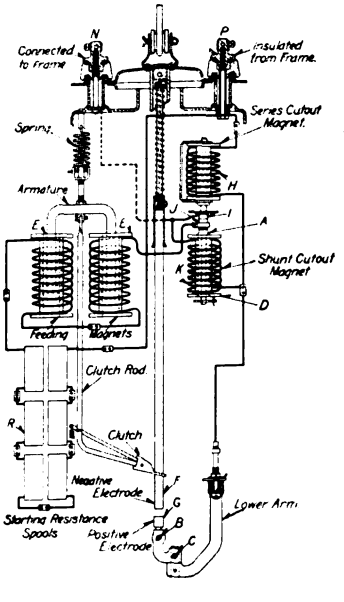
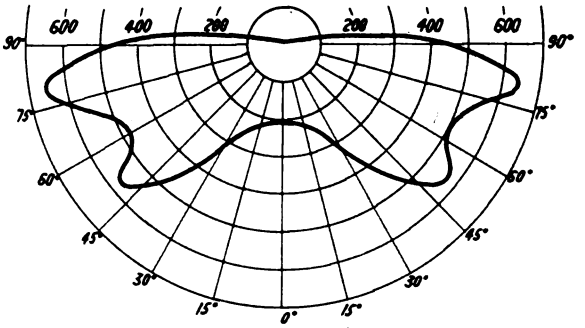


Fig. 9.—Circuit Diagram of Metallic-Flame Arc Lamp.



DISTRIBUTION CURVE OF D.C. SERIES TYPE C. METALLIC FLAME ARC LAMP
Clear Glass Globe Standard Y Electrode
Amperes 4

Terminal Volts.... 68	M.L.H.C.P. 495	M.S.C.P. 250
Arc Volts 66	M.L.H.C.P. per Watt 1.82	M.S.C.P. per Watt ... .92
Terminal Watts 272	Watt per M.L.H.C.P. .55	Watts per M.S.C.P. 1.09

Note. Lamp was burned 36 hours before test was made

Fig. 10.—Distribution Curve of Metallic-Flame Arc Lamp.

As only the negative electrode is consumed while the positive is consumed very little by vaporization, it is customary to use these oxides in the negative electrode only and to make the posotive electrode small and of a combination of iron and copper.

The products of combustion from the arc, due to the oxides projected into it, are gases and a fine powder. Some of the gases will condense, and, together with the small solids, will deposit upon any cool surfaces with which they come into contact. It is necessary, therefore, to in some way remove the fumes and soot from the lamp. The method of doing this is shown very clearly in Fig. 8. The mechanism of the lamp is shown in Fig. 9.

Referring to Figs. 8 and 9 it will be noted that the normal position of the electrodes when the lamp is not burning is separated. This is necessary because of the tendency of the electrodes to fuse together when they come into

Digitized by Google

contact. Use is, therefore, made of the shunt-feed type of mechanism, as shown. When the lamp is connected properly in the circuit, current will flow from the positive terminal *P* to the starting resistor *R*, and the windings of the feeding magnets *E*, and thence through contacts *J* and *I* to the lamp frame. The negative terminal is not insulated from the lamp frame, so that the circuit is then completed. These feeding magnets pull down their armature. The clutch rod is attached to this armature, and when the armature is pulled down the clutch rod is lowered so that the clutch releases its grip on the negative electrode *F*, letting the two electrodes *F* and *G* touch. Current now flows from *P* through the series cutout magnet winding *H* to the lower electrode *G* to the upper electrode *F*. Neither this electrode nor the negative terminals are insulated from the lamp frame, so that the circuit is then complete from the upper electrode to the negative terminal through the frame. The series cutout magnet is thus energized and lifts the series cutout contact *I* away from the shunt contact *J*, thus opening the circuit through the feeding magnets, and their armature is released. By virtue of the spring attached to the feeding magnet armature the clutch is then raised. It grips the negative electrode and draws it away from the positive, thus establishing an arc. The negative electrode is held in this position until it is burned away so much that the arc lengthens enough to cause the shunt magnet *K* to become energized sufficiently to lift the shunt cutout contact *J* until it touches the series contact *I*. Again current flows through the feeding magnets, and the feeding operation is repeated. This cycle is repeated throughout the life of the electrode.

The light distribution from this lamp is shown in Fig. 10, and the electrical performance is given in Table II.

TABLE II.

Four-Ampere Lamp.

Terminal volts	68
Arc volts	66
Terminal watts	272
M.L.H. C.P.	495
M.L.H. C.P. per watt	1.82
Watt per M.L.H. C.P.	.55
M.S. C.P.	250
M.S. C.P. per watt	.92
Watts per M.S. C.P.	1.09

Note—Lamp was burned 36 hours before test was made.

Application.

This lamp is particularly well adapted for street illumination, yard lighting and such other areas where a smaller light source is better adapted than that of the flame-carbon lamp. The lamp has a very low operating cost, the color of light is more nearly white than any other light source, and the distribution is such as to make the lamp well suited for illuminating large areas.

The arc lamp more than any other piece of electrical apparatus is very dependent upon allied branches of engineering. The carbon industry, the manufacturing of porcelain, of glass, of alloys of all kinds, and the production of various chemicals all have had a controlling influence on the development of the arc lamp. In spite of the many factors which require consideration the arc lamp has become a very important piece of electrical apparatus, and there is reason to expect continued development in the future as in the past.

Features of Important Swedish Hydroelectric Plant.

The Gullspang Hydroelectric Power Station is one of the most important in Sweden, and was at its completion the largest working concern of the kind. The Gullspang River is, next to the Klara River, the largest of the streams having their outlets into Lake Vänern. Prior to reaching this lake, it passes Lake Skagern, the river distance between the two lakes being about eight miles, and the level of the latter lake being about 79 feet higher than that of Lake Vänern. There are two falls—the Gullspang Fall, or rather rapid, which, over a distance of five-eighths mile, has an aggregate height of about 69 feet, and the Aras Fall, of about 11.5 feet height.

The combination of the two falls in one power plant was advantageous, inasmuch as the Munkfors Fall has no reservoir, whilst the Gullspang Fall has the already-mentioned Lake Skagern, with its (through regualtion) unlimited possibilities for storage. By the aid of certain regulating works the Gullspang power station could be planned for more than 3,600 cubic feet of water per second, although the average volume of water may not exceed 2,520 cubic feet per second, and the low-water volume has been as little as 972 cubic feet per second. The smallest quantity of water that will be available after the regulation of Lake Skagern, and its damming up to its present high-water level, has been calculated at 1,520 cubic feet per second, 108 cubic feet being reserved for the passing of fish. There is at present no timber-floating in this river. By the further regulation of some lakes higher up these figures may be raised.

It was first proposed to construct a solid dam, which, slightly arched against the water, should span the river between the two rocky banks; but when the place had been laid dry it was found that the rock bottom in the center was 26.5 feet below the river bed, and the proposed dam, if carried down to the firm rock, would consequently prove very costly. The construction was therefore altered, and a straight solid dam was built on the western shore, and across the western half of the river bed.

The power station, with its three stories, is located in a cavity blasted in the rock to a depth of 32 feet below the surface. The outer walls of the buildings are entirely free of the surrounding rock, so as to avoid, as far as possible, dampness in the machinery hall. On the bottom floor, which rests on the rock, the electric generators are installed, direct-coupled to the turbines, under which, in the longitudinal direction of the power-station, is formed the outlet tunnel, into which are taken the pipes from the turbines. These suction-pipes are cast into strongly reinforced-concrete beams, which have to sustain the pressure from the plate cylinders and from the volume of water in and above these. The lower ends of the suction-pipes are also encased with concrete so as to protect them from rust.

The outer walls of the bottom story of the power-station are made entirely of concrete. The wall towards the turbine chambers is built with a number of arches, supported by the intermediate pillars, and having the rock for outer support. The outer walls are made of reinforced concrete, and there is efficient provision for ventilation through openings to the respective turbine chambers, and ample exit through windows, etc. The transformers and high-voltage instruments are installed in the second story, and further instruments in the third story. The beams and floors are of reinforced concrete.

The exciting turbines are placed in insulated vertical plate-cylinders, of 6 feet 6.75 inches diameter, to which the water is led from the distribution basin through horizontal pipes of 3 feet 3 inches diameter. Opposite the exciting plant there is a lower two-storied structure, along the longitudinal wall of the power station, which contains the necessary low-voltage appliances, the switchboard forming the partition wall between the upper story and the machinery hall.

The power-station is at present built for four units, but the east-end wall is only a temporary one, made of wood. The distribution basin has, however, been designed and the blasting work carried out with the final capacity in view, so that extensions can be undertaken at any time. The power-station and the distribution basin are also placed sufficiently low to allow of a future junction with the Aras Fall, which will then be removed by blasting.

The first three units each have a turbine-shaft capacity of 4,000 horsepower, the fourth of 4,500 horsepower. The capacity of the exciting units is 200 horsepower for each.

Digitized by Google

HOW IS BUSINESS?

In Response to an Inquiry directed to a number of Leading Electrical Supply Jobbers and Manufacturers of Electrical Material, regarding the Present Situation in the Electrical Industry and the Outlook for Business for the Fall and Winter of 1915, a Number of Interesting and Instructive Replies have been received. Those Published below, because of their Authorship, need no Comment!

Undoubtedly the eastern section of the country is beginning to feel a decided impetus in business activity. Much of the increased employment and consequent encouragement of manufacturers generally is undoubtedly the result of many plants now being actively engaged executing orders for materials of warfare. However, there is a pretty general feeling that conditions warrant a greater expression of optimism and a more decided cheerfulness than has been possible for some time.

Among the Eastern Jobbers.

Commenting on the situation, B. H. Ellis, vice-president of the Manhattan Electrical Supply Company of New York, may be quoted as follows:

"We fortunately have not suffered from any loss of business but have been showing a steady increase all the while.

"While our raw materials have greatly advanced in cost, and there is some little hardship in obtaining our needs, with the necessary advance in the selling prices, this does not seem to restrict the buying in any respect. It is true that in some other lines there seems to be some business depression, but generally speaking, conditions are very satisfactory to us and we are looking for steady improvement."

Covering much the same territory, Frank H. Stewart, the well known proprietor of the Frank H. Stewart Electric Company, Philadelphia, Pa., has the following to say:

"Present conditions show a fair improvement over last year. The future outlook is one of continued improvement. Where business is not hampered or accelerated by war conditions it will in my opinion steadily increase until it reaches the normal level, and possibily a business boom if political conditions favor it."

The Pittsburgh District.

Coming further west to the Pittsburgh district, conditions appear better than usual, and the following expression of opinion from Thomas M. Cluley, sales manager of the Union Electric Company, Pittsburgh, Pa., is very reassuring:

"While present business conditions are not entirely satisfactory, they offer such a big improvement over what we have had for some time that we are very much pleased. A large share of our business is with the coal mining companies and the industrial plants. The industrial plants are all busy and many of them are building additions to their works. This, of course, makes business for us and gives a better outlook to the coal companies which makes business for us.

"I must admit that most of the industrial plants who seem to be busy are working on war orders. Just how much business they have which is not brought about by the unfortunate European war in one way or another is very problematical.

"We have enough confidence in both the present and the future to maintain our entire force and to carry our maximum amount of stock."

Chicago and the Middle West.

Chicago, representing a considerable part of the distribution of electrical material for the entire country and certainly a barometer for the great middle west, has suffered not only from a depression due to our international affliction, but local strikes for some considerable period during the latter part of 1914 and the first half of 1915, which have contributed to a decided negative situation. It is interesting, therefore, to note the cheerfulness of so keen an observer and at the same time so conservative a spirit as George A. McKinlock, president of the Central Electric Company, Chicago, Ill., who says:

"The electrical supply business is very sensitive to the changes and fluctuations in general business, while at the same time it is one of the most stable lines of business. We are now approaching a season when there will be more incandescent lamps used than at present and fewer fan motors; therefore the idea that the sale of incandescent lamps should increase is sound. The war and rumors of war have set in motion the wheels of many manufacturing plants that were built for other purposes than the manufacture of war munitions. This has caused a demand for supplies that otherwise would not have been felt and therefore the supply business is indirectly influenced by the war. The manufacture of machinery necessary to build automobiles has very much increased certain lines of business which also favorably affects the supply business. The good crop reports assure a large, bountiful and valuable harvest. The question of cotton is uncertain. Great distress exists among the unemployed and their dependents. The necessity for practicing economy was never before so urgent.

"Under all these conditions, with our international and Mexican relations so clouded, it is difficult to predict the business results of the season we are entering; nevertheless there is a rising feeling of confidence exhibited that expresses a distinct change for the better in the general outlook."

Speaking for much the same territory and of equal interest, is the expression of opinion contributed by L. A. Schwab, president of the Monarch Electric and Wire Company, of Chicago:

"There is little, if any, improvement in the volume at this time. Of course, in speaking of volume, we speak of profitable volume. There is, no doubt, quite a large amount of business which is being placed at no profit, and it is being taken by some jobbers and manufacturers, who seem to have but one idea, and that is to get business regardless of profit.

"The situation here has cleared considerably, on account of the settlement of the building strike, while in the territory outside of Cook County inquiries are more numerous. A better feeling seems to prevail in certain parts and in others it is very quiet. What the future has in store for us in the electrical business, it is hard to predict. We read a great deal in the daily press about prosperity being here. Well, it sounds good, but it is like the story of the banker; go to him and ask him for his opinion on conditions, which you desire for publication, and he will tell you business is good, but ask him for his private opinion and he will have a different story.

"Nevertheless conditions are bound to improve, but just when it is hard to say. Every day draws us nearer to it, however. When it does improve it will do so gradually and without any

Digitized by Google

boom, until our country will be prospering beyond anything ever thought of. This will come when all of our unemployed are working, when our employed are receiving fair pay, when merchants and manufacturers alike will receive a fair profit on their goods, and when each employer and employee are receiving full value for their dollar."

Louisville and the Valley.

Still confining our survey to the valley portion of the country, we get an insight into conditions toward the southland from a recent letter from J. L. Daeuble, secretary of the Harry I. Wood Company, of Louisville, Ky.:

"At the present time business is below par, although there seems to be a little increase over the previous months. Of course, as you probably know, the state of Kentucky has just gone through a primary election, which was of interest to all business men. There were two platforms: State-Wide Prohibition and County Unit, and according to this election the County Unit was favored exclusively. But it now lies for the regular election to tell just exactly which will win it.

"Of course all business men are waiting for the November election. The distilleries, breweries, etc., are waiting for the regular election before deciding to make improvements.

"If the 'wets' win I believe business will be a great deal better. The distilleries and breweries have let the repair work in their plants run on for some time until they know just where they stand."

In the Southland.

Going further south, conditions in Tennessee, Mississippi, Arkansas and Louisiana are sized up briefly, and, according to W. R. Herstein, secretary and treasurer of the Electric Supply Company, Memphis, Tenn., there is hope for improvement immediately, although the conditions have been unfortunate:

"While this section of the South is still heavily handicapped by reason of existing conditions, a slight but continuous improvement is thoroughly perceptible.

"I have, during the past two months, traveled extensively throughout Tennessee, Mississippi, Arkansas and Louisiana, and the size of the corn crop is strikingly apparent. In my opinion corn and cotton acreage in this section will be almost evenly divided and if this ratio is carried out throughout the entire South, a relatively high price of cotton is bound to ensue. The vast increase of corn acreage indicates that not only will the southern planter be beyond the necessity of buying corn for his cattle, but he will have corn to sell, as well as cotton. If this production is realized, a considerable portion of the South's old-time prosperity will doubtless return.

"Our other large industry, lumber, shows but slight improvement and the return of prosperity will be tempered by this disadvantage as long as ocean freight rates remain at their present high figure."

Respecting the Southland, also, there is no one better informed nor more enthusiastic in the electrical business than Col. C. Robert Churchill, president and general manager of the Electric Appliance Company, New Orleans, La. From his point of view:

"Things in the South have not mended materially, and industries everywhere are still suffering from the effects of the European war.

"Here and there we see little rays of hope, but they are the exception and not the rule. The lumber mills, on which we depend for a great deal of our business, are not turning out over 45 per cent of their normal output, and the price of cotton being still low, it does not give us any great amount of hope for the immediate future.

"Naturally, the electrical supply and automobile accessory businesses feel this the worst.

"Still, we are very hopeful. The past two or three months have been very good ones with us, and we are not complaining, but are working, working, working, all the time, and leaving no stone unturned."

The Northwest.

Coming now to the northwest, B. B. Downs, president of the St. Paul Electric Company, St. Paul, Minn., says:

"We find that at the present time, business to be in a healthy conditions, volume normal, and with the largest crop of small grain, the harvest of which is practically assured, in the Northwest. The prospect for the future is particularly bright, and we are looking forward to a very large fall trade."

Another active electrical man, J. M. Hannaford, Jr., manager of sales of the Northwest Electric Equipment Company, of St. Paul, Minn., contributes some interesting suggestions. He says:

"I have just returned from a western trip and the crop conditions in the two Dakotas and Montana look very fine. We cannot make a prediction as to the outlook of the immediate future, because of the fact that things are in such an unsettled condition that no one knows just exactly what will happen. If this were a normal year, we should have a very good fall business because the crop is certainly a good one; prices are right this year and there should be a great deal of prosperity in this section of the country.

"One thing particularly interesting to me on the trip is the fact that in western Minnesota and a number of portions of North Dakota, the farmers are forming community sub-stations and securing electric power from the transmission lines which are being run along the highways. Where a farmer cannot reach such a line, he is buying his own isolated plant. The number of farmers who are today doing all their work on the farm with the aid of electricity is surprising."

According to A. W. Lindgren, general manager of the Northern Electrical Company, Duluth, Minn., there is much to look forward to. Mr. Lindgren states:

"This section of the country has perhaps been somewhat more fortunate than many others, in that so far the volume of business has been fully as good as 1914. Since, however, other sections have been harder hit than we, they have gone after business with more effort, and this in turn has forced us to make greater effort to retain the business which we have, besides endeavoring to get new business.

"In the early part of the year all business practically was at a standstill, but gradually greater confidence was acquired and this in turn had a correspondingly good influence on general business conditions, until now nothing short of a national calamity would be able to stop the onrushing wave of prosperity and good feeling.

"With respect to financial conditions, money has been very scarce, and it has been somewhat harder to get collections than previously, but this condition also is greatly improving.

"The outlook for the immediate future is bright and I firmly believe that the balance of 1915 will be fraught with a good measure of prosperity for the electrical trade.

"Looking backward, it would appear that the general rise of prices of commodities entering into the manufacture of electrical goods has not had very much effect in curtailing business."

Among the Manufacturers.

Among many of the manufacturers the situation is viewed with equal confidence. Indicative of the general sit-

Digitized by Google

uation in the East, C. P. LaShelle, vice-president of W. R. Ostrander & Company, writes:

"For the past year, our company has enjoyed a volume of business of about the same value as the preceding year, with a difference, if any, in favor of this year.

"With the statement that we can detect the groundwork of a return to normal conditions, we are willing to waive a prophecy of the future to those experts who study general business conditions."

Mr. Herr Is Optimistic.

A valued and highly interesting commentary on the situation is furnished by E. M. Herr, president of the Westinghouse Electric and Manufacturing Company. Than Mr. Herr there is no one more capable of expressing an intelligent opinion of present conditions and the outlook in the electrical industry. He has himself only recently returned from an extended trip abroad and his intimate associates in the directorate of the Westinghouse Company have been making a careful analysis of our opportunities both in this country and in South America for some time. It is, therefore, with particular interest that Mr. Herr's views are presented at this time. Commenting directly upon the situation, he says:

"The present condition of the electrical manufacturing business is a steadily improving one. Some lines of our product show less tendency to increased activity than others. This is notably so in the electric railway field and also in the field of machinery and appliances for the equipment of large power plants.

"There is an abnormal activity in the industrial motor field, due largely to the considerable volume of war orders placed in this country recently, requiring large and improved shop facilities.

"The outlook is for a continued improvement with higher prices, owing to higher cost of materials, and I believe this tendency will be accelerated when the end of the war in Europe becomes evident.

"The large crops will no doubt stimulate the railroad purchasing and the electrical business should profit thereby."

More Optimism.

The opinion of C. E. Corrigan, vice-president of the National Metal Molding Company, Pittsburgh, Pa., is peculiarly appropriate at this time. Mr. Corrigan is not easily moved, and the caliber and interests of the man establish a genuine conviction for what he may have to say. Regarding present and prospective business his comment is as follows:

"There is a general feeling of optimism throughout the electrical trade in the United States with whom we have business transactions. For the last four months, building operations have not been up to the standard of the same period of last year, but the prospects are improving week by week and we feel confident because of prosperous conditions which prevail in the iron and steel industries that in the near future, this general revival of business will be felt in the electrical industry to a greater extent, and that by the last of this or the first of the coming year we will enter a period of unparalleled prosperity in the United States."

R. C. Lanphier, general manager of the Sangamo Electric Company, Springfield, Ill., has many opportunities for definite study of conditions in the electrical industry. His opinion, therefore, from which we quote, based upon the utilization of a product which forms a very good barometer of general conditions in the industry, is interesting:

"So far as we can judge, a great improvement is already taking place in general business conditions, and we anticipate during the fall months the largest meter business we have ever had. Some of this improvement is, of course, due to stimulation in many lines produced by so-called "war orders," but still more, we believe, by the anticipation of remarkable crops. As another factor, many firms are now, for the first time, going actively after export business, which in many cases will no doubt result in excellent increases in business."

The Electric Sign.

The electric-sign business is a good-times business. Notwithstanding the settled conviction upon the part of students of publicity and the psychological advantages of advertising, this most potent element of silent salesmanship is neglected when the pinch of necessity drives men to consider only the ordinary forms of business-getting media. The opinion of James M. Gilchrist, secretary of the Federal Sign System (Electric), is therefore timely:

"There is apparently a great deal of electric-sign business that will be released just as soon as general business conditions improve. Our salesmen report that there is a great deal of interest and inquiry in the various trades regarding electric signs and many people are asking for propositions which they receive with interest and then put by generally because they cannot afford to spend the money. Some of the big concerns are buying but the smaller merchants are holding back. The inability of the public-service companies to float bonds or stocks is having a decided effect upon the electric-sign business as well as the business in household appliances and similar current consuming devices. This inability to secure funds has led to the curtailment or entire stoppage of easy payment plans which are quite generally used to further this business. A good market for public-utility bonds and stocks will bring a revival in all of these lines of business. There is no question about the potential business in the various lines that we cover but general conditions must improve greatly before this potential business develops into actual orders."

A. W. Berresford, general manager of the Cutler-Hammer Manufacturing Company, Milwaukee, sees little uncertainty during the next 12 months and announces his conviction with regard to present conditions and the immediate future as follows:

"Our own experience is today that business is on a very much better basis; in fact, the present rate at which we are receiving orders is about normal for us.

"I have been very optimistic on the whole situation for a year and a half, and firmly believed that even had the war not taken place a marked increase in business would have made itself manifest at the end of the past year. The future appears to me to be bright, although should the war end in the near future there would unquestionably be a considerable unsettlement, which would mean a set-back for some months. This, however, does not seem to be the probability, and I can see no reason why the next twelve months should not mean good and increasing business."

The Southwest Will Be There.

An interesting commentary upon the above, and in answer to the same general inquiry, has been contributed by Charles A. Newning, editor of the *Southwestern Electrician*, Houston, Tex. Mr. Newning is in close touch with not only the electrical industry as its demands and opportunities have to do with the great southwest, but as publisher of the *Southern Industrial and Lumber Review*, is in a position to speak authoritatively with regard to conditions intimately affecting other industries upon which, to a great extent, the electrical industry is dependent for its prosperity. Mr. Newning writes as follows:

"In reply to your letter of 10th inst.,

Digitized by Google

we beg to state that up to the point where the disposition of the cotton crop of this year, now reaching its full maturity, was clouded by the suggestion of an overt act on the part of Great Britain, the business of this section never looked better and electrical jobbers were preparing for a general renewal of demand. The improvement had already set in when this new threat was sprung and it has not been palpably checked as yet, but any attack on cotton is necessarily liable to cause a halt in general buying of all commodities. We think in consequence of the generally prosperous condition of southwestern farmers that the banks will be found willing and able to tide them over a possible depression but this does not include the funds necessary for general betterments.

"We regret to be obliged to advise you along these lines for while we ourselves are most optimistic and practically know that our section cannot be permanently hurt by the decline in the value of any crop, we are obliged to admit that this forms but a poor predicate for buying beyond current needs. In September we may be able to tell another tale."

Measure Earth Resistance to Electric Current.

Oil in sand or earth causes it to have a very high resistance to the electric current. Certain valuable ores in the earth cause it to have a very low resistivity. For any particular specimen of earth the resistivity varies with the moisture content. The damage to pipe systems on account of electrolysis by the return current of street-railway systems depends, among other things, upon the resistivity of the earth around the pipes and near the tracks. There are, therefore, many reasons why knowledge concerning the resistivity of certain very limited portions of the earth is desired.

In a recent publication of the Bureau of Standards, a method for measuring earth resistivity which is free from some of the faults of methods which have previously been used is described. The method is particularly adapted to those cases in which it is important that the measurement be made without disturbing the earth, as is necessary where a sample is taken into the laboratory for measurement, and in those cases where the mean resistivity of a fairly large portion of earth, extending to a considerable depth, is investigated.

An electric sign to advertise Georgetown, Ky., is in prospect, according to a proposition credited to Samuel L. Allen, superintendent of the Georgetown Lighting Company, who was recently elected president of the Georgetown Commercial Club. The proposal is that Mr. Allen will supply the current and maintain the sign if someone else will provide it and erect it.

INSPECTING GOODS AFTER THEY ARE RECEIVED; THE BUYER'S RIGHTS AND LIABILITIES.

By Elton J. Buckley.

Some more law on the buying of goods is brought forward by the following letter:

Rochester, N. Y.

Elton J. Buckley, Esq.

Dear Sir: We are having a fight with a New York house over whether we have to pay for some goods which they shipped to us and which we found to be not according to specifications. Perhaps you can get something out of it for your column, and at the same time give us some light.

We ordered certain goods through one of this firm's salesmen. It was a line we had been handling, which a year or so ago had first been bought from samples. All the shipments had been up to standard except the last. When the goods arrived we supposed they were up to sample as usual, and did not examine them at once. About ten days elapsed between the time the goods were received and the time we examined them, preparatory to delivery to our customers. We then found them below standard and wrote the shipper, telling him we would not accept them and would ship them back. This we did, but they refused to receive them and the railroad company is now threatening to sell them for the freight. Who is right? The New York concern say the goods are all right and in accordance with the contract, and that we accepted them.

Yours respectfully,

M——— Bros.

This is a familiar situation in everyday business and is governed by simple and familiar law. Let me say at the outset that if the goods really are up to standard, this correspondent will have to pay for them of course. They are justified in rejecting them only if they are not up to standard, and not even then if they have been too slow in inspecting and rejecting.

It is a fundamental rule, almost never departed from, that the buyer of goods has a right to inspect them within a reasonable time after he receives them, and that pending that inspection, he cannot be held as having accepted them. These points, however, are of paramount importance:

1.—He must inspect within a time that is reasonable under all the circumstances of the case.

2.—If he rejects he must at once notify the shipper.

3.—If he either fails to inspect within a reasonable time or fails to notify the shipper promptly, he will be held as having accepted the goods and must pay for them.

(Copyright, 1915, by Elton J. Buckley.)

I take the following from a leading case which states the law as it exists all over the United States:

The seller is under obligation to afford the buyer opportunity for examination of the goods, so that he may satisfy himself that they are in accordance with the contract. The buyer has the right of inspection and a tender under circumstances not permitting of an inspection is not sufficient to constitute or excuse delivery or to put the buyer in default. But a refusal to inspect where a reasonable opportunity has been afforded constitutes a breach of contract upon the part of the purchaser. Only a reasonable time is allowed for inspection. The place of inspection is the place of delivery. Taking such possession of the goods as is necessary to make an inspection does not constitute acceptance of them. The buyer must notify the seller of the result of inspection.

Many of the cases turn on what is a reasonable time for inspection. There is no rule about this—it depends on the peculiar facts of each case. I recall one case in which a firm bought goods that were to be delivered by boat. They made no effort to inspect when the boat arrived, but allowed the stuff to be landed and delivered to them. Then they inspected, found that the specifications had not been complied with, and rejected. The court said they were too late with their inspection and rejection. Apparently they could have inspected before the boat unloaded, and when they let it go until everything was unloaded and actually carted into their place, they did not inspect within a reasonable time.

There are also several cases in which goods were shipped via a railroad and where inspection, under the rules of the railroad, could not be made in the freight yard or anywhere on the railroad's premises. In these cases the consignees took the goods to their own stores, which under the circumstances were the only places available, and inspected them there. The point was the same—was inspection done within a reasonable time, or was it waived by taking the goods into the store? The courts have always held that inspection being impracticable anywhere else, the consignee did not accept the goods merely by taking them into his store. He could reject after inspection.

It should be remembered that inspection and rejection are not of any avail whatever without notification to the shipper, which must be just as prompt—in fact, even more so, if anything—as the inspection.

It is a good rule to get around to inspecting goods received just as soon as possible after they are received.

Digitized by Google

THE OUTLOOK IN OTHER INDUSTRIES

The Prosperity of the Electrical Industry is tied up in the Prosperity of the Other Industries. So Extensive are the Ramifications of Electrical Service, that we Find it a Part of Productive Effort in Every Occupation. Incidentally the Use of Energy for Household Utilities Gains or Fails as the Employment of Men and Women in Other Industries is on the Increase or on the Wane. The Opinion of the Editors of the Leading Trade Publications of the Country, Published below, are Full of Human Interest, Point to Many Sales Prospects and Reflect Accurately the Outlook for Business in the Country at Large.

Agricultural.

"The agricultural implement business received a set back in 1914 on account of the war, for our manufacturers had a substantial export business that was stopped in a great measure, but they immediately laid plans for an increased domestic sale, and the result of their labors is shown by the crop reports.

"The industry today is prosperous and the factories are all working good time.

"Gasoline and kindred fuels are playing an important part in the operation of farm machinery, and, of course, **to a limited extent electricity and electric appliances are used, and this feature of agricultural implement development is well worth the serious attention that it is receiving from your manufacturers,** for to my mind the operation of implements in the future must be through more perfect development of electric power."—Grant Wright, Editor *The Eastern Dealer in Implements and Vehicles,* Philadelphia, Pa.

"In the farm power field, the prospects were never better than they are at the present time. This is especially true of farm tractors. There is extraordinary interest in this subject manifested by the farmers in all parts of the country. A few years ago the tractor industry flourished for a brief period and then died down. About a year ago the small tractor began to attract attention and now the farmers everywhere are talking of buying. It looks as though the trade this fall and next spring would be record breaking. We are practically certain of two or three years of intense activity and after that of a steady persistent growth for several years more. The threshing machine industry will probably go along in about the usual way, but with a diminution in the number of steam traction engines built.

"In the electric line the **farm trade is concerned principally with house lighting.** This requires a two or three-horsepower gasoline engine and from a one to two-kilowatt generator. **The trade in these small plants is increasing from year to year and will continue to increase.** The general use of electrical power in agriculture is as yet a long look ahead into the future. It may come some day, but that day will undoubtedly be quite far distant."—P. T. Rose, Assistant Editor *The American Thresherman and Farm Power,* Madison, Wis.

Automobile.

"The automobile and motor truck industry is profiting very much because of the war situation and factories are busier now, and have been for months, than they were a year ago. Business has increased all along, and the great difficulty is for automobile and truck makers to secure enough parts for their machines. In many factories deliveres are being held up because of this lack of parts. The demand for motor trucks is such that few, if any, of the factories can meet the requirements. The war has called for large numbers, but there has been quite a general increase in domestic demand during the past few months.

"Farmers are buying light capacity vehicles which are apparently taking the place of many horses sold to belligerents.

"Retail sales of automobiles throughout the country are much in advance of a year ago, in spite of the fact that the harvest is holding up sales temporarily in many of the agricultural districts, and weather conditions have been somewhat against farmers taking cars off the dealers' hands during the past two or three months.

"Motor car distributors in the large centers are not able to get enough cars to meet the demand and is a condition not heretofore known at this season of the year. Only increased business is looked for in the future in both the passenger car and truck field."—David Beecroft, Directing Editor *The Automobile,* New York, N. Y.

"The only way my special attention is directed toward electrical illumination involves the motor car. I know that the production and sale of automobiles is growing daily and that, commensurately, the demand for electrical illumination is increasing. **This should be the greatest season for motor car electrical illumination since the automobile was introduced.**"—G. T. Bindbeutel, Editor *Motor Print,* New York, N. Y.

"General business conditions in the trade territory which is usually allotted by other markets to St. Louis are very bright at this time. We have had excellent crops which fact has put new spirit into the farmers and made them ready to spend their money. This in turn has been communicated to the retail merchants in their nearby towns and by them in turn to the wholesalers and manufacturers of St. Louis. The writer looks for a year for very brisk business from September 1, 1915, to September 1, 1916.

"There has been a notable improvement in St. Louis in the sale of electric automobiles. We have an active lot of agents and branch managers here who are using general publicity to educate the public to the value of the electric automobile for city and nearby use and they are succeeding. **We look for an increase of 100 per cent in the sale of electric cars during the coming year.** As far as I can ascertain the general electric business in this territory is also very good. I know this is true as regards electric supplies for automobiles. —Robert E. Lee, Editor *Auto Review,* St. Louis, Mo.

Bakeries.

"This ancient industry has had a phenomenal development in the last 10 years. While our population increased 21 per cent the number of bakeries increased 61 per cent; the value of bakery products, 127 per cent, and the capital invested in the business 160 per cent. Because it deals mainly with a necessity—the chief manufactured food of mankind, the business is not subject to the fluctuations common to many others. There appears now no reason why the baking industry should not prosper in the near future. True, the price of flour (the baker's chief raw material) is uncertain, and the outlook is for hand-to-mouth buying; but there is no sign of a lessened demand for bread. While bakers with meager capital are slower than usual to spend money for improvements, the larger plants do not hesitate; they keep on preparing for big things in the future. The demonstrated efficiency of mechanical bread making is steadily compelling the installation of machinery in bakeries that a few years ago did not dream of such a thing; and an increasing number of these machines is run by individual motors. **Electricity shifts and blends the flour, mixes, divides, weighs, and molds the dough and wraps the baked bread in the bakery, and the baker's motor delivery**

Digitized by Google

wagon grows more common each day upon our streets. These conditions, and the fact that most of our bread is made at night, should combine to make the baker and the electrician fast friends."—H. R. Clissold, Editor, *Bakers' Helper,* Chicago, Ill.

Brick and Clay Working.

"The conditions which confront that part of the clay products industry which has to do with the manufacture of materials that enter into building construction, is far from being satisfactory. Three bad years have passed, each leaving its scar on the industry and although the promised prosperity of 1915 seems imminent, it will bring but little comfort, since it will come when the frost prevents any great building impetus.

"The industry believes in electric power and improved plants are seldom built without the installation of a motor. Later, when building operations have resumed, material been shipped and money collected, the demand for electrical apparatus in clayworking plants will be very large.

"The present financial condition of nine-tenths of the men engaged in manufacturing brick, hollow tile, terra cotta, etc., is such that they will not be able to spend any money on their equipment until the stock which is now in the plants has been shipped and used and paid for.

"From present appearances, this will not occur until well into the spring of 1916."—Frederic W. Donahoe, Editor, *Brick and Clay Record,* Chicago, Ill.

Brooms and Brushes.

"There is every indication of renewed business activities in the broom and brush industries, and its subsidiary line, the manufacture of handles. While the demand for brooms during the summer months did not assume any definite improvement, prospects at this time are generally regarded optimistically and the fact that distributting houses have been purchasing sparingly and in accordance with actual consuming requirements for several months past, justifies the expectations, that their stocks as a rule, are low, and that the first indications of a revival of consuming buying will reflect quickly to the manufacturers' advantage.

"Reports of light business have prevailed in the brush market, but dealers were reconciled to this position as wholly typical to the season and are not discouraged as to fall and winter prospects. There have been no new developments concerning prices, and the generally firm position of the basic material operates with sustaining effect upon the market for brushes. A good demand for exports is reported for English account comprising round quantities of shoe, hair, and cloth brushes. England it is believed is operating for the allies generally. The prices of brushes have been raised in England and France, but the increase in America has been extrordinarily slight considering the advanced prices for bristles. Increased business should be general during the fall and winter months.

"A fair volume of business is received in the broom-handle trade. Supplies are adequate for the usual requirements and all broom and mop handle plants are being kept busy.

"There has been a tendency on the part of broom, brush and handle manufacturers to adopt labor and time-saving electrical apparatus, and in this respect it is safe to say that there has been a gain of fully 25 per cent in electric power equipped plants in this country in the past ten months."—J. S. Smith, Editor, *Brooms, Brushes* and *Handles,* Milwaukee, Wis.

Buildings and Building Material.

"Our various representatives throughout the country advise us that business is looking up and that there is every prospect of a good amount of work for the fall.

"Architects are generally very busy and in the Chicago district especially, a large number of projects are going ahead, which were held up by the recent strike.

"As practically all of these buildings require electrical apparatus and supplies of some sort, it seems to us that the prospects should be good for increased sales in these lines."—Charles A. Miller, Jr., Managing Editor, *The National Builder,* Chicago, Ill.

"The exceptionally bright crop reports from the United States Government authorities have given encouragement to the manufacturers and dealers of building materials throughout the country. As a result of the European affray and the tendency in the past year on the part of American financiers to withhold their money from new building ventures the building material industry has naturally been thrown into a pessimistic channel. In addition to this, building reports for the past year have shown decreases when compared with similar periods of the previous year.

"In 100 leading cities of the country for the month of July there is shown a loss in the value of building permits issued amounting to 12 per cent, but close scrutiny of the figures furnished by building commissioners show that such cities as Brooklyn, Buffalo, Minneapolis, Washington, D. C., Kansas City, Cincinnati, Atlanta, Omaha, New Orleans, Sacramento, Lincoln, Portland, Me., Des Moines, and Topeka, show gains in the number of permits issued in July, 1915, when compared with July, 1914, ranging up to 150 per cent.

"In a number of cities like Chicago, strikes among the building trades tied up work for several months and the activities shown in such centers at present are largely due to the enforced idleness earlier in the year.

"Throughout the country, however, optimism prevails in this particular field in spite of building reports, and late statistics from a few centers indicate that business during the fall months warrants this attitude.

"With the harvesting of crops there will naturally result a large amount of construction work in the rural communities. During the next 12 months there will be an increased amount of road work calling for sand, gravel, crushed stone, cement, vitrified brick and other road materials.

"One of the interesting features of building permits issued in the larger centers is that the type of construction is superior to that demanded on the part of builders heretofore. With better materials and more costly construction, naturally a much improved interior will be considered and buildings will be equipped with electric lights and electric accessories which make for the comfort and convenience of homes, offices and industrial plants." —George A. Olsen, Retail Editor *Rock Products and Building Materials,* Chicago, Ill.

Coal Mining.

"The coal business as a whole is extremely dull. Mining companies are only purchasing such supplies as are absolutely necessary to the operation of their plants. There are great opportunities for the sale of American coal in South America and in Europe, due to war conditions. However, mine owners in America have not yet gone after this business in a serious way. The very small increase in the export of coal from the United States is due largely to a lack of bottoms.

"The coke business has improved slightly during the past few weeks, due to the increased activity in the steel business.

"Anthracite mining is quite dull at the present time, but is likely to improve considerably in the fall and winter when the mining companies will be storing coal in expectation of a possible strike in the spring when agreements with the miners are to be renewed."—Floyd W. Parsons, Editor *Coal Age,* New York, N. Y.

Concrete and Cement Products.

"The greatest single tendency in the development of manufacturing methods in the cement industry is the electrification of Portland cement mills. There is an unmistakable trend in the direction of exclusive use of electric power for driving the very heavy equipment necessary for the manufacture of cement. Power represents about 25 per cent of the cost of cement production. **If the production of a barrel of cement represents a power consumption of 18 kilowatt-hours, on a basis of ninety million barrels annual production this represents a possible power consumption of over a billion and a half kilowatt-hours.** These figures are given to show the possible field for electrical apparatus, and, as stated before, there is a growing sentiment among cement manufacturers in favor of the exclusive use of electric power applied through individual units direct-connected.

"The other development is in the contracting field where the use of small electric power units direct-connected to such equipment as concrete mixers, portable saw rigs, pumps, etc., is constantly on the increase. The electric motor as a power unit is often preferred over steam because it does not require a licensed engineer to run it; it is often preferred over gasoline power because of its reliability and the ease with which it is started. The national movement for the suppression of unnecessary street noises seems to help the electric motor on construction equipment used on public streets.

"These are two different lines which seem to promise bigger business for manufacturers of electrical supplies who turn their attention to the cement manufacturing field and the contracting business."—R. Marshall, Business Manager *Concrete-Cement Age,* Detroit, Mich.

Digitized by Google

Drugs and Druggists.

"There are approximately 50,000 retail druggists in the United States. Their stores are kept open from 10 to 24 hours a day. We do not think the statement will be disputed that druggists burn more electricity than any other class of retail merchants. We believe that the better class of retail druggists are very much alive to the value of electricity in advertising their business. The wide-awake ones use electric signs, electric window illumination, brilliant store illumination, electric cash carriers, electric mixers at the soda fountain and not infrequently they are purchasers of electric motors for operation of ice-cream-making plants which are used in conjunction with their soda fountains.

"We think these facts are conclusive as pointing to the importance of retail drug stores as consumers of electric power. Now as to business conditions at present and the outlook for fall and winter. We believe that there is on the way a gradual return to normal. We feel that before winter has set in this country will have begun to feel the effects of a marked upward trend in business. Any improvement will, of course, be beneficial to the drug business.

"The war has affected the drug trade more seriously perhaps than any other line of retail business. Many of the drugs and chemicals and pharmaceutical preparations are imported from Germany and other European countries. The war has either shut off our imports entirely on some things, or has reduced them to such an extent that prices have been materially affected. On some items the increased cost has ranged from 100 to 1,000 per cent or more.

"Druggists have had to pay more for their stocks and it is doubtful if they have been able to charge much more to their consumers. Consequently their profits have been reduced.

"On the other hand, the business of the druggist is in some respects one of the most stable, the demand for drugs, medicine and sundries being a consistent one the year around. As a general proposition we believe that retail druggists the country over are in as prosperous a condition as any other retail merchants."—The Editors, D. O. Haynes & Company, Publishers *The Pharmaceutical Era and The Soda Fountain*, New York, N. Y.

Dry Goods.

"On account of our operating the Store Equipment Magazine Section that appears once each month, both in the *Dry Goods Reporter* of Chicago, and the *Drygoodsman of St. Louis*, we are in a position to feel the pulse of progress in the retail field in the way of store building and remodeling, and it is significant that the last two months has brought to us more inquiries from our readers regarding store equipment than in any other two months in the ten years we have been publishing our section.

"On account of the introduction of the gas-filled Mazda lamps, there is a widespread movement among retailers for using this method of lighting in the store, and this calls for a new type of fixture.

"A great amount of remodeling, principally due to the installing of the new type store fronts, calls for a large increase in show-window lighting.

"It is the general belief that if the weather is favorable the retailers will have a most prosperous season this fall and winter."—George J. Cowan, Secretary, *Dry Goods Reporter*, Chicago, Ill.

Electric Railways.

The record of 950.2 miles of track built or put in operation during 1912; 1,018.9 miles in 1913 and 946.38 miles in 1914, and of 6,001 cars purchased in 1912; 5,514 cars in 1913 and 3,010 cars in 1914 tends on close analysis of the details involved to confirm the general impression that the electric railway industry is not keeping so much abreast of the growth of the country as it did in preceding years. Without a doubt electric railways have felt the depressing influence of the nation-wide curtailment of business that has been evidenced with increasing force since the middle of 1913. Yet indications are not lacking that this condition will be mitigated in the future. We cannot here make a composite analysis of all the factors involved in the present electric railway business situation, but a few points are worthy of note. Electric-railway earnings for 1913 and 1914 as compared with steam-railroad earnings, building permits, bank clearings, steel and iron production, agricultural products and the cotton crop, show the highest relative stability, and it is to be expected that under normal circumstances they would respond most quickly to the business rejuvenation that is now presaged by the increasingly favorable foreign trade balance, the lack of a marked tendency toward prohibitive prices for capital and the exceedingly propitious crop reports. The full response of electric railway earnings to these influences, however, is likely to be retarded by some of the factors peculiar to this industry, such as the special problems of rates, wages, regulation and now jitney competition. While these factors have a certain effect upon the relative stability of electric railway earnings, they influence more the relative profitableness of the industry and are the more dangerous thereby. In spite of the stability of earnings, the problem of furnishing continually more and better service under constantly increasing costs at a depreciated rate of fare has in recent years become one of serious moment, but we believe that daily there is now growing a wider appreciation of the economic service performed by electric railways, their right to protection against unfair unregulated competition of jitneys and their needs for successful operation. Various decisions, such as those in the Schenectady Railway, Manchester Street Railway, Middlesex & Boston Railway, Blue Hill Street Railway, and Eastern and Western rate cases, indicate that at last the courts, the commissions and even the public seem to be taking a more rational view of the urgency of relief to common carriers. This promise of improvement in regard to the special problems of electric railways, when considered in connection with the present propitiousness of general conditions, warrants a letting-up of pessimism and even a mild optimism in the electric railway field. The prospect should encourage purchases, for in the shadow of the receding depression prices should be low, construction work cheap and long-time loans fairly moderate-priced. — *Electric Railway Journal.*

Engineering Construction.

"The outlook for the future depends chiefly upon the condition of the financial markets. If it should prove possible to obtain capital upon easy terms, and if the earnings of the railway companies can be maintained at a point which will restore confidence in railway investments, it is likely that a very large amount of work on improvements of railway lines, which have been postponed from year to year for the past half dozen years, will be undertaken." — Charles Whiting Baker, Editor-in-Chief, *Engineering News*, New York, N. Y.

"Our experience indicates that during the depression of the past two years municipalities have materially curtailed their expenditures for new work. This curtailment has been evident from the fact that the total amount of money expended for new work has been approximately the same for the past three years, or about $1,240,000,000 annually. This includes, of course, all sorts of public work of which electrical work is only one item.

"This summer there has been a marked improvement and our daily record indicates that more new work is being done now than at any similar period of the year for the past 20 years covering which we have record. Municipal bonds are meeting with a fair demand. In fact, some of our clients among the bond brokers state that municipal bonds are about the only thing among which they are able to do business at this time, except, of course, that the demand for listed bonds is active.

"To answer your question more definitely, **there is every indication in our field that the demand for electrical supplies and apparatus will be abnormally large during the coming year.**"—C. S. Sale, General Manager, *Engineering Publishing Company*, Chicago, Ill.

Engineering Equipment.

"Our field so closely ties with your own, that I doubt if I can give you anything of value in regard to the power-plant field which you have not already in hand.

"I have not much faith in anybody's opinion in regard to the business outlook. The facts as they develop are the only things of importance.

"Increase in the activity of the steel mills, both in resuming work of existing plants and building new ones, seems to indicate a live demand in that field for electrical power equipment.

"As you know, on account of high interest rates now prevailing, in spite of the large amounts of money in the banks, the development of central-station properties for lighting, power or railway service, has been slow, and the outlook is that it will continue that way.

"Industrial plants, in the matter of electrical equipment as well as machinery, vary greatly, depending on the nature of the industry. All of those plants which are concerned in the furnishing of war materials are likely to demand refitting and increasing of electrical equipment. Industries engaged in supply of articles for peace

Digitized by Google

consumption are running at normal capacity or under, and are not likely to refit more than is absolutely necessary or to enlarge.

"There is tendency more and more to the use of electrical drive in all plants, and electric lighting in all buildings, both commercial and domestic, so that the business of supplying equipment for electrical installations, and motors for industrial plants, is almost sure to increase slowly and steadily as it has been doing at all times."—Arthur L. Rice, Managing Editor, *Practical Engineer,* Chicago, Ill.

Flour Milling.

"The flour milling industry of the United States was never more prosperous than it is at the present time. The crop year ending June 30, was a profitable one and flour exports for the fiscal year were the largest on record with a single exception. There was natural profit in flour trade, due to the enhanced value of wheat supplies immediately after the war. Trade was stimulated and quite profitable, but many risks were assumed. Following such a profitable year it is natural that improvements, enlargements and possibly new mills will be built. In fact, during May and June the equipment of mills was quite general.

"At the present time flour trade is dull and the mills are getting a streak of lean, but there is every reason to believe that the amount of new electrical equipment among mills will be in harmony with general improvement brought on by a year of unusual prosperity. In some machinery lines supplying flour mills, the volume of business is said to be almost double what it was last year."—C. M. Yager, Editor, *Modern Miller,* Chicago, Ill.

Furniture Trade.

"Little change in the general commercial situation throughout the furniture trade field, in which for the past eighteen months influences of subnormal trend have been manifested, could have been noted in any analyzation of the situation immediately following the close of the midsummer exposition. Trade has been depressed for some time. The markets, particularly in the leading centers of New York, Chicago, and Grand Rapids, were lethargic at their opening. As the buying season progressed, attendance records equalled or nearly equalled those of the year before, but little improvement in the buying attitude of the retailer was indicated.

"Many manufacturers left the exhibition centers on July 21, the practical close of the market—satisfied with the results of the exposition, not because they had made record sales, but because their somewhat modest expectations had been realized. Buying throughout the markets was spasmodic and the tendency was to purchase only patterns of recent development in order that a semblance of freshness might be contributed to the fall stock of the retailer. Some orders of more than usual volume, particularly in the chamber furniture field, were accorded unusual discounts which offset the natural upward trend of their influence.

"With a retrospective period of 60 days a new tone may be interpreted throughout the field without undue optimism. Undoubtedly considerable advance has been made within the past 30 days, particularly is this true in the South where factories for months closed have been reopened and plants running for several seasons at half blast are again operating at full capacity. The improvement, of course, reflects a corresponding activity in the retail field. The dealer is again buying; not in quantity, but in such amounts as will bring the retail stocks throughout the country, which for some time have been low, again to normal assortment. Whatever improvement has thus far been noted, undoubtedly will be augmented soon after the opening of the fall season. The tendency without question is constructive.

"There has been noted in various parts of the country a revival in building conditions. Many new homes naturally necessitating home equipment have encouraged the retailers of communities both north and south to greater effort. The pre-fall period has been especially active in this direction. The tendency is reflected in the constantly increasing average of home owners in many localities.

"Little can be said of the spring and summer of 1916 that is not largely supposition. Indications are favorable. There is a more optimistic attitude on the part of the trade in both retail and producing departments. Some of the problems attendant upon the war involving especially domestic manufacture of analine dyes and the producing of domestic stains which will compete with those formerly produced from imported chemicals will to some extent have been solved. A sounder footing undoubtedly will increase the confidence of the trade. Larger exports are expected to South America and to the Orient and districts unaffected by the European conflict. This avenue of output is improving in aspect constantly. Beyond all reasonable doubt the status of fall and winter trade—particularly that of the holiday buying season—will do much to determine the situation through following seasons. There is cause, however, for optimism. The trade faces the possibility of an active future."—E. M. Wakefield, Associate Editor, *The Grand Rapids Furniture Record,* Grand Rapids, Mich.

Grain Dealers.

"Continued rainfall has made it impossible to gather the small grain in most sections, with the result that much wheat, oats and barley which has been cut, has sprouted in the shock. Two weeks of dry weather would mean millions to the country, and release a flood of wheat upon the central markets that would make everything hum.

"The enormous crop promised for the winter wheat section was materially reduced by wet weather, and the same cause now promises to reduce the yield in the spring wheat states, which will produce, even after liberal reductions for damage, the largest crop in their history.

"The grain-elevator men handled an enormous crop last year and expecting even a larger crop this year, they have been building rapidly, improving facilities in all parts of the grain surplus states. We find that many grain-elevator men are getting current from interurban lines and from local power plants, for illuminating their plants, as well as for propelling their machinery, so that **electricity is being used more extensively each season than before by the wholesale grain dealers of the country.**"—Charles S. Clark, Manager, *Grain Dealers Journal,* Chicago.

Grocery—Wholesale and Retail.

"Conditions in the grocery trade are looking up, business is improving with each month and as the wave of prosperity due to increased manufacturing sweeps over the country, the food products trades will be the first to reap the reward.

"In nearly all lines there is an increased demand and this of course means better conditions internally in the trade.

"With this improvement will come new buildings, new fixtures and a general burnishing up of many business houses that have held this work in abeyance, due to the general conditions.

"With this will come a demand for electrical goods and fixtures, as the progressive grocer realizes that a well lighted store, with proper lighting of his windows, is the best asset in an advertising way that he can possess. It is, in fact, a method of advertising we have always urged on our readers and continue to do so."—S. W. Roth, Editor, *The Roth Publications,* Chicago.

"The grocery business has been comparatively quiet for the past two years or more. There has been a considerable falling off in the sale of groceries generally, but more especially in the sale of luxuries. In some of the agricultural states business has been rather better than in the manufacturing communities, which means to a large extent the eastern states. There has been a good deal better feeling during the past few weeks and it is our opinion that this fall will witness a great improvement in the food business generally. Prices in the food line have averaged to be very low for some time past, and while we hear a good deal said about the high cost of living, and perhaps always will, the fact remains that for the past year or so, with the exception of meats, prices of foods have been lower on an average than for many years past, in fact, actually lower than they were in the seventies when carpenters were glad to work for $2 per day.

"The manufacture of war supplies has given employment to thousands of men in the east, and the effect of it is already noticeable. We expect business in the grocery line to gradually increase and before many months to become very active. Some few articles, including evaporated milk, are being sold below the cost of production, which condition we hope will soon be remedied by the increased demand sure to follow the recent quiet period. The depression has taught those in the trade to make a closer study of their business, including the matter of costs and, in short, has served to teach those engaged in it to be better merchants.

"Referring to the matter of electrical apparatus **the general tendency of grocers to install modern electric systems for lighting is very marked, and the store not well lighted will soon be**

Digitized by Google

an exception to the rule."—Edwin B. Pillsbury. Editor *Grocers' Magazine,* Boston, Mass.

"As is perfectly obvious, the consumption of food is one of the last things to be affected in time of business depression. This would apply especially to staple items, however, of course a business depression of any kind has a tendency to make the grocer's collections slower and his own merchandise supply purchases of a hand-to-mouth order.

"The above has been the case during the last couple of months in the grocery business.

"Crop conditions, according to the latest Government reports, are certainly very promising and if these bumper crops materialize, they will in a large measure, help to bring business conditions back to normal.

"It is the city dealer—the merchant who is obliged to depend on the trade of workers in the industrial plants—rather than the country town merchant, that has been complaining.

"In other words, the rural districts for the most part are in good condition and have been throughout this year.

"One of the first things the retail grocer does in times of financial depression is to cease buying new equipment. This would mean that instead of buying a new power coffee mill or an electrically operated cooling plant, he would await the return of confidence and prosperity.—Harry W. Otto, Editor *The Modern Grocer,* Chicago.

"The present conditions of the grocery business, which is one of the greatest departments of mercantile activity, inasmuch as it has to do with the disposition of the daily food of the people, the general volume of merchandise moving from manufacturers and producers through the different branches of the grocery trade to consumers is about normal. It cannot be otherwise, because people must eat and economy as to food, if practiced at all, is spasmodic, and where consumers curtail in one direction they offset the economy in another.

"The jobbing grocery houses report just at the present time a steady but not active business. The rainy weather which continued through the month of July very greatly interfered with the summer-resort trade and the demand from that source has been very much less than usual to date. If the month of August proves seasonable for summer-resort business, undoubtedly the deficit of July, so far as movement of goods is concerned, will be considerably reduced.

"A feature of the business which should be particularly mentioned is that collections are extremely slow, very difficult; money is being hard to collect. This is a complaint which comes from both branches of the business—wholesale and retail.

"I believe that by the last of October we shall experience a marked improvement. I look for a little stronger prices on food staples but do not expect any radical advance. The restrictions upon exportations prevent the European demand from making great inroads upon our productions, so that prices are not likely to be greatly enhanced because of the requirements for war purposes.

"I look upon the future as decidedly hopeful, not only hopeful but bright. The country is prosperous; industries are active; the only thing being a certain uncertainty, not of a serious nature, but sufficient to keep people a little conservative. However, confidence is gradually returning and with a great, wealthy, prosperous country there is no reason why the future should bring forth anything but prosperity. I expect to see 1916 open very auspiciously for all lines of business.—*C. W. Willis,* Editor *New England Grocer and Tradesman,* Boston, Mass.

"There is a gradual awakening on the part of retail grocers, particularly as to the necessity of better lighting.

"One need only go down the streets of the business section of any city and observe the prosperous retailers to ascertain that well lighted stores are playing an important part in every day business and are, in fact, a necessity to the successful conduct of any grocery store. This situation is emphasized if one views a dimly lighted store, and almost invariably such a business is not enjoying the trade as does the store that is brilliantly lighted.

"Our observation also shows that better window lighting is being indulged in by the progressive retailers as they are realizing the importance of a good light in drawing attention to good displays and thereby attracting trade. A clearly lighted store goes hand in hand with the sale of groceries as nothing appeals more to the consuming public than something which has the appearance of brightness, cheerfulness and cleanliness.

"As a further indication of changed conditions in this respect, let me point to the fact that the Iowa State University, in its Trade Extension Division, which department specializes in retail merchandising, is featuring store lighting in one of its lectures, backed up by stereopticon views showing poorly and well lighted stores and windows.

"Nothing appeals stronger to one interested in merchandising than this portrayal in pictures of the good and bad effects of lighting.

"Most all cities now, of course, have electrical facilities, and the progressive merchant is forced to adopt every means, in a competitive way, to draw trade and light is an important factor.

As to the grocery business generally, conditions are still below normal, but the future outlook seems to be more hopeful. One would think the people have to eat regardless of conditions and that the grocer would be the last to suffer loss of trade. This is not true, however, and while people are forced to eat to sustain life, yet when there is a financial pinch they are compelled to economize in their purchases, and instead of having a variety of food for each meal, the menu is reduced and in addition the people buy a little lower grade than has been their custom when times were prosperous."—George J. Schulte, General Manager *The Interstate Grocer,* St. Louis, Mo.

Harness and Saddlery.

"There was a time when the iron and steel industry was a reliable barometer of business, but with their apparent prosperity there seems to be a depression in many other industries, including harness and saddlery.

"However, taking everything into consideration, business men feel safe in predicting that the autumn trade, while not phenomenal, will be substantial and conspicuous by an unusually large proportion of cash business. Already harness factories and saddle houses are reporting good collections. Traveling salesmen from many states are exceedingly optimistic concerning autumn trade.

"There is a growing demand for modern machinery in every branch of the harness and saddle industry, and, indeed, the smallest manufacturer has installed, or will probably make use of electrical apparatus wherever possible."—E. M. Mantiply, *Harness Herald,* St. Louis, Mo.

Hide and Leather.

"European war demands have doubled the exports from the United States, of leather, and manufactures of, for the fiscal year ended June 30, as compared with previous fiscal period in 1914.

"While war demands were active for our leathers, shoes, harness, etc., the domestic demand has continued to be severely curtailed, indicating widespread economy among the people at large.

"War orders are in abeyance at present, but domestic inquiries for leather and goods made therefrom is showing some improvement. Very high prices for hides and skins have discouraged tanners from working their plants to full capacity.

"Manufacturers of leather, shoes, harness, belting and other leather merchandise are more and more recognizing the great advantages and economies of electricity for light and power in factories.

"This field of manufacturers is pretty closely covered by *Hide and Leather,* and we are satisfied that widespread popularity of electricity among our readers is bound to increase.

"We believe that electricity has a great future among shoe and leather factories. Steam has outlived its usefulness for power, and just as soon as shoe and leather manufacturers are more confident about the return of business activity, there should be many openings for the installation of electrical equipment."—R. C. Jacobsen, Editor *Hide and Leather,* Chicago.

Hotels.

"Hotel business is a sort of business barometer, as travel reflects largely the business condition in **all** lines of industry, and the amount of travel is the measure of hotel prosperity.

"During the more than 35 years that I have published *The Hotel World I* have never before seen both hotel and general business so what I may describe as 'spotted,' some doing well and others poorly, but a quite unanimous hesitancy to embark in new enterprises.

"Causes of the 'spotted' condition, to my mind, is due to the European war, the tremendous demand for munitions, for grains, horses and mules, in some sections having more than counterbalanced the depression previously inaugurated by the change of national administration and adoption of a policy to lower prices of all standard commodities to the public through tariff reductions. The logic is simple and easily understood. Every dollar's worth of property is owned by **somebody;** reduce the value of the dollar's worth to ninety cents and you inaugurate 'hard times,' universal economy and retrenchment. Roger Babson, our greatest statistician,

Digitized by Google

has said: 'The difference of one necktie for every man in the United States during a year will create a financial depression.'

"As to the hotel outlook. The 'See America First' movement and the European war effect on American tourists have not overbalanced the apathy to pleasure travel caused by the psychology of gloom due to a great international militant catastrophe and a general business depression. New hotel construction has consisted largely of filling contracts entered into previous to the war, and many new hotel projects are held in abeyance. Naturally, there is large travel California- and Exposition-ward, but not one-half what was expected.

"One of the prime worries of the hotel men at present is the widespread prohibition movement, as nearly all hotel operators are lessees and not hotel owners, and their rental leases are based on revenues that include liquid supplies profits. They can stand the losses on alcoholic sales, but not the loss of patronage occasioned by killing an industry involving hundreds of millions of capital and the labor of millions of men, for it is the small margin of business above gross operating receipts and disbursements that measures the profits and the prosperity.

"The use of electricity in hotels, I feel sure, will more than double in the next five years, as the hotel men are slowly but surely learning the efficiency and economic advantages of electricity in the culinary department; but the hardest thing in the world to get out of is a rut, a habit or encrusted routine, and the electrical manufacturers are largely to blame, so far as the hotel field is concerned, because they have not done the proper educational work with hotel men through channels that reach the attention and understanding of the hotel fraternity. The modern hotel, both in country and city, is one of the largest and most promising fields in the world for electrical development, as was evidenced by the Electrical Number of *The Hotel World* of November 7, 1914."—Henry J. Bohn, *The Hotel World,* Chicago.

"The electrical energy is used in every department—engine room, laundry, kitchen, dining room, office, bed rooms—it dominates in the telephone and signals communication; in illumination, in power (elevators, ventilation, cleaners), also has practically become indispensable in a thousand and one labor-saving devices."—John Willy, *The Hotel Monthly,* Chicago.

"The past year has not been the best in its history for the hotel industry. Various untoward developments which affected business in general had a quick effect on hotels, which, of course, depened for their prosperity on that of business houses in general, and particularly on that of the big wholesale and manufacturing concerns which travel salesmen.

"Despite all of this, however, the past 12 months have been much better than members of the hotel industry expected in many instances. The European war, which perhaps was the most potent of the influences at work, reacted favorably, as far as the hotel industry is concerned. Tourists who formerly made a point of seeing Europe every year have perforce contented themselves with the attractions on this side of the water. This, and other advantageous factors, have made the year better than fairly good. The hotel industry is prosperous, generally speaking, and is one of the few which is not seriously retrenching.

"Improvements are numerous in the hotel field, while the number of new houses which will go up in 1915-16 has in no way been diminished. The Blackhawk, at Davenport, Ia.; the Muehlebach, at Kansas City; the Kaiserhof, at Chicago; the Statler, at Detroit; the New Morrison, of Chicago, and the Inman, at Champaign, Ill., are but a few of the hotels which opened their doors to the public during the last six months. An even larger number will be erected during the next year.

"From the standpoint of the electrical industry, the subject of hotels is a peculiarly interesting one, because of the fact that no other line of business offers such a profitable field to manufacturers of electrical devices of all kinds. In the first place, the tendency among modern hotel men is to install their own power plants, instead of buying current. While the smaller houses are in some cases buying power, the larger hostelries, and in nearly every case, the new ones, are installing private plants.

"Hotels long ago recognized the potency of publicity, and are generous consumers of current for electric signs. Many instances of this may be seen in Chicago alone. The Hotel La Salle, the Sherman, the Brevoort, and many others in and out of the loop may be located blocks away by the brilliance and number of the electric signs which beckon to potential and actual guests.

"*The Hotel Bulletin,* no later than last month, in an article on the operation of kitchens, called the attention of the hotel trade to the possibilities of electricity for use in kitchen ranges and broilers, as well as for making coffee, toast and other similar dishes. Coal and gas have heretofore been the accepted fuel. *The Hotel Bulletin,* however, pointed out the advantages of electricity, and urged hotel men to secure further data before making installations in new or old houses.

"The possibilities for the use of electric current and electric appliances in other departments of hotels seem unlimited, though it appears that the electrical industry has neglected its opportunities here to some extent. Hotels are heavy purchasers of switchboards, maintaining, of course, private telephone exchanges. All of the best hotels place electric fans in their guest rooms, or would, if an effort were made to sell them. Electric appliances are numerous in hotel barber shops, which are usually conducted by the house, though occasionally sub-leased.

"In modern hotels, plugs have been installed in the rooms, so that guests, especially feminine patrons, may utilize electric hair-curlers and similar devices. In family hotels electric irons are sometimes provided, though in houses which cater to transient trade, the practice of doing the family wash in rooms is not yet welcomed. The manufacturers of an electrical instrument which transmits written messages from one department of the hotel to any other one desired has done a good volume of business recently in hotels of Chicago and elsewhere.

"Hotel men are now in some instances conducting garages in connection for the benefit of motorists. Just how far the hotel man will pierce this business remains to be seen. At least one boniface, however, is not only housing cars, but is charging those of the electric variety. This is but one instance of the trend of the times. It would seem, therefore, that the hotel man is one of the biggest consumers of electric current and devices, and that the surface of this field has only been scratched by members of the electrical industry."—Harry M. Eastman, Managing Editor *Hotel Bulletin,* Chicago.

Ice and Refrigeration.

"According to reports received by *Ice and Refrigeration* recently, the business of manufacturing ice-making and refrigerating machinery and accessories has been picking up of late and the outlook is more encouraging, although the very untoward weather for ice manufacturing has had a considerable depressing effect on that branch of the industry. A matter of particular interest is the rapid increase in the use of electricity for power in the manufacture of ice. *Ice and Refrigeration* has recently published two or three articles descriptive of plants using electricity for power, a large plant of that character having been described in the August issue. In the September issue will be described another plant formerly operated by steam power and recently changed to electric power with very satisfactory results. In every issue of *Ice and Refrigeration* are published under 'New Plants and Improvements,' items referring to the installation of ice-making plants in connection with electric light plants or electric power plants, showing how the manufacturers of electricity appreciate the value of ice manufacture as a side line. Likewise items regarding the installation of refrigerating machinery electrically operated occur in every issue. These facts should certainly be of interest to the manufacturers of electrical machinery and appliances."—S. S. Van Der Vaart, Editor *Ice and Refrigeration,* Chicago.

Jewelry.

"There is a very hopeful feeling in the wholesale jewelry trade, and that this becomes more pronounced the farther you get from the eastern manufacturing states until you reach the Rockies.

"The Pacific Coast has always been regarded as a territory by itself in the jewelry business, and this year is additionally exceptional on account of the stimulus of the exposition at San Francisco, the distribution of travelers' money being felt from Los Angeles to Seattle.

"Small grains have been a record crop and in most cases the crop has already been gathered before the recent heavy rains. Corn and cotton may also be depended upon to add wealth to the entire section between Buffalo and Denver, and while the cotton crop has a smaller acreage than last year, feeding crops and food stuffs in general have been planted in such variety as to more than make up for this, because the sale of such crops throughout the year greatly reduces the indebtedness and consequently the money borrowed on growing cotton crops.

"Jewelers of the jobbing centers are therefore generally of the opinion that the coming twelve months must be vastly better than the preceding year."—

Digitized by Google

C. E. Walker, *The American Jeweler,* Chicago.

Lumber Trade.

"The lumber industry has probably been more seriously depressed during several years past than any other line of business in this country. It felt the panic of 1907 more promptly and seriously than almost any other and failed to recover with any promptness from the subsequent depression. In fact, it never has recovered entirely, although there was a brief period during which the industry was upon a fairly substantial basis of business volume and profits. For two years, however, it has been on a substantially level plane of extreme depression, with production steadily in excess of the demand and with prices which, on the average, have represented little, if any, return on standing timber, the raw material of the industry. It is recognized by financiers and students of business situations of the country that lumber producers and cotton producers are the greatest sufferers from business depression, and if these two could be put upon a basis of reasonable profit, the country would probably resume a condition of normal prosperity.

"This condition of the lumber industry, while due nominally to over-production, is in fact an example of the effects of under-consumption. To a considerable extent changes in requirements of other industries, whereby other materials have been substituted in considerable quantities for wood, are responsible for this situation; and yet it is largely due to the fact that lumber is more sensitive to general trade conditions than almost any other commodity. It is, in a sense, a luxury. People must eat, clothes wear out quickly, but the need for lumber, except in manufacturing industries, is seldom immediate or sharp. The farmer, the village dweller, the city merchant, can if times are depressed postpone building improvements for another year or two, and that they have done during these years when conservatism and economy have been so generally urged.

"What is the prospect for the future? The lumber trade looks forward to a fair volume of business this fall based, first, on the apparent disposition of the agricultural communities to loosen their hold on their money. The farmers, after several years when they have showed a buying interest in nothing but automobiles, at last seem disposed to make building improvements and otherwise spend their money in ways which will involve benefit to the lumber business. The character of orders coming from the railroads indicates that the transportation agencies of the country have reached a point where they must make some improvements or lose business, and that means the use of lumber. Then there is a growing activity in general manufactures, to say nothing of the special activity in war manufactures.

"These things all spell larger business in lumber, but we look for no boom until after the war is over. When that comes, and when Mexican affairs are settled, there will be, almost certainly, a temporary boom. Lumber will be wanted urgently and in large quantities. America, as the greatest lumber-producing nation, will be called upon to supply the immediate needs of many nations, but that demand is in the hiding of the future, and while it is one of the considerations that encourages lumbermen to hold on to their enterprises with grim determination, they are not counting on it as an immediate reliance. The best to be hoped for, as in sight, is an activity in the demand for their commodity which they hope will give them a modest prosperity.—Leonard Bronson, Editor, *American Lumberman,* Chicago.

"For several years the lumber indusary has been in a rather peculiar, not to say precarious position. It has been made the football of government investigations and later discriminated against, in having the entire duty abolished, permitting the entry of enormous quantities of lumber and shingles from Canada, so that the members of the industry have felt that they were getting it both a-comin' and a-goin'. Consequently when the real hard times came with the war and the greatest shifting of markets ever known in history took place, the lumber manufacturers and dealers were probably the most illy prepared of any industry to withstand all these handicaps, and suffered, we believe, more seriously than any. An enormous export trade to Europe was instantly shut off, damming up large quantities of lumber cut with especial reference to the wants of foreign buyers, and forcing it upon the domestic markets, to the demoralization of values. Vast quantities of lumber could have been diverted to South America, Africa, Australia and the Orient had bottoms been available, but ocean rates were sprung to a prohibitive figure, and our manufacturers were unable to market more than a fraction of their product outside of our own borders.

"Another burden upon the trade has been the tinkering with lumber freight rates in every locality, which has kept the trade in a state of continual unrest. Lately, in accordance with a recommendation made some time ago by the Interstate Commerce Commission, the railroads are proposing to reclassify lumber, putting dressed or remanufactured lumber on a higher rate than the rough product. This factor alone is sufficient to create in the trade a state of confusion and put a check upon development. The railroads, which consume annually about 10 per cent of our product, stopped the construction of freight cars. In the city of Chicago, which consumes annually five per cent of the total production of lumber in the United States, building operations were practically suspended for five months last year, and for three months this year on account of strikes.

"All of these matters have contributed to the most unsatisfactory condition that has ever existed in the lumber trade, it being found impossible to manufacture and sell lumber at a profit. In the last two or three years very few new mill plants have been erected, and most of those were erected for the purpose of replacing plants that had been burned. The modern saw mill plant is invariably equipped with electricity, many of them for all of their power and others using electrical apparatus in their planing mills only. Construction work being suspended, naturally the demand for electrical equipment in this industry has been extremely limited during the period mentioned.

"Within the last three months work on a number of large saw mill plants has been undertaken in anticipation of a turn in the tide of the demand for lumber. There are other plants now contemplated that will be erected this year, and all of these are and will be heavy users of electrical equipment of various kinds. However, the saw mill situation is far from normal, and it is doubtful whether, with the existing doubtful prospects, there will be much more construction work done in the near future than already planned. Members of the industry are hopeful, however, that something will occur to favorably affect this situation, and if there is any encouragement or hint of improvement the lumbermen will be found active in aiding the restoration of prosperity."—Lucius E. Fuller, Market Editor, *Lumber World Review,* Chicago.

"The lumber business of the Pacific Coast for the first six months of 1915 was from 20 to 25 per cent less than the corresponding period of 1914.

"The offshore decrease has been largely on account of lack of tonnage, while domestic business has suffered from the universal habit of banking interests refusing to advance funds for improvements.

"General business conditions throughout the Pacific coast are favorable, and when normal times prevail the demand for forest products will probably be of great magnitude.

"The use of electricity in the operation of saw-milling machinery has passed the experimental stage, and is gaining in popularity; the same statement applies to motor-driven machines in planing mills, box factories and other woodworking establishments, as such operation eliminates the friction load and by use of power only as required, reduces operating or power costs to a minimum."—Guy A. Buell, Editor, *Pioneer Western Lumberman,* San Francisco, Cal.

Marine Engineering.

"Probably no engineering industry in the United States is in the happy condition that shipbuilding is, especially on the sea coasts.

"When the war broke out a year ago shipyards were almost empty of work and the prospects were almost hopeless. Within three or four months ship owners realized that there would be a great demand for vessels to replace those lost by the belligerents, and we all know that there was a great demand for tonnage to carry American products to various parts of the world. As a result, orders began pouring in upon the shipyards and there is not a yard on the Atlantic coast that can take an order and guarantee delivery inside of two or three years. Indeed, these yards have work enough in hand and in sight to keep them running full capacity for at least five years. A very remarkable feature of the new ships under construction is that practically 250,000 tons deadweight of tank steamers are being built—to say nothing of a very large tonnage of ordinary merchant vessels. A significant feature of the situation is the fact that the Ward Line of New York has been obliged to place a contract for a new ship with a shipbuilding concern in Seattle, Wash., in order to secure fairly prompt delivery.

"Shipbuilding on the Great Lakes is very slow. Very few new vessels are under construction and shipbuilders

Digitized by Google

have had to depend very largely for the past year upon repair work to keep their yards busy.

"As electricity is necessary on board every steam vessel of the present day, you can readily see that the electrical industry so far as the marine field is concerned has been very fortunately affected. **The uses of electricity on board ship are steadily increasing, particularly motors for various purposes.** Furthermore, the building of so many vessels is very significant to manufacturers of incandescent lamps, as the ships in this country must use somewhere from eight million to ten million lamps.

"In other words, the industry represented by this magazine is running practically 100 per cent capacity on legitimate business without any trace of so-called war orders, and is sure to remain in this happy condition for years to come."—H. L. Aldrich, President, *International Marine Engineering*, New York.

Millinery.

"The millinery business is not quite normal in volume. The demand for hats decidedly less in value than in past years, accounts for part of the decline. Local conditions throughout the country affect the millinery business decidedly. In the localities where industrial troubles prevailed last year (and part of this) business is poor. In agricultural districts business is normal.

"In new plants, individual motors for each machine are installed. The old continuous shaft with belts to each machine has practically disappeared. The indirect lighting system is gradually superseding the exposed lamps in millinery departments in all parts of the country."—G. K. Glenn, President, *The Illustrated Milliner*, New York.

Mining.

"The writer recently returned from extended trips through the northern and western mining districts, where he found the electrification of mines, ore-concentrating plants, smelters, etc., proceeding on a scale which a few years ago would have seemed incredible. In the majority of cases, all new installations of hoists, compressors, pumps, mill machinery, etc., are now motor-driven and a great deal of new equipment is being changed over. Automatic and distance control has also become a feature of present operation. The activity now existing in the mining field exceeds anything known heretofore for the past eight or ten years. Extensive plans for new equipment are being made and the orders placed within the next few months will aggregate many hundreds of thousands of dollars. Most mining companies, as you know, have for some time past been getting along with just as little machinery and material as possible, but with the heavy demands made upon them for the production of ore and concentrates, it is now being found necessary both to replace worn-out or obsolete equipment and to make further installations of new apparatus in order to secure increased capacity, especially so at the present high metal prices. In this demand orders for electrical machinery and supplies will be prominent.—C. A. Tupper, Secretary-Treasurer, *Mining World and Engineering*, Chicago.

"The mine and reduction works of the United States are being operated at their maximum capacity, and in several industries the capacity has been, or is being, increased. Unfortunately, the great demand upon the mines and metallurgical works is, to a large extent, to furnish material required for military purposes. The consumption for domestic, peaceful purposes has increased somewhat, but is still far below normal.

"At present there is feverish activity in the production of iron and steel, copper, lead, zinc, and the minor metals. In lead and zinc production has probably been stimulated excessively by the high prices prevailing during the second quarter of 1915. I think that the outlook is, therefore, for a recession of prices and curtailment of activity, but probably the position of copper is much sounder than are the positions of lead and zinc."—W. R. Ingalls, Editor, *Mining Journal*, New York.

"The increased demand for the base metals, due largely to the consumption of them in the manufacture of munitions of war, is stimulating the mining industry. The big copper mines of Michigan, Montana, and the Southwest are working at full capacity and the zinc mines of Missouri, Oklahoma, Montana, Idaho, and Wisconsin are making the best of the abnormal price of spelter. Such electrical apparatus as is used in mines is sure to come into increasing demand in consequence of this general renewal of activity."—T. A. Rickard, Editor, *Mining and Scientific Press*, San Francisco, Cal.

Music.

"Electricity plays a very conspicuous part in the industries and trade devoted to musical instruments. It may be said that as a motive power electricity is employed to perhaps a more diversified degree in this department of human progress than in most of the others. Electricity is now employed, not only in the so-called automatic pianos, such as are used in public places and amusement resorts, but of late also in the larger musical instruments designed to reproduce the effects of small bands and orchestras. This phase of the musical-instrument industry is seen at its best in the so-called photo-players or movie-musicians, to be seen and heard in the larger photoplay houses. The coin-operated pianos are, of course, actuated by electrical motors. It goes without saying that in many of the piano factories the machinery is propelled by electrical power, the motors of varying capacity being used in all parts of the country where musical instruments are made.

"Of late years electricity is also employed in the publicity departments of the musical-instrument establishments. The piano store window is one of the most difficult to so arrange as to present an effective display, but with the aid of the electric light it becomes comparatively a simple matter to give to the instrument a suitable surrounding and to enhance the appearance of the store front by brilliant lighting. More and more, also, electrical signs are being used by the larger piano establishments throughout the country. The brilliant sheen of the well finished piano case lends itself perfectly to the electric light in attracting attention of passersby. Furthermore, the interest in the player piano is greatly increased by the visual movement of the action propelled by the unseen power. It is very common, especially in the smaller cities, to see and hear these instruments as they are electrically played in the music store windows. Of course the demand for small and specially constructed motors for player pianos increases with the growth of the player piano industry, and that now represents about 40 per cent of the American piano product.

"While, in common with most other lines of industry, the piano business, including the electrically operated instruments, has been somewhat below normal this year, the outlook is for a very speedy and rapid improvement. There are very few manufacturers of musical instruments in this country who do not confidently anticipate a good business beginning with the fall months and extending through the following year and, in this increase, as has already been clearly implied, the electrical instruments will play a very large part.—*The Presto*, Chicago.

Office Appliances.

"Hardly any industry is nowadays independent of electrical light and power. The office-appliances industry is a heavy user of both, for we have all manner of machines which are motor driven, such as letter-duplicating machines, addressing machines, adding machines, envelope openers, etc. As the use of such machines increases—and it is increasing right along—naturally this demand calls for an increased consumption of electrical power.

"In the lighting field, hardly any retail store can now regard itself as up-to-date which is not lighted electrically by the indirect lighting method. In factories where it is necessary to use artificial light, electricity of course is now one of the prime necessities, and great ingenuity and scientific skill have been displayed in using the electric light so as to bring out the greatest efficiency with the least eye strain.

"We regard the outlook in the office-equipment industry as very promising indeed. We believe the fall and winter of 1915-16 will show a steadily strengthening tendency in the demand for all manner of office machines, devices and supplies. Business for a year has been at a low ebb. We have now settled down to face those conditions which disturbances abroad have brought upon us, and we have ceased to be apprehensive of any immediate entanglement in European affairs. At last it would seem that the business men of the country have the government working with them instead of against them, or at least not proceeding in a manner calculated to obstruct the development of industry. We feel certain that the coming season will be one of satisfactory business in this and other lines."—H. W. Martin, Associate Editor, *Office Appliances, Chicago.*

Photography.

"Professional photography furnishes what the majority of people consider as more or less of a luxury; amateur photography is a hobby and is not vigorously prosecuted under unfavorable conditions of business or of weather. Business conditions in the photographic field have, therefore, generally speaking, been subnormal this year. The

Digitized by Google

war has caused unusual conditions in the trade, especially a marked hampering of imports, which are of considerable importance. Some American manufacturers have felt a stimulus to their business from this cause; other large firms, importers of either raw materials or finished goods, have suffered greatly. Generally speaking, however, the business conditions, among manufacturers, importers, and retailers, seems to be sound, and indications are not lacking that retail trade will readily respond to any improvement in general business conditions.

"Photography comes in contact with the electrical field at several points. There is a large and growing demand among portrait photographers for electrical lighting equipment of various types, to replace fluctuating and uncertain daylight, both in the taking of portraits and the making of prints. A continually increasing use of enlarging apparatus among amateurs and professionals, caused by the present vogue for small cameras, will react to the benefit of the electrical industry. An unlooked for development is the considerable use of the pocket flash-lamp, among photographers, for printing and darkroom illumination. The manufacturers in this field have not been alive to their opportunities, and although the great majority of dealers in photographic supplies sell flash-lamps, no firm in this field can see that it is to its interest to advertise these goods to the photographer."—F. R. Frapin, American Photographic Publishing Company. Boston, Mass.

Schools.

"The school field continues almost untouched from year to year because of the war and other conditions which confront ordinary trades and industries.

"If in anything, the attendance at school has been increased during the past year as a result of the war. This may seem peculiar. You must keep in mind the fact that a great many people go to school when times are hard to be able to earn more money when times are good.

"The use of electrical devices in schools is decidedly on the increase. Two schools in the West are being heated, lighted, etc., by electricity.

"The past year has seen an unusual increase in the number of schools that teach manual training. This means that the demand for electrically driven lathes, saw benches, planers, etc., is increased.

"It is perfectly obvious that electricity is the only practical motive power for schools since manual training rooms are used only a few hours a day, only five days in the week, and only nine or ten months of the year.

"Indirectly it is very much on the increase. With the extension of night school work, the demand for better lighting in school houses is making itself felt more and more every day. It is a remarkable fact that all sorts of industrial and technical courses are being offered by all sorts of schools and a very large percentage of this work is being done at night.

"In a great many schools, pupils are being taught to cook with electricity just as they would be taught to cook with gas or coal. While the greatest volume of this business is confined to the Pacific Coast, nevertheless the work is being introduced in other sections of the country.

"School boards are demanding more and more every year the use of auditoriums for all sorts of purposes. This means that more stages are being equipped for all sorts of purposes, which materially includes the various electrical outfits which are necessary for the staging of plays, etc.

"Such motor devices as vacuum cleaners, heating and ventilation apparatus is decidedly on the increase. While comparatively little is done with old buildings, every new building is being equipped with a vacuum cleaner, or a heating and ventilation system, which is practically always driven by motor.

"There were in the schools of the country last year twenty-two million children. The increase for 1915-1916 should be more than that, and with it there should come the normal demand for electrical apparatus.

The school field offers most attractive possibilities in the fact that money is always secure, and collections are always good, war or no war, hard times or good times."—Frank Bruce, *The American School Board Journal*, Milwaukee, Wis.

Shoe Findings.

"Business conditions in our industry change very little from year to year. Of course, there is the hue and cry of the pessimist, but most of the lines we represent being staple commodities, the consumer cannot do without them.

"Our manufacturers have had to contend with increased prices of raw material, which in some instances has resulted in increasing their own prices, especially in the leather trade, but if we can judge the general business outlook by the manner in which our advertisers are taking space in *Shoe Findings*, the coming season will be a prosperous one.

"More than 50 per cent of our readers own shoe repairing shops or departments that call for the use of electric motors. We have over a thousand wholesalers among our subscribers who act as distributors for such appliances. There are over twenty-five thousand prospects in our field who will some day buy an electric motor to be used in operating their repairing machinery."—Harry Schwarzchild, Editor *Shoe Findings*, Chicago.

Storekeeping.

"As you know, our magazine goes **exclusively** to the proprietors of general stores and small department stores in the smaller cities and towns. These dealers are largely dependent upon the farmer for their trade, and we find they are, almost without exception, very well satisfied and optimistic.

"The farmers have had nothing to complain of during the last twelve months, as crops have been heavy and prices high, a condition which seldom exists. This means that our subscribers are reaping their share of the money which is going to the farmer, and as a consequence are reporting an increase in business over corresponding months last year, and are buying liberally with the expectation of a good holiday trade.

"Just what effect this condition will have on sales of electrical apparatus, it is difficult to say. There is, of course, a growing interest among the farmers in electrical apparatus, and in the small towns in electrical plants, and prospects for good business will only encourage activities along this line."—O. F. Byxbee, Editor *Inland Storekeeper*, Chicago.

Sugar.

"The war has had a tremendous effect on the world's sugar industry. One-half of the total production is beet sugar, and 90 per cent of that half is produced in those countries which are fighting to the death. One of the combatants, the United Kingdom, produces no sugar, and previous to the war she took practically the bulk of Germany's and Austria-Hungary's surplus, with which countries she is now at war. The beet fields of France have been ravaged and its sugar industry interfered with. As a consequence the United Kingdom, France and Switzerland have been buying in markets new to them. This has tended to raise prices.

"The big sugar industry of Cuba has, as a consequence, had a successful season. New plants are going up all over the island and existing factories are being enlarged and improved. Incidentally, electrifying Cuban sugar factories is being given considerable and widespread attention. We ran a series of articles on electrifying cane sugar factories in our issues May to November inclusive, last year. This series was written by Wirt S. Scott, chief engineer of the Westinghouse Electric and Manufacturing Company. The articles attracted much attention and it is a common occurrance these days to hear that some plants either is installing electricity or considering doing so.

"As for the sugar industry in the United States—over it is hanging the black shadow of the Underwood tariff carrying free sugar in May, 1916. The sugar men expect a satisfactory campaign this fall, and as long as the war continues the home industry is safe, but under free sugar the industry is doomed. If the war had not intervened the factories would not have operated this year. It is a hard cold business fact that sugar made in America under the American wage scale cannot compete with that made by cheap European and tropic labor. Sugar cane in Cuba is almost a weed—it grows year after year with little more attention than that needed to cut it and get it to the mill. Beet farming is intensive farming and intensive farming with our high-priced labor means money. If we had Europe's wage scale: Russia, 10 cents a day for children, 17½ cents for women, and 24.9 cents for men; Austria, 20 cents for children, 26.8 cents for women and 30.2 cents for men; Germany, 22.8 cents for children, 28½ cents for women and 47 cents for men; if we could raise beets under this wage scale instead of an average in the beet fields of the United States of as high as $3.25 per day, there might be some reason for putting the American sugar industry against the world, but as things stand the industry is doomed unless Congress, or rather the president, will reverse his policy toward it; and failing that a Republican administration at Washington."—E. A. Jones, Editor *Sugar*, Chicago.

Telephony.

"The telephone industry, about which you request an opinion in your letter of the 10th inst., is exhibiting a gradual upward tendency, as viewed from

Digitized by Google

the manufacturers' and supply dealers' standpoint. The low point was passed some time ago and reports now indicate continual improvement and that normal conditions will prevail by next spring.

"The operating telephone companies were, of course, affected to some extent by the war, but not as much as other industries. With the general improvement in business throughout the country, net earnings in general are greater than those of last year. There is every reason to believe that the telephone companies, in common with the general broadening out of business, will also expand and come into the market as in former years."—S. R. Edwards, Editor, *Telephony*, Chicago.

Textiles.

"Manufacturing conditions in the cotton textile line have been gradually improving since the beginning of this year and with a few exceptions mills are well employed. These exceptions are in colored-goods lines where the trouble is not a shortage of orders, but a shortage of dyestuffs. The first of September will undoubtedly see curtailment in some colored-goods mills which have heretofore been operating full time. The reason for this will be an attempt to conserve some of the present dyestuffs in order to keep their operatives at work through the winter months at least on part time. Until such time as the general public are willing to accept colored goods dyed with fugitive colors, or until such time as a greater supply of fast color dyes can be secured, this curtailment of the colored-goods mills must be expected.

"In the white lines business is exceptionally good, particularly in those lines which are being benefited by the so-called 'war orders.' However, the fine goods mills of New England have put more fancy, fine quality dress goods on the market in specialty form during the past few months than ever before in the history of the mills. These goods are high-priced goods, many of them running well over 32½ cents to 42½ cents a yard at wholesale. They are being manufactured in great variety and large volume.

"Ever since last April a note of optimism has been in evidence in the cotton-goods industry and the new mills under construction in the South at the present time, as well as hundreds of mills that are adding new machinery or replacing old machinery with a better and higher grade, emphasize this fact perhaps more strongly than any production figures which may be advanced.

"A great deal of this new construction is being electrically driven, although not always with purchased power. The new $500,000 Fairfax Mill of the West Point Manufacturing Company, at West Point, Ga., for example, will be driven from a central station owned and operated by this company on the Chattahoochee River, from which power is also furnished to the Langdale Mills and Shawmut Mills of the same corporation. I published an illustrated description of the Erlanger cotton mill at Lexington, N. C., in the March, 1915, issue of *Cotton*, which is another type of electrical mill recently constructed in the South. Their current is generated by a steam-driven turbogenerator of 1,500 kilowatts capacity, and individual motor drives are used throughout the mill, 1,100 separate motors being used in the weave room alone.

"Lighting systems in many mills are being remodeled and the old long cord suspension carbon lamp replaced by the higher powered lamps hung on short cords and equipped with reflectors.

"It is, I believe, becoming better understood in all lines textile, that with the ending of the war more active competition than has ever before been received will be encountered. The warring nations are learning that women and children can do many things heretofore done by men and at the close of the conflict the abject poverty and gigantic taxes will necessitate the active work of every able-bodied person of both sexes with a consequent increased production of goods, which will be marketed at probably the lowest prices known in present years, in order to regain trade lost during the present crisis.

"It is probably because many cotton manufacturers at the present time realize these facts and are preparing for them, that so much new and up-to-date machinery is being put in the mills to replace that which is older and less efficient, and which has been in use for a number of years past.

"Export markets are being investigated and promoted and these new markets will call for more and more goods as the lines become firmly established and the purchasers become better acquainted with American products. Particularly is this statement true of knit-goods markets and with the vast opportunities in the knit-goods trade now open to this country, which have formerly been supplied almost entirely with the German products, there seems to be no limit in sight when considered from the standpoint of quantity.

"Personally I believe the textile industry of this country is today upon a bigger, broader and stronger basis than ever before in its history, and the present time might be termed a "get ready" period, which will be followed by the largest general business boom in the history of the country."—L. L. Arnold, Editor, *Cotton*, Atlanta, Ga.

"In common with other divisions of the business world the textile industry has been affected during the past year by war conditions both favorably and adversely. In the first place, had it not been for the war it is probable there would have been a flood of imports that would have been disastrous to the operations of textile mills and to the marketing of domestic products. The influx of this merchandise began before the war started and continued in spite of the influences working against increased importations. Naturally, as the conflict progressed demand for equipment for the armies of the belligerents has caused the placing of orders in this country for an aggregate volume of merchandise which, though possibly exaggerated in reports, has been sufficient to keep machinery in operation that otherwise would have been idle. These demands except in certain periods of inactivity have been the mainstay at least of the woolen manufacturer and have extended into other lines, such as underwear, hosiery, and into certain lines of cotton goods. Renewed interest has been evident of late from various governments, evidently preparing for another winter campaign and the outlook is for even larger purchases than those already made.

"An incident of these war orders which has been unfortunate for the textile industry has been the criticism in the daily press of deliveries that were not acceptable to the purchasers and the intimation has been that manufacturers have endeavored to palm off merchandise not up to specifications upon foreign governments. This, with a very limited number of exceptions, has proved to be untrue. The fault has been with the intermediaries who have been responsible for the placing of these orders. They have not furnished complete particulars in many instances, and in others have calculated upon a demand from official sources that did not materialize. Fortunately, this condition does not apply to all foreign governments which have been in the market for the purchase of supplies. The majority have conducted their operations in a businesslike, systematic manner and have profited thereby. Where the opposite is true merchandise has in instances cost purchasers more than was necessary. At present, however, these unfortunate conditions seem to have been eliminated with regard to future operations.

"Generally speaking, operations by textile buyers during the last twelve months have been most conservative. In the woolen trade up to the opening of new lines for the spring 1916 season more or less machinery has been idle and it has been a difficult matter to inject life into the operations of the buying trade. Beginning with the first of July, however, a more encouraging condition began to make its appearance and has progressed until sellers are eminently satisfied with the character of buying for the current period. In fact, orders by the clothing trade have been numerous enough and of an extent to lead to the belief that they smacked of speculation. Under existing conditions, however, it would seem as though purchasers of men's wear fabrics particularly were warranted in providing against future contingencies. The status of the raw-material market has been such as to indicate not only higher prices, many of which have already been realized, but a decided scarcity in certain lines. The embargo on wool for a period led to the fear that supplies for manufacturers would be very difficult to secure. Although wool today is coming in under license there are certain qualities that are not available, but this dearth is offset by increased quantities of other wools to which this market is not accustomed. The effect of the presence of these wools is not fully determined as yet, but it is believed that their admixture with domestic qualities and well known foreign lines will make for the betterment of fabrics rather than otherwise.

"Prices, naturally, on new spring lines of woolens show an increase. The advance, however, has not been abnormal figured on the increased cost of production and buyers have accepted the new level of quotations philosophically. There is every indication that the original prices for the season are likely to be the lowest prices; already advances have been announced in certain quarters and the fact that lines in many instances are sold up would evidence the necessity for higher quotations as the season progresses.

"In the cotton-goods division of the market the trade has had unusual prob-

Digitized by Google

lems to confront. The distribution of last year's cotton crop was effected with much less disturbance than was thought possible. While prices of raw material declined, yet the exports were of such volume as to eliminate fear of disastrous consequences and the market level reached a point where distribution was possible at a profit. Naturally, prices for fabrics have been irregular, owing to the fluctuation of raw material. For the most part, however, mills have been able to operate at a close margin of profit and there has not been the idle machinery that many feared.

"At the present writing the trade is faced with the problem of cotton being declared contraband of war. Whether the assurances of the Allies that some method will be devised whereby any surplus will be absorbed and a disastrous slump prevented will be sufficient to prevent chaotic conditions only the future can decide. No marked change has resulted so far from the startling announcements of the last few days and the fact that buyers' stocks are in small compass is an element in favor of comparative regularity.

"Naturally, the problem of dyestuffs has been most apparent in its effect upon the manufacturer of cotton goods. Larger relative quantities are used by these mills and consequently strenuous measures have had to be adopted in order to meet unusual conditions. Dependent upon supplies from Germany whence imports have not been received since April, unusual efforts have been made to develop a domestic dyestuff industry. So far these efforts have been only indifferently successful, whatever may be the ultimate outcome. There seems to be little likelihood at present of a change in the attitude of Germany toward shipment of dyes to this country. Undoubtedly Germany has used the dyestuff situation as a club to modify, if possible, the blockade of her ports by England through her Orders in Council. As long as England will not permit shipments of cotton from this country to Germany, just so long will the movement of dyestuffs to this country be held up. Manufacturers, however, are endeavoring to make the best of the situation and are successful in many instances in keeping their machinery running by using substitutes and conserving the small supply of dye materials which they have on hand.

"Export trade has been of very limited volume in cotton goods during the year, the absence of demand from China, where the influence of Japan has been most disastrous, being one of the principal factors in this lessening business. Comparatively small results have been achieved in the South American market and while certain new outlets have been developed they have not been sufficient to offset the decline in other directions."—V. E. Carroll, Managing Editor, *Textile Manufacturers' Journal*, New York.

Transfer and Storage.

"An electrical man's first impression of the transfer and storage industry as a field for electrical equipment would be that it does not amount to much, but a little thought and a little investigation would soon convince him otherwise. The transfer and storage men of the country use enormous quantities of electrical supplies every year, and the prospects are that the demand in this field will steadily increase for it is an industry that is just beginning to wake up and to find itself.

"Among the carters of package freight to and from railroad terminals and steamship lines, the transferrers of baggage to and from railroad stations and residences and hotels, the haulers of heavy machinery, safes, etc., and the movers and storers of household goods and merchandise, of the United States and Canada, business has not been good during the past year. The cartage people have suffered because general business has been bad and little freight has been moving; the baggage transferrers because people have not traveled as much as usual, and firms have not had as many salesmen on the road; the heavy haulage concerns have felt the general depression and the movers and storers of household goods have not had as many people to move.

"However, all of the indications for the coming months point toward decided improvement. There is more freight moving, general business is better, money is pouring into the United States from Europe and must soon be felt in every line. The outlook for a good fall season in the moving and storing of household goods is better than fair.

"The entire industry is awakening. In spite of the depression last year, there has been unprecedented activity in the erection of new stables, and new storage warehouses. There is a growing demand for more sanitary and modern stables—some of the cartage firms have as many as 1,200 horses in use—and in the storage industry, everyone is talking 'fireproof' storage, which means new buildings in a great many cases. In all these building projects electric lighting equipment and electric elevators play a prominent part.

"Many of the owners of horses use electric motors for running oat crushers, hay choppers, woodworking machinery and machine-shop machinery, for they have their own wagon and blacksmith shops. The storage people use a large number of electric motors for woodworking machinery, for cutting and trimming lumber for packing. There should be an increasing demand for motors for this purpose during the coming year.

"But the principal application of electricity to this field has as yet been scarcely touched. I refer to the use of the electric motor truck. The transfer and storage field is without doubt one of the greatest existing fields for the electric commercial vehicle for practically 80 per cent of the work done is haulage and most of this is short-haul work, over city streets. One of the New York City furniture warehousemen recently made the remark that if he could afford it he would throw out his entire horse equipment and substitute electric trucks. A large Brooklyn warehouse has recently done this very thing and it may confidently be expected that, with the steadily increasing cost of horse maintenance, there will be a big demand for electric trucks during the coming year. The electric vehicle is the proper solution for most of the haulage problems in the transfer and storage field."—H. T. Lay, Managing Editor, *Transfer and Storage*, Pittsburgh, Pa.

Woodworking.

"Business in building and in house furnishing has not bulked big for some time. Events in the woodworking lines are now more rich of promise.

"Trade in general, though too largely built upon war demands, is bringing here a lot of money which will, through labor alone, filter to every part of the body industrial.

"Immigration is dull. Workers are uneasy. Wages unstable. Recent strikes show tendency of times.

"When war ceases there will be a lively commercial awakening abroad. Labor there and here will then be scant. Demand for improved labor-saving devices, for better light, and for more convenient and speedy appliances—such as electrical power and lighting apparatus—will be actively insistent, enlightened and enlarged. Your field will be a winner."—Rob I. Clegg, Editor, *Wood Craft*, Cleveland, O.

Resistance of Radiotelegraphic Antennas.

A suggested explanation of increase of resistance of radiotelegraphic antennas which has been observed under certain conditions where the wave length is increased, has been offered by L. W. Austin in a paper on the subject issued by the Bureau of Standards.

The resistance of radiotelegraphic antennas may be divided into three parts—first, the ohmic resistance of the wires; second, the so-called radiation resistance; and third, the so-called earth resistance.

Up to the present no satisfactory theory of ground resistance has been developed. The experimental curves of antenna resistance, on account of the decreasing radiation resistance, fall rapidly at first, as the wave length is increased, and then as the wave length is further increased remain nearly constant, if the ground conditions are good as in the case of a ship's antenna, or again rise nearly in a straight line, if the ground conditions are poor. This rise may be very rapid in the case of peculiarly poor grounds. For instance, the resistance of the Bureau of Standards antenna rises from 13 ohms at 800 meters wave length to 38 ohms at 2,000 meters.

Great difficulty has been found in explaining this increase of resistance with increasing wave length, but it is believed that the antenna system must be looked upon as a condenser, the antenna itself being the upper plate and the ground water the lower plate. Between the ground water and the surface there is usually a layer of semiconducting material, which would correspond to a poor dielectric in the case of an ordinary condenser. It is well known that the dielectric losses in imperfect condensers generally increase in proportion to the wave length of the current employed in the measurement. It is found that by covering the surface of the ground under and around the antenna with a wire net, thus making the lower plate of the condenser, ground losses nearly disappear.

Digitized by Google

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS.

Annual Convention, Cincinnati, O., August 24 to 27.

Concentric wiring and its use in America, one of the subjects discussed at the twentieth annual convention of the International Association of Municipal Electricians, held in Cincinnati, O., August 24 to 27, perhaps was accorded the closest attention of any of the subjects by the delegates and others who attended the convention.

Many excellent papers were read and attracted more or less discussion and a great deal of business was transacted during the sessions of the Association, it being the opinion of nearly all of those present that the convention just closed had been one of the most profitable from every point of view the Association has ever held.

The attendance was fully up to the average and the faces of many new members were seen, showing that the work of the officers of the Association to broaden its scope and increase the membership, both active and associate, is bearing fruit. Every bit of space in the room provided for exhibit purposes was occupied and a number of those contemplating exhibiting were unable to obtain space, so great was the demand.

Baltimore was selected as the meeting place for 1916, following the earnest efforts put forth in behalf of the "Monumental City" by J. B. Yeakle, superintendent of Fire Telegraph of that city and one of the old members of the Association. The election of officers resulted in no change being made, President Flandreau, of Mount Vernon, N. Y., Secretary George, of Houston, Texas, and Treasurer Diehl, of Harrisburg, Pa., being re-elected by a unanimous vote. Several new names are seen on the Executive Committee and it is anticipated that it will result in the increase in the scope of the work of the Association and that further interest will be awakened in city electricians, superintendents of fire and police alarm systems, electrical inspectors, as well as all interested in the electrical field generally, not only throughout this country, but in Canada and other foreign countries where the membership extends.

Among the prominent men of the profession present at the convention was the first vice-president of the Association, Dr. Charles P. Steinmetz. Not only did Dr. Steinmetz take a prominent part in the discussions on the various papers, but showed in many ways that he is heartily imbued with the spirit of the Association and an earnest advocate of its purposes and policies. Several times he went out of his way to express his great admiration for the Association and his appreciation of the value he placed on his membership in it. He received much attention from Cincinnatians generally during his stay.

Tuesday night the members of the Association were welcomed to Cincinnati by Mayor Spiegel and representatives of the Chamber of Commerce, responses being made by Dr. Steinmetz, Will Y. Ellett, of Elmira, N. Y., and J. B. Yeakle, of Baltimore. The latter, in the course of his remarks, introduced Miss Cora Lucille Thompson, daughter of William Thompson, city electrician of Richmond, Va., as the "Daughter" of the Association.

In his talk, Mr. Ellett took occasion to refer to those city electricians who obtain their positions through political pull as men who very seldom attend a meeting of the Association and said that "the only man worth while is the chap who holds on to his job through a changing administration because of sheer ability." Mr. Ellett, together with James F. Zeluff, of Paterson, N. J., and Adam Bosch, of Newark, N. J., all of whom were present, were three of the men who helped organize the Association in Brooklyn, N. Y., in 1896.

The real business began Wednesday morning, when President Flandreau read his annual address, referring to the work already accomplished and outlining that for the future.

He advocated a membership committee, consisting of one member from each state and urged that a census be taken of those engaged in electrical work, also that every city electrician in the country should be a member of the Association.

Following the reading of the paper by R. A. Smith, of Norfolk, Va., on "The Advisability of Using Concentric Wiring in this Country," there was an animated discussion on the subject. The object of this style of wiring, which is said to be in wide use in European countries, is to cheapen the cost of wiring, especially in what is known as branch circuit work, in the smaller class of homes and in the suburbs of large cities. Mr. Smith said that the rules suggested by him had not been approved, but were simply suggested. The adoption of this system would enable electricity to be largely substituted for oil and gas, he said.

In this connection, it was stated that an electric lighting company in Little Rock, Ark., had attempted to introduce the concentric system in that city, but that the citizens did not seem to favor that style of wiring.

Before any action is taken on this system, it will be fully investigated by a committee from the Association.

A paper on "Fire-Alarm Systems for Industrial Plants," by Albert J. Cross of New York, was read, advocating the use of such systems in industrial plants and referring to the benefits to be derived from their use. Many such systems are in wide use throughout the country, some of them being very complete.

In this connection a discussion arose on the subject of sprinkler alarms, the prevailing opinion being that it is best for such alarms to come into fire-alarm headquarters before being sent out to the fire department. The discussion covered a wide range and was participated in by many of the electricians. The opinion also prevailed that in most fire departments it is better to respond to sprinkler alarms, even if trivial, rather than run the risk of a conflagration. The Association went on record as favoring fire-alarm systems for such plants.

At this point G. Francis Gray, of Schenectady, N. Y., read a paper on "Lightning Arresters," which went thoroughly into the subject and treated it from practically every standpoint.

W. J. Canada, electrical engineer of the Bureau of Standards, Washington, D. C., read a paper on "The Scope and Present Status of the National Electric Safety Code," and said that a conference would be held in Washington on October 27, of state commissions, municipalities and national associations, when the National Electrical Safety Code, which the Bureau has been engaged in the preparation of for the past two years, will be persented for final amendment, ratification and adoption for a year's trial.

The paper, a lengthy one, went fully into the subject, and brought out a considerable discussion. The Code was generally endorsed, as being a move to effect standardization in all lines of industry. Mr. Canada intimated that the rules would probably apply to both old and new work, as old construction cannot always be abolished. A committee of three from the Association will attend the conference, R. A. Smith, of Norfolk, Va., A. C. Farrand, of Ventnor City, N. J., and W. S. Fastnacht, of York, Pa., being named to represent the Association.

Following a discussion as to the Association's status with the National Fire Protective Association, it was decided to have the organization fully represented in that body. The Association is already represented on the signal board, and will also be on the Electrical Committee, which has in charge the preparation of the Code for final consideration.

S. E. Doane, of Cleveland, O., who recently returned from Europe, where he went to investigate concentric wiring, made the following statement: "There are different rules of practice on both sides of the Atlantic. Abroad, the smaller customers are sought out, while in this country, the companies have been averse to carrying small

Digitized by Google

customers as a profit could not be made. It is a question of less expensive wiring. Concentric wiring is in my judgment the neatest scheme put forward to connect the dynamo with the lamp. It is also the best and cheapest, entailing the least cost of insulation. It is simply a rubber covering on No. 14 wire, with a coating of paper around it, all inclosed in a copper tube. The wire is not laid in a wall, but on the outside, although usually concealed by paint and wall paper. The only fittings are at junction points. There has been a general impression that this system is a general panacea for all electric ills, but this is not so, the system being principally for small residences, suburbs of cities, etc., where a cheap cost of construction is desired."

Mr. Doane expressed the opinion that ultimately the concentric system of wiring would come into general use in this country, as the cost of installation is one-third that of the present forms of wiring. Samples of this new form of wiring were on exhibition.

In the general discussion that ensued, electrical "pirates," incompetent workmen who suddenly leave an occupation, buy a few tools, and claim to be electricians, were condemned as being poor workmen and a discredit to the profession generally. "They put wiring in a house cheaper than a reliable contractor can buy the material and I am in favor of having only licensed electricians do such work," said President Flandreau.

A paper, with demonstration, of "Practical Cable Maintenance Methods," was given by O. F. Tallman, of St. Louis, who showed an easy method of discovering leaks, etc., wherever they might exist.

H. M. Beck, of Chicago, in a paper on "Storage Batteries for Fire and Police Purposes," went into the subject in an exhaustive manner, giving the details of construction and maintenance. He said there are many who have storage batteries who find methods of their own by experimenting and by experience to maintain them up to a high state of efficiency. It was shown that batteries in one instance run down had the polarity reversed, which brought them up to original value in current output. It was shown that this treatment after several graduated charges had produced good results, and that when the charging current was put back to its original pole, i. e., positive to positive and negative to negative, as the batteries were intended to be charged, it was found that batteries had been rebuilt by this process, and excellent results obtained.

"The Work of the Bureau of Standards," including an account of the cooperation of the bureau with municipalities in securing electrolysis mitigation and improving electrical service and meter accuracy, was presented by Burton McCollum of the Bureau of Standards, Washington, representing Dr. E. B. Rosa, chief physicist of the Bureau, who was unable to be present.

The paper went into detail in describing the work of the Bureau and what it expected to accomplish in the future. It was exceedingly interesting and was illustrated with stereopticon views.

Dr. Steinmetz remarked that the government appropriation for the work of the Bureau was totally inadequate and hoped the Association would use its influence toward obtaining more recognition for the Bureau.

The paper on "Uniform Electrical Standards," by Dr. John Price Jackson, of Pennsylvania, was presented by J. Herman Kinseley, of Harrisburg, Pa., and was a plea for uniformity in standards pertaining to everything electrical. In the discussion that followed, W. J. Canada of Washington said, "Speaking for the Bureau of Standards, we appreciate the strong appeal for national standards. Dr. Jackson has the benefit not only of long engineering experience, but also of contact with life hazards which his connection with the largest state industrial commission has given."

One of the most interesting papers brought to the attention of the convention was that of W. H. Flandreau, of Mt. Vernon, N. Y., president of the Association, on "The Responsibility and Importance to the Public of the Office of Municipal Electrician or Superintendent of Fire and Police Telegraph." He made a plea that the men in charge of the fire and police-alarm signal systems throughout the country be paid salaries commensurate with their calling, stating that "upon these men depends very largely the safety of the public, in keeping down losses of life and property by fire, and in maintaining the efficiency of the police service." In the discussion that followed, Dr. Steinmetz urged the city electricians and fire and police-alarm superintendents to keep the public fully informed on those subjects, stating that the more the public knew of those matters, the more they would support their requests for larger appropriations. He also believed that more efficient results would be found where fire and police-alarm systems were maintained separately from fire-department control.

Price I. Patton, second assistant manager of the Electrical Bureau, Philadelphia, in speaking on "Police Patrol and Fire-Alarm Records," described the method in use in Philadelphia in keeping such records, which received much favorable comment.

One of the most interesting papers brought to the attention of the convention was that on "Standards for Fire-Alarm Installations," by F. A. Raymond, of New York, of the National Board of Fire Underwriters, which was followed with close attention. Mr. Raymond stated that the paper was intended as a basis for discussion of fire-alarm systems for cities, rather than an attempt to lay down any fixed rules. He referred to the different classes of street boxes, of the improvements made in fire-alarm systems and made numerous suggestions for still further improvement in the receiving and transmitting of alarms, care of battery rooms, etc.

He stated that when the National Board of Fire Underwriters began to investigate and report on fire-alarm systems, it found no fixed standards and no scale by which the relative merits of any fire-alarm installation could be determined.

In the discussion that followed the suggestion was made that an approved list of fittings for fire-alarm boxes be prepared by the Underwriters' laboratories, but no definite action was taken on the suggestion.

C. E. Convers, of San Antonio, Texas, read an interesting paper on "The Fallacy of Placing Fire and Police-Alarm Wires in Telephone Cables," in which he advocated the use of separate cables for fire-alarm purposes.

L. S. Brach, of Newark, N. J., read a paper on "Lightning Protective Apparatus for Fire and Police Telegraph Circuits," in which was mentioned the many benefits resulting from their use.

Walter Bischoff, of Chicago, made a talk on "Jovianism" and spoke of the coming observance of Electrical Week, which is to be general throughout the country and urged upon the electricians the importance of being members of the Order.

Reports of various committees were adopted and ordered printed, and embraced reports of the Committee on the Grounding of Boxes, recommending that the Association should not go further than it already has gone in placing itself on record favoring a ground.

The Committee on Overhead Line Construction reported progress and stated that it was desirable to extend the work beyond the general recommendations made at the last convention, for the reason that the National Bureau of Standards in preparing the safety code which will deal with this construction, and the Association is co-operating in the preparation of the same and further action will be postponed until the National Electric Code is issued by the Bureau of Standards.

The report of the Electrolysis Committee represents data and recommendations of the Bureau of Standards and the committee was continued.

Digitized by Google

The Committee on Municipal Lighting reported that such a committee can be of great value to the members of the Association whose departments have jurisdiction over such matters. Among the subjects recommended to be considered is that of an analysis of street-lighting rates, in order to find the most equitable and intelligent method of determining the price that should be paid by a municipality for public lighting, at the same time allowing the utility company an equitable return on the actual investment.

Before adjourning resolutions were adopted praising the hospitality extended by Cincinnati, especially by D. H. Fisher of that city, chairman of the Arrangements Committee, Fire Chief Bunker, Mayor Spiegel and the citizens generally, it being the universal opinion that the convention was one of the most successful ever held.

Election of Officers.

The following officers were elected to serve during the coming year:

W. H. Flandreau, president, Mt. Vernon, N. Y.

Dr. Charles P. Steinmetz, first vice-president, Schenectady, N. Y.

Frank T. Brooks, second vice-president, Indianapolis, Ind.

C. E. Convers, third vice-president, San Antonio, Texas.

L. S. Bosley, fourth vice-president, Springfield, Ohio.

Clarence R. George, secretary, Houston, Texas.

C. E. Diehl, treasurer, Harrisburg, Pa.

The new Executive Committee is composed of: Robert J. Gaskill, chairman, Fort Wayne, Ind.; John Thomas, Scranton, Pa.; D. H. Fisher, Cincinnati, Ohio; R. C. Turner, Atlanta, Ga.; Jos. Macaulay, St. Paul, Minn.; Emil Schmidt, Rochester, N. Y.; W. H. Thompson, Richmond, Va.; C. F. Gaul, Louisville, Ky.; W. P. Briggs, New Bedford, Mass.

Exhibitors.

Westinghouse Electric & Manufacturing Company. J. I. Brett, manager Cincinnati office, in charge. Showed metallic flame and flame carbon arc lamps, also Mazda C lighting fixtures.

L. S. Brach Supply Company, Newark, N. J., represented by Mr. Brach. Showed lightning arresters, terminal blocks and introducing traffic signals.

Economy Fuse & Manufacturing Company, Chicago, represented by A. L. Eustice, A. E. Tregenza and H. S. Day. Showed Economy renewable cartridge fuses.

Manhattan Electrical Supply Company, of Chicago, represented by F. J. Foster, of Cincinnati. Showed Red Seal dry batteries.

H. W. Johns-Manville Company, represented by H. L. Steiner, manager Cincinnati office. Showed fuse devices, fiber conduit, batteries, friction tape and meter-protective devices.

American Steel & Wire Company, represented by members of the Cincinnati office. Showed lead cable and bonds.

Gamewell Fire Alarm Telegraph Company, represented by C. F. Maulin of the Chicago office and O. P. Crocker, general agent. Showed six-circuit automatic storage-battery switchboard, new type Peerless positive non-interfering high-tension current-resisting fire-alarm boxes; also new types of punch registers, time stamps, police signal apparatus and various devices for calling patrolmen who are patroling their beats.

Safety Insulated Wire & Cable Company, M. B. Austin & Company, district managers, represented by Arnold Friend, of Chicago. Showed Safety fire and police cables, steel-tape cables, which are being extensively used without conduits.

Western Electric Company, represented by Jack Nolloth, of the Cincinnati office, and G. M. Crammond, Showed line of P. B. X. boards, and police and mine sets. Also a standard line of common-battery sets and lead-covered insulated telephone cable.

Kellogg Switchboard & Supply Company, represented by E. A. Woodward, of Chicago. Showed combined telegraph and telephone equipment, operating on same circuit without interference. Also central-office equipment, switchboard of improved type, controlling a number of circuits.

Star Electric Company, represented by J. W. Mackay, F. F. Stover and Ollie Doolittle, of the Chicago office, and E. D. Fay, of Newark, N. J Showed a 10-circuit repeater, engine-house set, register, time stamp, take-up reel and fast time register for six blows per second. Also six styles of boxes, three styles of gongs and a 12-circuit switchboard.

General Electric Company, represented by G. Francis Gray, of Schenectady, N. Y. Showed vacuum lightning arresters, high-frequency testing oscillator, multigap and compression chamber lightning arresters for 2,300-volt circuits. Also incandescent and arc lamps for street lighting.

Large New Telephone Exchange Building for Chicago.

What will be one of the largest telephone exchanges in the world is now being completed by the Chicago Telephone Company at 6041 Kenwood Avenue, Chicago, Ill. It will take the place of the present Hyde Park Exchange located at 5723 Dorchester Avenue.

The original equipment will be adequate to serve more than 25,000 telephones, which is a larger number of telephones than there is in the whole city of New Orleans, La., or in Jersey City, N. J., and more telephones than are in service in the countries of Greece, Portugal, Servia and Bulgaria combined.

The "A" switchboard of the exchange, where all incoming calls are received, will have positions for nearly one hundred operators and extend in a continuous line as long as half a city block. The distributing frame, where the cables containing the wires that connect subscribers' telephones terminate, is the largest frame of its kind ever installed.

Three separate exchanges will be housed in the new office building—Hyde Park, Midway, and Blackstone—and the structure is large enough to care for three additional exchanges, which it is expected will be required.

The new building is four stories in height, of brick and reinforced concrete and, like all the other exchanges of the Chicago Telephone Company, thoroughly fireproof, affording the greatest measure of protection to operators and other employees.

Electric Heating and Heat Storage.

An article by M. Semenza in *Elettrotecnica* deals with the subject of electric heating under conditions where heat storage is necessary, so that a demand will not be put upon the power plant at times of peak load. It is aimed to utilize energy for heat during the night and through storage to make this available during the day.

A comparison is made with a central hot-water heating system and it is assumed that heat will be required during a period of 120 to 140 days during the year. It is found that an exceedingly low rate for electric energy is necessary to compete with the hot-water heating system. The cost of apparatus, its installation and the provision of necessary capacity in the distributing system are important items on account of the shortness of the period of utilization.

The author concludes that this method has not great possibilities under present conditions in Italy.

The use of various materials for use in heat storage is considered. For a room having a volume of 100 cubic meters, it is necessary to accumulate every night 28,000 large calories. The materials considered for this purpose are water, cast-iron, bricks, cement and granite. While the other materials may be used at higher temperatures, he concludes that water whose limiting temperature is only 100 degrees centigrade, the most satisfactory substance.

Digitized by Google

Electrical Construction

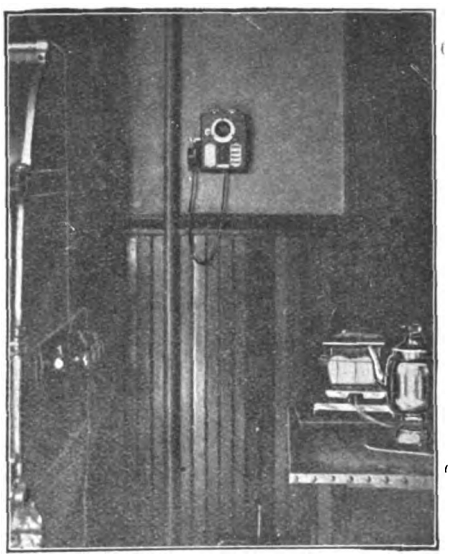
An Electrical Contractor Who Practices What He Preaches.

It is a well known fact that the professional man's profession never quite extends to himself; a doctor who is never sick, a dentist with perfect teeth or a reverend's children who are paragons of virtue are among the many examples to prove this contention. Under the same general heading we have the electrical dealer who hopes to introduce electrical devices into the homes of his community and who uses gas for light and cooking, lets his wife turn the washer by hand, fans himself during the summer months with a piece of cardboard on a stick, and otherwise adheres to the customs of his fathers, meanwhile attempting to educate his fellowmen in the "Do-It-Electrically" doctrine. E. P. Smith, of Dubuque, Iowa, is an electrical dealer who is the exception that proves the rule.

Mr. Smith has made his home electrical from cellar to garret. The lighting system starts at the curb where a boulevard post of special design stands sentinel. The illumination of the home and garage is solely electrical, taking the form of direct and indirect systems according to conditions met. Special circuits for emergency or burglar lights, controlled from several locations, light five lights on the outside of the house, and all the lights in every room in basement, first and second floors.

The Home.

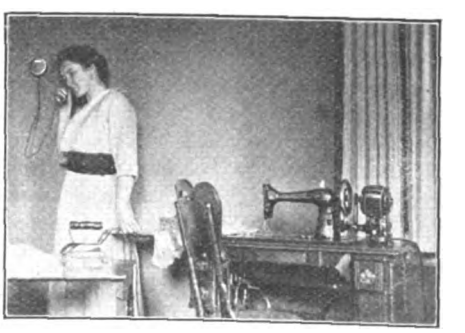
A two-horsepower stationary vacuum cleaner in the basement, with a remote control switch on every floor, keeps the house clean. In winter the rooms are heated by a hot-water boiler with electric thermostatic control, and in summer they are cooled with twelve-inch fans permanently fastened to the walls of the various rooms and eight-inch portable fans that are capable of being placed where needed. The water supply, which is heated in the summer months by an electric water heater, is furnished by a water cistern with an automatic electric control pump. The laundry is equipped with an electrically driven washing machine, an electrically driven and heated ironing machine, an electric iron and electric clothes dryer.



The Pantry.

The cooking is done on individual units, which have been provided for by equipping the kitchen and dining-room tables with plugs and receptacles. The dining room is also furnished with a special electric cabinet with sufficient equipment to cook a light meal. In the sewing room a motor runs the machine and an electric iron has been provided for light pressing. The piano is played by means of a special electric attachment, current for which is supplied by a motor generator set. A ten-station Interphone system provides instant communication between any two rooms in the home and between the home and garage. The garage is electrically lighted and is equipped with a one-half-horsepower motor which does grinding and polishing work.

The entire electrical equipment, which was furnished by the Western Electric Company, serves not only to lighten the work of the Smith household, but has the added distinction of serving as a permanent exhibit by which Mr. Smith is able to demonstrate conclusively and prove that the electrical household appliance is as necessary as it is practical. When a prospect says: "Well, it looks all right here in your store, but I don't believe it'll work in my home," he is promptly taken to the Smith home, where he sees that particular device at work. The bills for current consumption are open for his perusal and he has but to ask the domestic to get first-hand information regarding results obtained with the devices. Mr. Smith is convinced that his scheme is the best for real sales results and it remains for the other electrical dealers to try this system of practicing what they preach that they too may be able to reap the benefits in increased sales.



The Sewing Room.

Grounding Insulator Circuits.

In a paper in the *Elettrotecnica*, G. H. Semenza reports experiments upon grounding the supports of insulators in concrete cellular switching compartments in order to discover whether this practice gives the results expected or whether it increases the hazard.

It is generally feared that an accidental contact between a high-tension conductor and the wall of the cell will be dangerous for a workman when the circuits have not been grounded. But the author's experiments show that for voltages as high as 61,000 these fears are groundless.

On the contrary, the author considers the practice undesirable as introducing a greater likelihood of interruption to service, since an arc-over is rendered easier in case of excessive voltage.

During the first year's operation of the Panama Canal, which ended August 14, 1915, there passed through the canal 1,317 ocean-going vessels.

Digitized by Google

Wiring and Conduit Work at the Panama-Pacific Exposition.—II.

By A. A. Willoughby, Pacific Coast Correspondent.

Type of Cable.

After the plans for the underground conduit network had advanced to the point of being ready for constructional details, the engineers next took up the question of working out the type and voltage of the distribution cables and the location and type of transformer stations at the terminals of these cables.

Studying closely the relative merits of the 2,300-volt delta-connected as against the 4,000-volt four-wire star-connected distribution system, the advantages offered by the latter in the saving in cables and the fact that it possesses the utmost flexibility in absorbing the various characters of loads which would be imposed on it, led to its selection as the standard to be used. It was evident from the beginning that the loads were entirely too scattered and too small in quantity at any one point to consider any higher voltages. It will be shown later in this article how well this type of distribution has served the Exposition purposes. In fact, it developed later on considerably more advantages than the engineers had anticipated.

On reaching the decision to use the 4,000-volt system, it was determined to install three-inch Linaduct as being the maximum size necessary to handle 4,000-volt 4/0 three-conductor cable, this being the largest size which was indicated for use in connection with this work. The system is installed mainly in three-inch conduit, with the exception of a certain number of two-inch ducts, principally located in the State and Foreign Section. The two-inch duct was installed with a view to handling the secondary and telephone services and the grounded neutral for the four-wire system. When the time came for actually ordering the cable, the engineers representing the Exposition and those for the power company, gave close attention to the selection of a cable which would serve all the Exposition requirements and still give the power company as much latitude as possible with a view to its future use. The very liberal and broad-minded manner in which the contract was interpreted by the principals on both sides, resulted in the final agreement which was mutually advantageous to the power company and the Exposition. After comprehending the extent of the requirements of the Exposition for cables, it was noted that the power company was likely to become stocked with an altogether disproportionate amount of 4,000-volt cable, although this cable is standard in some portions of its power district. The heavy loads in such places as San Francisco and other points about the bay has forced it to the use of 11,000-volt cable as a standard for city transmission. Consequently the engineers for the power company proposed that they furnish instead of the 4,000-volt, the 11,000-volt cable at the same cost price, with a view to having a more usable product at the conclusion of the Exposition period. The situation became complicated through the fact that the three-inch conduit lines of the Exposition had been laid over the major portion of the grounds and were not of a sufficient diameter to accommodate the 11,000-volt standard round cable. To meet this difficulty, the power company ordered for the Exposition use, an 11,000-volt cable of the sector or clover-leaf type, which is admirably suited to this size of conduit. In the main trunk lines which had not been installed at this time, 3.5-inch conduit was used in order to accommodate a certain amount of the 11,000-volt round type of cable which the power company desired for future use. In numerous runs in the cable system it was found inadvisable to use the higher-voltage cable, on account of the short cable runs which could not be salvaged for future use and these were of the lower-voltage cable.

The result of the whole arrangement was that the Exposition secured an installation with an unusual factor of safety as far as dielectric strength is concerned, and the Pacific Gas & Electric Company secured the desired absorption balance between the 4,000 and 11,000-volt types as would later be used in their own system.

As will be noticed from the diagram of the cable system as installed, Fig. 5, a number of these were in the nature of ties or connections from one transformer station to another. A great many of these cables could have been of smaller size, but again the influence of the contract is shown, it being impractical for the power company to absorb cables of smaller sizes in their local distribution system. In addition to the 4,000-volt network which was the main source of supply for the Exposition consumption and to cover requirements for concessionaires and participants, it became necessary to run two 11,000-volt No. 2 three-conductor cables to serve the two 1,000-kilowatt motor-generator sets and the two 250-kilowatt sets for supplying direct current to the Exposition search-lamps and for special power circuits to industrial exhibits. These motor-generator sets were supplied under the apparatus contract with the power company, the 11,000-volt synchronous motors being a standard unit in its system. The 11,000-volt cables supplied for this work by it were old cables pulled out from the power company's earlier distribution systems elsewhere and were re-leaded for use on the Exposition work.

Transforming Stations.

When the question of transformer stations was first considered, the amount and character of the loads to be handled were absolutely unknown factors. Though the amount of territory to be covered was known with certainty, the Exposition palaces laid out and the amount of aisle and exhibit spaces definitely determined, the solution of the problem was arrived at by allotting to the exhibit area, certain assumed loads per square foot of floor area and to the State and Foreign Section by assuming a certain percentage of area occupied by buildings, on a similar basis.

The amusement-section load was based on loads of similar concessions at other expositions and at amusement parks. The problem in the amusement district was solved by running two aerial lines along the service road at the rear of the concessions' buildings, it being only necessary to hang transformers on poles and structures as required. In the Exposition palaces and in the State and Foreign Section, the problem resolved itself into an estimated balance of cost between the amount of secondary distribution required in these districts as against the additional cost of installing more frequent transformer stations. With the assumed loads as a basis, a system was laid out which utilized to the fullest commercial extent the very favorable contract for leased apparatus and primary cables and minimized, to a great degree, the heavy investment in large distribution secondaries.

In order to comply with the insurance requirements, which was the governing factor in the design of the type of transformer stations used, it was necessary to build these stations of concrete along the outer walls of the main exhibit palaces, with their only opening to the outer atmosphere. These transformer stations or vaults,

Digitized by Google

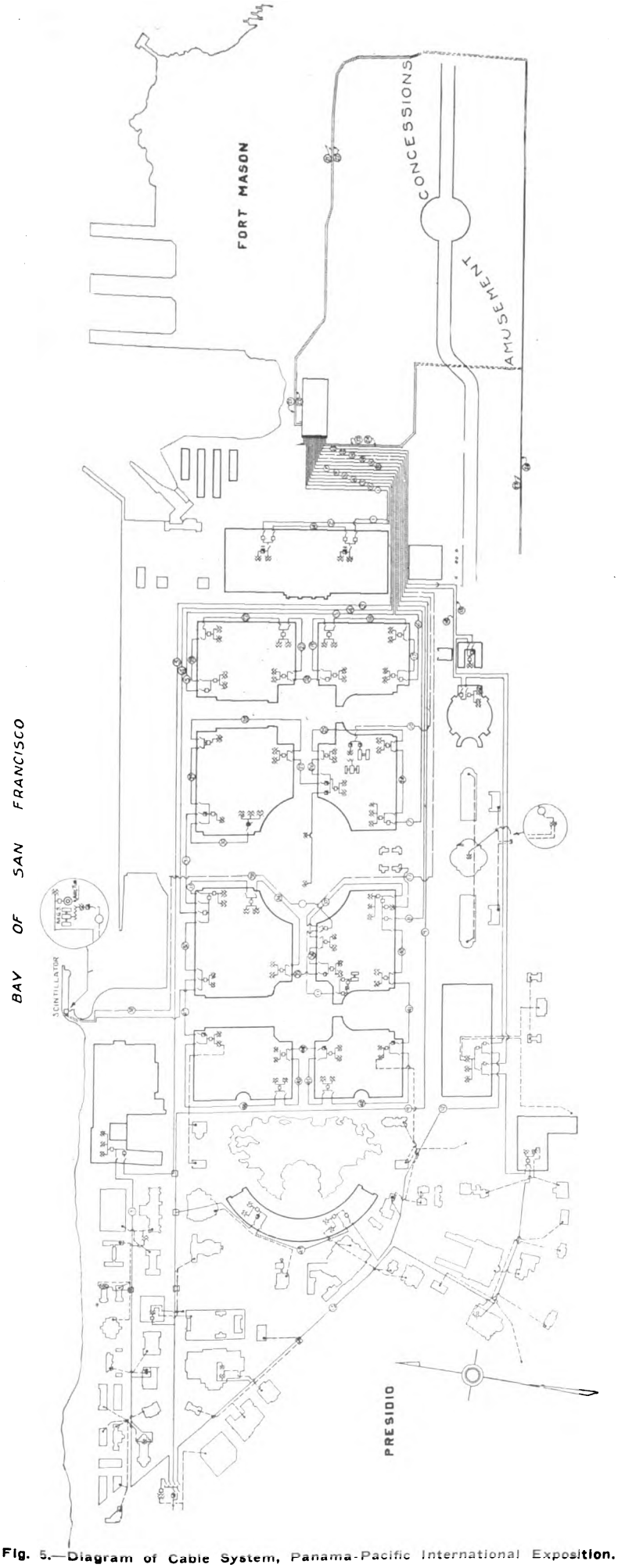


Fig. 5.—Diagram of Cable System, Panama-Pacific International Exposition.

as they are termed, are inaccessible from the interiors of the buildings, but have a ventilating stack which was run up from an inner corner of the vault roof to the roof of the building proper. The door leading to the terraced space in front of the building was made of wood, covered with tin sheeting, hung on an inclined runway by means of rollers, and being held open normally by a fusible underwriter's link. In addition to this door, an outer ventilating door, made of expanded metal, covers the opening and is kept locked to exclude intruders. These vaults were located in the corners of the exhibit palaces, there being from two to four of the stations to each building, dependent on the load conditions.

In the State and Foreign district the vaults were not located in every building, as it was easily seen from the preliminary plans that some of these loads would be very slight. Vaults were located in buildings having the heaviest projected load and were used as secondary distribution control points for adjacent buildings of lighter load characteristics, the main conduit system being used as a distributing medium.

In the design of the interior of these stations the chief consideration was a layout of the utmost simplicity, yet with sufficient wire capacity and floor space to meet the necessary changes in transformer size which the engineers knew would surely have to be made when the final connected loads were known. The principal factor that influenced the design of the interiors was the fact that the power company supplying the transformers requested that all transformers used be of the pole type, as this was the only type in such small sizes that could be utilized in that system. In a very few cases where the loads were unusually concentrated it became necessary to use transformers of the station type in sizes ranging from 100 to 200 kilowatts each. In all cases, however, transformers of the self-cooling type were used.

The scheme adopted, as shown in Fig. 6, was a single weatherproof busbar, supported by glass insulators on a wooden framework, this framework being cantilevered out to support the secondary wiring of the transformers. This framework also serves to support the simple pole-type transformer fuses which were used. The design provided for one bank of lighting transformers and one bank of power transformers, although later developments made it unnecessary in all cases to use both banks. For economy's sake, where the motor load was very light, the small motors were connected to the lighting transformers, as the

Digitized by Google

transformers were banked in star and the 220-volt motors were connected to the 208-volt outside wires of the star lighting mains. Motors as large as 10 horsepower have been successfully run from these mains without unduly disturbing the lighting service.

Secondary Distribution.

As has been mentioned in the earlier portion of this article, the distribution system. In the main exhibit palaces, however, the concentration of loads due to the large number of consumers, made it necessary to run secondary distributing mains for both light and power. In the eight chief buildings, these mains were run underneath the exhibit space floors, there being an excavated basement varying in depth from 5 to 7 feet beneath these buildings. These mains were run independently from each transformer vault and were purposely not interconnected so as to localize as far as possible any interruptions to exhibitors' service, this advantage being considered of more importance than the slight saving in copper that would be effected by interconnecting the secondary network.

Fig. 6.—Typical Lighting and Power Transformer Banks.

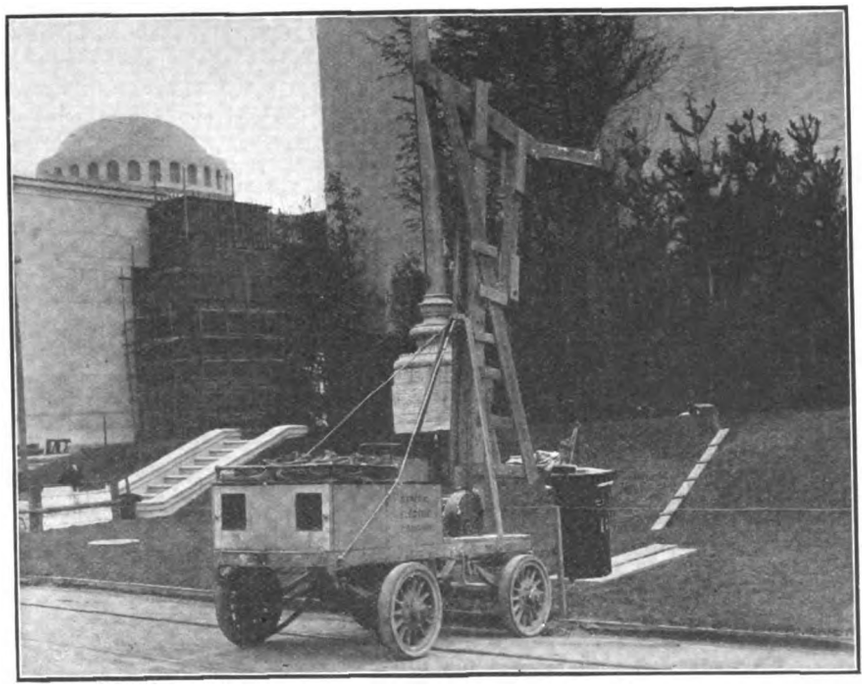


Fig. 7.—Derrick Used in Handling Transformers.

in the amusement section is by means of overhead 4,000-volt pole lines in the rear of the concessions buildings. The secondaries were run along building walls and over roofs by means of brackets and framework along the usual lines employed for this class of work. In the State and Foreign Section the distribution was accomplished from transformer vaults located in the larger buildings, the distribution being handled through the main conduit

The power mains were run from 220-volt delta-connected transformer secondaries and the lighting mains from 120-volt four-wire three-phase star-connected transformer secondaries. The control of both the power and lighting buses is by means of knife switches, mounted on simple wooden racks bolted to the face of the concrete transformer vaults, the leads from the transformer being brought through the wall in a sealed tube. This carried out the idea of isolating the vaults from the buildings proper as recommended by the underwriters. The flexibility of the four-wire three-phase lighting mains was such that by balancing between the exhibit loads, it was possible to carry the lighting circuits in single-phase, three-wire two-phase, and four-wire three-phase, and the power circuits in single-phase and three-wire three-phase, all connected to the single set of mains. This was a most important development in the cost attached to making the numerous minor services in the exhibit palaces.

In order to economize on meter installations, a set of rules was promulgated for the main exhibit palaces which required the exhibitors to connect to a single phase of the lighting mains for loads up to 5 kilowatts; to two phases of the lighting mains for loads up to 10 kilowatts, and to make four-wire three-phase lighting connections for loads over 10 kilowatts. Single-phase motors up to one horsepower were allowed connected to the lighting mains and three-phase 220-volt motors of larger sizes were permitted to connect with the lighting mains for purposes of economy where the loads on these motors would not disturb the regulation of the adjacent lighting circuits. In the Palaces of Machinery and Horticulture and the exhibit section of the California Counties Building, where no basements existed, the mains were run along the horizontal bracing trusses and supported by porcelain cleats, the same type of distribution obtaining as in the eight buildings of the central group. All wire used in these mains was of the weatherproof variety, which offered the advantages of lower first costs and equal salvage in weight of copper.

In the design of the lighting mains in the various Exposition palaces, their size was determined by balancing the projected day load that would be imposed by consumers and by the Exposition's daytime activities against the night illumination load and the janitor lighting which comes on after the consumer's load has disappeared. There is a very slight overlapping of the customer's load due to cleaning up in individual booths, but as the main exhibit palaces were planned to and

Digitized by Google

do close at six o'clock, the bulk of the day load is off before general illumination begins.

Metering.

The question of selecting the type of meters to be used in metering the Exposition current consumption was of vital importance to the engineers of the power company, because the character of the Exposition consumers' loads was in so many cases so radically different from the character of the loads on the power company's system. The Exposition engineers, knowing that all meters must be ultimately absorbed into the permanent commercial installations of the Pacific Gas & Electric Company, gave the engineers of the latter company the amplest latitude for selection of types that were consonant with commercial accuracy in metering. The consequence of this arrangement was that the Exposition in most cases used three-wire meters on two-wire single-phase installations. In order to give the power company the benefit of more meters of smaller capacity than could be used on the Exposition system, a large number of 25-ampere three-wire meters were cut over at a very small cost with coils in multiple, giving the equivalent of 50-ampere single-phase meters, which was the size mostly used on the Exposition loads. The meter readings in these cases had to be multiplied by the constant 2 due to the current coils receiving only half the normal supply. The total expense of making both the initial and final change in these meters is approximately 60 cents per meter.

With the conventional plan adopted of dividing the loads into 5 kilowatts for single-phase loads, 10 kilowatts for two-phase loads, and over 10 kilowatts for three-phase loads, the meter situation was very much simplified. Due to the unbalance that must necessarily occur in loads of exposition character, single-phase metering was used throughout and following the above divisions of loads; the 50-ampere, two-wire meter or its equivalent serves about 90 per cent of all exhibitors' load connections. This was of very considerable advantage in minimizing the number of square meters.

All consumers were required to build wooden or metal boxes of approved design and size, these boxes being equipped with hasps for sealing and small glass panels set into the door opposite each meter dial. This plan served the two-fold purpose of preventing unauthorized persons from tampering with meters and gave the Exposition's meter readers a view of the dial without having to open the meter box. The general plan of handling consumers' installations was to have the consumer run his service from this meter box to the Exposition mains, terminating at the mains in a metal fuse box and allowing sufficient wire for a meter loop at one end and for connections to the mains at the other end, the Exposition's service department having to do only the actual work of connecting in the meter and making the service taps. The services were required to be run in conduit within the main group of Exposition palaces and in the State and Foreign pavilions, but in the concessions' district, which is served from aerial pole lines, the services were run in open weatherproof construction, except the usual service pipe entry to the building proper.

(To be continued.)

Electrolysis Mitigation in Springfield and New Elyria, Ohio.

A forthcoming publication on electrolysis mitigation in Springfield, O., is one of a series of technologic papers issued by the Bureau of Standards on this subject. The aim is to reduce the damage done to city water and gas mains, underground telegraph and telephone cables, etc., by stray currents from electric railway lines. It is shown how, by the use of a specially designed copper cable system, improved rail bonding, and suitable cross connection between different railway lines, the leakage currents in these underground structures were reduced so that the damage by stray currents is now practically negligible.

The report also contains recommendations that should be followed in the future, both by the railway companies and by the city authorities, to maintain these satisfactory conditions. It is the aim of the Bureau that this definite and detailed report upon the problem of electrolysis mitigation in Springfield will be of service to other American municipalities that have to deal with similar problems, which in their early stages need careful engineering investigation rather than ill-considered legislation for their solution. The paper was prepared by Messrs. McCollum and Ahlborn.

Changes in the feeding distances of the power house are recommended in the preliminary report on electrolysis mitigation in Elyria, O., made by Burton McCollum and K. H. Logan in the form of a paper which has been issued by the Bureau of Standards.

From data furnished by the city and the Cleveland, Southwestern & Columbus Railway Company, the feeding distances of the Elyria power house are found to be too long and the potential gradients too high. It is recommended that the gradients be reduced to 0.3 volt per 1,000 feet average for 24 hours by the addition of a substation, the interconnection of the tracks of the two electric railways, and the installation of an insulated return-feeder system.

The saving in power due to the reduced feeding distance is shown to be more than sufficient to pay the annual charges on the additional investment of $34,373. The plan provides for 800 kilowatts additional substation capacity, improved operating conditions, and substantial elimination of electrolysis.

Copies of this report may be obtained by application to the Bureau of Standards, Washington, D. C.

Building Congress to be Held in San Francisco.

The National Association of Builders' Exchanges at its convention in Columbus, O., last January, fixed the week of October 18 to 23 as American Builders' Week, to be observed at the Panama-Pacific Exposition in San Francisco.

Elaborate preparations are being made in the latter city to properly carry out the objects of this convention. It will be of importance not only to builders, but to those interested in allied trades, such as the electrical contractors.

The ballroom at the Inside Inn will be the Association headquarters, while the opening ball on the evening of October 18 will be held in the new auditorium at the Civic Center. A reception will be held during the week at the California State Building and on the evening of Saturday, October 23, there will be a grand banquet at the Palace Hotel.

Additional information regarding American Builders' Week can be obtained from the Publicity Committee, General Contractors' Association, 110 Jessie Street, San Francisco, Cal.

Voltage Diagrams of Autotransformers.

C. D. Salda in *Elettrotecnica* develops the diagrams for voltage in a step-down autotransformer, pointing out that in a transformer with two separate windings the magnetic flux decreases from no load to full load, whereas in an autotransformer operating at constant voltage there is an increasing from no load to full load for any type of load, whether inductive, non-inductive or with leading current. This applies especially to transformers with a ratio less than two to one.

Philadelphia Mardi Gras.

The electrical interests of Philadelphia are arranging for a Mardi Gras celebration to be held at the athletic grounds of the Philadelphia Electric Company on September 11. A similar affair was held last year and proved a big success. It is expected this year to excel the record of last year.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Fuses for Alternators.

Question 308.—Why are not alternating-current generators and their exciters required to be protected by fuses or other equivalent devices?

Answer 1(O). In the 1905 edition of the Code there first appeared the exception referred to. The Code previously required all constant-potential machines to be protected by "a safety fuse or equivalent device of approved design." When this exception first appeared in the Code it had become standard practice with central stations to use alternating-current machines generating at 1,100 or 2,300 volts; and the fact that there was not then, nor is there as yet, any listed fuse or circuit-breaker specifically approved for over 600 volts, would be one fairly good reason why the use of such a device is not required.

Answer 2(K)*. Because from the design of the machine it is quite improbable that sufficient current could be generated at any speed to cause injury to the machine or its windings.

Answer 3(P)*. Because the interruption of the circuit by the blowing of a fuse would cause more damage than would the troubles resulting from the absence of fuse protection.

Answer 4(R)*. Due to the construction and the general characteristics of alternating-current apparatus excessive overload is not so injurious as would be the case with direct-current machinery. The modern procedure in the power station is to insert in series with the alternator a reactance, so proportioned as to limit the current to a fixed value, say 200 per cent overload. Smaller generators in this vicinity are generally arranged for no-voltage and overload relay protection. The necessity of re-synchronizing synchronous motors, etc., makes it imperative for continuity of operation, to keep alternating-current systems always alive.

Answer 5(L). To answer this question in the space allowed would be impossible. Would suggest the author of this question can obtain full and complete information by study of any of the books on alternating currents and their phenomena.

Answer 6(T). Because of the inherent qualities possessed by an alternating-current generator it is not considered necessary to protect it, especially as a protective device would be liable to be opened frequently by momentary heavy synchronizing current, if generator was operated in parallel with others. The quick opening of such devices is also liable to give rise to instantaneous high voltages on system. The quick opening of an exciter circuit is liable to prove injurious to field winding of generator.

Answer 7(B)*. The characteristics of alternating-current generators and their exciters are such that it is not advisable with the modern types of apparatus to use fuses or other equivalent devices for the protection of same. In case of trouble on the modern types of machines, while the current for a fraction of a second jumps to ten or twelve times its normal load, it drops back to something under three times its normal load, which the machine can take care of until the attendant has an opportunity to cut same out of operation. If circuit-breakers or similar devices were used for the protection of this type of machine in stations, they would be a source of annoyance from their operation when machine was out of synchronism with other station apparatus.

Answer 8(M). Alternating-current generators are not required to be protected by fuses or equivalent devices for the following reasons:

1. Alternating-current generators are usually found in power stations and then under competent supervision. In the event of trouble in the generator the operator would disconnect the machine from the bus by opening the oil switch.

2. It is not practical from an operating standpoint to have a machine disconnected from the line by a circuit-breaker in the event of an overload of short duration.

3. If the overload were a "dead short" the operator would disconnect the line upon which the trouble appeared to exist.

4. If the generator were to be relieved of its load suddenly there would be a momentary rise of potential that might puncture or break down the insulation of the generator winding.

5. A generator driven by an engine with a sluggish governor would "race" if the load were suddenly relieved, and likely harm the equipment.

In the case of exciters for alternating-current generators:

1. If an alternating-current generator were to lose its field the generator would be relieved of its load, which from a point of operation is not very desirable.

Digitized by Google

2. Fuses or equivalent devices are not required, as the load on an exciter is constant and supplying the current for excitation is usually the exciter's only function.

Answer 9(J). The outgoing circuits from an alternator should be protected with fuses or circuit-breakers installed on feeder panels. The impedance of the common type of alternator is such that a short-circuit of brief duration is not liable to injure it; hence, any protection further than this is not usually necessary. Moreover, where alternators are to be operated in multiple, fuses or circuit-breakers would be objectionable because of their liability to open under the action of cross-currents when an incoming machine is being thrown on the busbars.

When alternators are running in multiple the blowing of an exciter fuse might leave one machine without excitation and with the voltage of the others impressed upon its armature. As a safeguard against this fuses are generally left out of exciter circuits.

Answer 10(F and G). There appear to be several reasons for not requiring alternating-current generators to be fused or equipped with other similar devices, among which are the following:

When we consider the great amount of inductively wound apparatus connected to alternating-current generators we can readily appreciate the destructive high-potential surge that would occur if the circuit was suddenly opened at the peak of the current wave, which might happen if fuses are used.

If alternating-current generators are connected in parallel there is sometimes a surging of current between the two machines. This condition rectifies itself as the machines get in proper step, but if fuses were used to operate near normal current, first one machine and then the other would go out and shut down the plant, and any fuses used would have to be so large that they would lose their effectiveness.

The armature winding of an alternating-current generator has a very high inductance compared with a direct-current generator. This inductance is caused by the higher frequency and the method of arranging the winding. The inductance causes an armature reaction which tends to weaken the field magnetism and reduces the effective voltage when the current is increased. This condition is more readily understood when we consider the series arc machine, which has an armature reaction high enough to reduce the voltage and limit the current flow to a point very little above normal, even under short-circuit conditions, so that unless the field strength is increased the current flow from the machine is restricted.

In regard to the omission of fuses for the exciter, it is common practice to place all generator fuses on the switchboard. This leaves the mains between the generator and the board unprotected, and experience appears to justify this method. Under these conditions it is not necessary to fuse the exciter or the exciter mains. Under no circumstances are fuses required in the field circuit of motors or generators. From the above we can readily see that fuses are not necessary in any part of the exciter circuit. It might also be incidentally mentioned that if the exciter circuit opened during parallel operation of the alternating-current generators it might result in a shutdown of the entire plant.

Answer 11(H)*. I do not know, but believe they should be protected in some way.

Answer 12(N).* As to the exciter it is most important that the field of the alternator should be maintained. Further, the exciter is relatively small. The alternator field is a heavily inductive load, and if suddenly opened by a blowing fuse is likely to be punctured, so that altogether it is more judicious not to fuse the exciter circuit. If some protection appears necessary it can be provided by arranging for the automatic weakening of the exciter field.

As to the alternating-current generator, if of low voltage it is wisest to fuse each outgoing feeder circuit. In higher-voltage machines fuse or protect on the line side of the transformers in a similar way. The reactance of the armatures (together with suitable current-limiting reactances) will protect the machines long enough for the operator to take any necessary steps and will avoid the dangerous possibility of a sudden rupturing of an inductive circuit on the crest of the wave.

Fuse in Grounded Generator Lead.

Question 309.—Why should the fuse be placed in the grounded lead when a generator has one terminal grounded, as referred to in Rule 1d, fourth paragraph? Does this refer to railway generators, and why is the exception made for electrically driven generators?

Answer 1(O). The fuse is required in the grounded lead of a generator on a two-wire grounded circuit, so that it will surely be in circuit no matter at what point an accidental ground may occur on the other side of the circuit or even in the machine itself. The rule finds its principal application in street-railway work. If the generator is driven by a motor, adequate protection can be secured by the motor fuses.

Answer 2(K)*. (a) Because if fused on the non-grounded side and the fuse should blow, the machine windings would be placed under stress to ground, which might rupture the insulation. In that event the circuit would be again completed from ground, through machine windings (or a portion) to ground with no fuse protection interposed. The same is also true of an accidental ground occurring on the machine side of the fuse.

(b) Railway generators are included in this rule.

(c) It is assumed that the protection on the motor side of electrically driven generators will protect against excessive current in the generator.

Answer 3(P)*. Do not know.

Answer 4(R)*. A generator, not electrically driven, is certain to be clear of the liability of stray currents from a grounded system. Placing the protection in the grounded lead prevents any part of the system, fed from such a generator, being alive to ground in case of a short-circuit opening such protection. Overload protection is generally secured on all feeders in railway work.

Answer 5(L). This question is difficult to answer in these columns, as the author has tangled up grounded terminals and grounded neutrals of three-wire systems on electrically driven balancing sets. Would again suggest that a little study in any of the standard works will enlighten him.

Answer 6(T). In reference to rule 1, section *d*, fourth paragraph, I cannot find any exception made to railway generators, and would say that same should apply if generators supplying railway systems are other than electrically driven.

Answer 7(B)*. The requirement that fuse be placed in the grounded lead when generator has one terminal grounded, is so that all current shall pass through said device, which might not be the case were it connected in the other lead permitting part of the current flow to shunt through the equalizer.

Answer 8(M). Rule 1*d* does not refer to railway generators. The exception is made, no doubt, because of the protection afforded the generator on the motor side. Railway generators are usually 600-volt machines which will sustain an arc, and as the circuit-breakers are connected in the positive lead and the negative lead is grounded on the track, protection is afforded in the event of a grounded wire or object coming in contact with the lead of positive polarity. If the fuse or circuit-

Digitized by Google

breaker were placed in the grounded lead, the generator would have no protection, other than the relays on the motor, in the event of a ground coming in contact with the positive lead.

Answer 9(H)*. I can see no good reason for fusing the ground leads.

Answer 10(N). There are many reasons for this requirement; it certainly does apply to railway generators, and the reasons may most simply be summed up by saying that experience obtained in the early days of such railway working demonstrated that a higher degree of protection was thus obtained. As to the exception of electrically driven generators: Assume the generator to have 95 per cent efficiency at full load of 100 kilowatts and 90 per cent at 25 per cent overload; at this latter point it will call for an input of 140 kilowatts or a little less. This 140 kilowatts will be the motor output and if we again assume 90 per cent efficiency the motor input will be 156 kilowatts. We must protect the motor, and unless this is unreasonably large, it is obvious that its fuses must always let go before the generator reaches the danger point, while the elasticity of the set will prevent their letting go under a very brief generator overload (the momentum of rotating parts supplying the requisite energy for a brief space of time), whereas fuses in the generator outgoing side might let go and cause a loss of voltage on the lines it was supplying. This is, of course, undesirable.

I do not feel, however, that this applies except in the case of individual drive, as in case of several machines driven by one motor large enough for all together the reasoning would no longer apply. This, however, would be a very exceptional and usually inefficient arrangement, and I think is not contemplated in the rule.

Answer 11(F and G). When a generator has one terminal grounded, a fuse placed in the circuit between the machine and the ground will protect the generator in addition to the insulated wire, whereas if the fuse is inserted only in the ungrounded terminal, the generator has no protection against excessive current in event of the winding of the machine being accidentally grounded. Railway generators are included.

I believe the exception for electrically driven generators only applies when driven by individual motors. The reason for not requiring fuses in the generator leads under these conditions is probably because the motor fuses can be depended upon to operate if any abnormal quantity of current flows from the generator.

Public Service Commissions

Conducted by William J. Norton

IDAHO.

The Great Shoshone & Twin Falls Water Power Company applied for and was granted leave to adopt a form of application for electric air-heating service and contract therefor, together with rules and regulations adapted to such service.

Where heating service is furnished the customer all electric energy used by the customer is to be purchased from the company. The rules state that the heating service will not be supplied in excess of the station capacity available for such service, and explains that "the furnishing of electricity for air-heating service is possible only because the company now has station capacity and distribution equipment available during the winter months, for the use of which no remunerative service can at present be obtained. Such electricity, therefore, is in the nature of a by-product, and a limited amount is offered for air-heating service pending the time when a more remunerative service can be had."

The Great Shoshone & Twin Falls Water Power Company and the Southern Idaho Power Company have filed schedules of rates for incandescent municipal lighting service. The rates of both companies are as follows: $26 per light per year for 100-candlepower units, $38 per light per year for 250-candlepower lights, $44 per light per year for 400-candlepower lights, and $52 per light per year for 600-candlepower lights. The schedule of the Great Shoshone Company was filed for the towns of Amsterdam, Berger, Bliss, Bruneau, Buhl, Filer, Gooding, Glenns Ferry, Hagerman, Hammett, Hansen, Hazleton, Hollister, Jerome, Kimberly, King Hill, Marion, Milner, Mountainhome, Peavey, Oakley, Shoshone, Twin Falls and Wendell; and the Southern Idaho Company, for American Falls, Blackfoot and Pocatello.

MAINE.

The Rumford Falls Light & Water Company asked for approval of a contract under which it desires to furnish electricity to the town of Mexico for street-lighting service. The proposed contract is for a rate less than the regular domestic lighting rate, and for a fixed term.

The Maine public utilities law permits a public utility "to make a contract for a definite term, subject to the approval of the Commission." The Commission says: "Contracts for comparatively long terms between a public utility and its customers, whereby a particular individual or corporation seems to be securing an advantage over a smaller customer, are not now favored by legislatures or public utilities commissions. In the past such contracts (sometimes written and sometimes oral 'gentlemen's agreements') constituted the methods by which rebates and other special and unwarranted advantages were obtained. It was to make such practices impossible, or at least unlawful, that the legislatures in nearly every state during the last seven years have passed public-utility acts and created commissions to assist public service corporations in doing away with the necessity of these special agreements, and to so arrange matters between the corporations and the public that all business dealings should be carried on in the open, each having a full, mutual understanding of the acts and the rights of the other, and each having in the Commission a friend to whom he could at all times go with full confidence in finding a patient ear, a ready though just sympathy, and a full, calm and judicial hearing and decision."

The Commission says that these are cases in which the welfare of the utility, its prospective customers, and the public, require certainty as to the future rate for a particular service. "Frequently the establishment of an enterprise depends upon the certainty of its being able to secure power at a known cost for an extended period. In other cases, where a change of the character of power used is contemplated, the user

Digitized by Google

must know what the future cost will be.

"In still other cases, and the present is an example of this class, a prospective consumer of large units, must determine whether he will generate his own power or purchase from some established utility." * * *

The consumer may be in a position to generate power as a by-product of his regular business, or, as in the case of municipalities, may forego a return on the investment. "None of these considerations would warrant special rates or especially favorable terms to such prospective users. No person may be given a lower rate to induce him to use the current, or to prevent his generating his own power. This decision is to be read with this always in mind.

"But such consumers afford an opportunity for larger producers of power to dispose of what otherwise would go unused. If this surplus energy is sold at any price above the cost of production and transmission, it returns some profit to the utility. To that extent also it assists the general public in carrying the overhead charges of the utility. If a contract is approved which does not promise its full pro rata of the utility's fair profit on its business as a whole, it will be on the ground that it takes care of its surplus product, and no such contract should be presented where it is reasonable to expect that the same units of product might have been disposed of on terms more consistent with the return of approximately the same percentage of profit lawfully enjoyed generally by the utility on its output." * * *

"And so long as the price is sufficient to return some profit to the utility, and is open as long as the utility has current to supply without injury to the general public dependent upon it, it is obviously to the advantage of all that it be permitted to avail itself of the privilege. That the unit required is so large, or the character of its use confined to so few users that its customers under this rate will be few, should not operate against it, provided it keeps reasonably within the spirit of the law. These contracts should and will be scrutinized with great care, but the public interest does not require, and it is not the policy of the law to effect anything that shall stand in the way of the widest reasonable and just expansion of the business of the public utilities of the state."

The contract rate is approved. The company is ordered to file a class rate for the service in question, making the rate open to other customers, although the Commission states that in all probability no other customers will come in this class, but "the statute evidently presupposes the filing of an open rate similar to that on which the contract is based, so that other applicants for service of the same character may know what they are entitled to."

MISSOURI.

The Annual Report of the Missouri Public Service Commission, covering the period from April 15, 1913, to December 31, 1914, has been issued in bound form.

NEW YORK—Second District.

Nassau Light & Power Company. The petition of F. A. Ludlun and others, asking that the Nassau Light & Power Company be compelled to string its wires on the poles of the Glen Cove Light & Power Company in Dosoris Way, Glen Cove, was dismissed, the Commission holding that it did not have power to make such an order.

The Glen Cove has a line of poles upon which it furnishes electric service to private users, and the Nassau company has a contract for street lighting on Dosoris Way. The Nassau company intends to erect its own poles for furnishing street lighting and is unwilling to string its wires on the poles of the other company. The Commission says: "While the Commission can readily see how much better it would be for the appearance of the street if there were only one line of poles in the Dosoris Way, yet, under the circumstances, it has no power to compel the Nassau company to abandon any of the rights which it claims under its existing franchise, nor has it any right, so far as the record in this case is concerned, to compel the Nassau company to put its wires on the poles of the Glen Cove company in Dosoris Way."

OHIO.

The Northwestern Ohio Light Company. The consolidation of the five electric plants of Urban, Van Wert, Delphos, Deshler and Leipsic into an $800,000 combine has been authorized by the Commission. The Northwestern Ohio Light Company was authorized to issue $400,000 common stock and $400,000 five-per-cent bonds, the proceeds to be used in the purchase of the properties to be consolidated.

WASHINGTON.

Deposits for Telephone Service. The Commission has issued an order requiring that the practice of certain telephone companies in the state of requiring a $5 deposit before service is installed, be discontinued. According to the terms of the order, however, the company may exact two months' rental in advance at the time of ordering service, if the charge does not exceed $5. Should the charge exceed $5 the patrons are to pay month to month in advance, and if it does not exceed $5 the portion not absorbed in the first month's rental is to be applied on the succeeding month's rental, the patron thereafter to pay from month to month in advance.

Not only are cash deposits eliminated, but the order also specifies that no other security for installation can be required by the companies.

The order gives the companies the right to disconnect any telephone, private exchange, or other instrumentality of any subscriber and discontinue the subscriber's service on or after the expiration of ten days from the date on which any account for local exchange service or long-distance service becomes due and payable, in advance or otherwise, when such account remains unpaid after the expiration of ten days from that date.

Water-Power Conference to be Held at Portland.

A conference to discuss water-power development has been called to meet at Portland, Ore., September 21, 22 and 23. The delegates will comprise Federal and State Government officials, utility experts, leaders in water-power development, particularly in the West, and others interested in the subject.

Governor Withycombe, of Oregon, chairman of the delegation from that state, has announced the following tentative program of speakers and addresses:

J. C. Ralston, of Spokane, Wash., "Water Power and Its Relation to National Development." Samuel H. Piles, Seattle, Wash., "State Ownership of Water." Reed Smoot, Provo, Utah, "Federal Tax on Water Powers." John D. Works, Los Angeles, Cal.; George E. Chamberlain, Portland, Ore.; John H. Roemer, Chicago, Ill.; Frank H. Short, Fresno, Cal., "The Constitutional Aspects of the Ferris Bill." William E. Borah, Boise, Idaho; Wesley O. Jones, North Yakima, Wash.; Oscar W. Underwood, Birmingham, Ala.; Henry D. Pierce, Seattle, Wash.; David F. Houston, Secretary of Agriculture; Franklin K. Lane, Secretary of the Interior; Lindley M. Garrison, Secretary of War, "Navigable-Stream Water-Power Legislation."

The final program will be comprehensive, covering the various aspects of the subject. It is expected that about one and one-half days will be devoted to the presentation of addresses and papers, leaving the remaining time for general discussion of the subject.

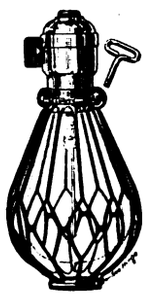
The mule tramway of Maracaibo, Venezuela, is to be changed to electric power, but it has not yet been decided whether the trolley or the storage-battery system will be employed. A storage-battery tram is being tested out at present.

Digitized by Google

New Electrical and Mechanical Appliances

Security Lamp Guards.

A novelty in design and construction is shown in the "Security" lamp guards manufactured by the Flexible Steel Lacing Company, Chicago, Ill. The guard is formed of two shells of expanded steel, hinging together at their base. It obstructs the light to a minimum extent and combines light weight with strength. In addition to guarding against breakage, a special

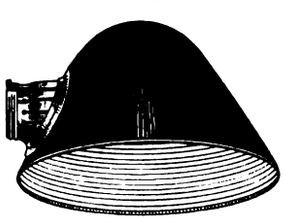


New Simplex Guard.

key-locking device efficiently prevents tampering with, or theft of the lamp. Dealers will be interested to know that it is packed nested, a dozen guards to the carton, and consequently occupies a minimum space for shipping or in the store room.

Parabolic Asbestos Reflector.

A new type of light-weight and relatively low-cost reflector has been placed on the market by the Asbesto-Glean Manufacturing Company, 846



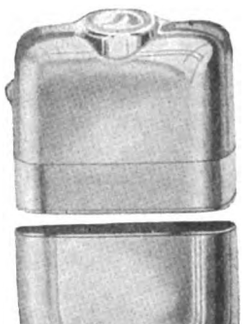
Asbestos Reflector.

South Canal Street, Chicago. This reflector is made of compressed asbestos composition and is similar to the conical reflectors made by this company, which were described in our issue of April 3, 1915. The new reflector, however, is made seamless and has its inner surface corrugated or furrowed so as to eliminate the reflection of bright filament lines on the work. The interior is given a high-grade aluminum finish which is easily cleaned and kept bright. The outer surface has a rich green smooth enamel finish.

These reflectors fit all of the standard brass-shell sockets and are equipped with the Grip-Lock contractile shade-holder by means of which with a simple quarter turn of the grip the reflector can be attached or detached from the socket. The weight of this reflector complete is slightly less than four ounces.

New Kwik-Lite Flashlights.

Electrical dealers will be interested in the 32-page catalog just issued by the Usona Manufacturing Company, 1 Hudson Street, New York City, and 306 South St. Clair Street, Toledo, O. This handsome book fully illustrates and describes the company's Kwik-Lite products, and also gives much valuable flashlight information of general interest. The Kwik-Lite line is complete,



New Vest-Pocket Kwik-Lite.

covering every flashlight requirement, including cases, batteries and lamps. A large variety of new types of cases and battery lanterns are offered, all of which are intensely practical and of exceptional beauty in design and finish.

The new telescope vest-pocket case illustrated herewith is unusually neat and attractive. It consists of two parts drawn from solid sheet brass, and constructed so as to telescope at the center. When pushed together they firmly lock; with a slight pressure on the sides they can be pulled apart and the battery easily inserted. There is not a hinge or a clasp on the entire case.

Another device of much merit is the telescope metal tubular case. It is absolutely non-short-circuiting, and is very strongly made of tubular brass. The lower piece telescopes the upper near the center, this insures maximum strength and permits engaging the screw threads without effort. The lens is secured by a separate screw end ring, which allows a broken lens to be replaced without procuring an entire new head.

All metal Kwik-Lite sets are furnished in a variety of finishes not heretofore obtainable, and provide for a very attractive display and a large sale because they meet the demand of the public for serviceable flashlights of a specially beautiful appearance.

The Kwik-Lite line also includes several very practical types of battery lanterns, fiber tubulars, watch-chain lights, headlights for bicycles and boats and a number of specialties and flashlight novelties, such as gold and ivory tubulars, gold and silver-plated vest-pocket flashlights, pistol lights, etc.

The Kwik-Lite batteries are made for all cases and guaranteed as to life and service. These cases are equipped

Telescoping Tubular Kwik-Lite.

with Mazda lamps, selected with reference to the reflectors in which they are used.

New Prismatic-Glass Window Reflector.

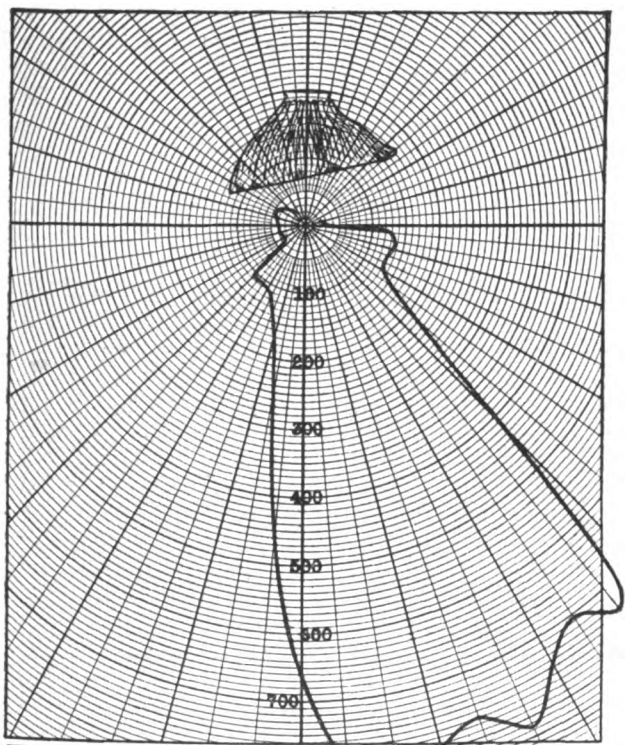
As a result of the agitation to improve the methods of lighting show windows there has resulted an assortment of equipment by means of which this class of lighting can be effectively and efficiently provided. In this line there has recently been placed on the market a new type of prismatic-glass window reflector known as Holophane No. 983. This has the shape shown in Fig. 1, and is designed to be placed at the front upper edge of the window behind the screen usually found in the upper portion of show windows. This reflector is designed particularly for use with the new 100-watt Mazda type C or gas-filled lamps, and usually is mounted in the pendent position shown,

Digitized by Google

being held by a form H shade-holder. The reflector is provided with prismatic ribs on both inside and outside. These are smooth and do not readily catch dust or dirt. However, they can be easily dusted and cleaned as regular cleaning of the lamp itself is necessary.

The shape of this reflector is such that it throws practically all of the light downward and against the back of the window, giving the distribution curve shown in Fig. 2. This distribution is peculiarly suitable for show-window purposes because the maximum illumination is in the zone lying between the vertical and about 40 degrees from the vertical, that is, just where the window display is located. Thus it produces a most effective illumination of the goods displayed without permitting the lamp or reflector to be seen. A small amount of light is permitted to fall upon the upper front portion of the window, which is usually translucent and contains the name of the firm or something relating to the products sold in the store.

Fig. 1.—New Holophane Show-Window Reflector.



ANGLE	CANDLE POWER To Left	To Right	ANGLE	CANDLE POWER To Left	To Right
0	661	661	65	37.2	129
5	461	797	75	39.7	136
10	251	838	85	38.8	128
15	170	797	90	37.4	36.0
20	134	770	95	40.5	29.8
25	116	816	105	44.0	22.2
30	--	747	115	46.1	
35	105	704	125	42.1	
40	--	738	135	33.4	
45	104	409	145	22.6	
50	--	217			
55	33.6	154			

HOLOPHANE ANGLE REFLECTOR
No.983
With 100-watt Mazda C Lamp
at .80 W.P.C.
Form H Holder position
Average of Tests on Four
different samples.
8-2-15

Fig. 2.—Distribution Curve of New Reflector.

In Fig. 3 is shown a convenient chart to aid in determining the type of Holophane prismatic reflector to use for show-window lighting The chart is practically self-explanatory. For windows that are very high compared to their depth, reflector No. 8300 is recommended. For medium - shaped windows the new No. 983 is to be used pendent. For windows that are relatively deep in comparison to their height the latter reflector is tipped upward about 15 degrees. The manufacturer recommends that in determining the size and number of lamps to use, 5 to 15 watts per square foot of window floor area should be allowed, depending upon the nature of the goods to be displayed. The reflectors should not be placed far apart along the upper edge of the window, as too large a spacing produces a lack of uniformity of illumination.

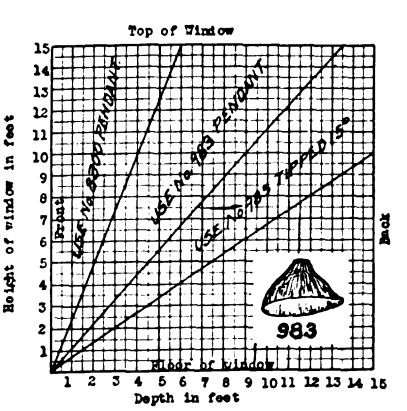
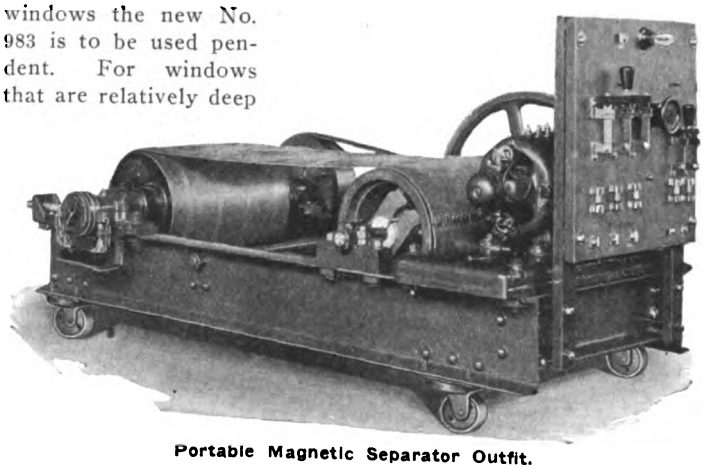


Fig. 3.—Guide Chart for Reflector Selection.

These reflectors are made by the Holophane Works of General Electric Company, Cleveland, O.

New Portable Magnetic Separator Outfit.

The accompanying illustration shows an interesting portable magnetic separating outfit built for the Graphite Lubrication Company, Boundbrook, N. J., by the Cutler-Hammer Clutch Company, Milwaukee, Wis. The separator is used for removing magnetic content from brass in various parts of the plant. The outfit is moved to where a separation is to be made and the material conveyed onto the belt.



Portable Magnetic Separator Outfit.

The brass is projected beyond the pulley freed from magnetic pieces, since the latter hug the belt in passing over the magnetized pulley and are dropped below where the belt leaves the pulley.

The direct current for the magnetic pulley is furnished by the small 110-volt generator which is driven by the same induction motor that drives the pulley. The small panel mounted at one end of the frame carries the three-pole motor knife switch and fuses, the double-pole generator knife switch and fuses, back-of-board type dynamo-field regulator and pilot lamp.

Simple Means for Cleaning Illuminating Glassware.

Smooth glass shades and reflectors, even of the prismatic type, can be easily cleaned of dust and dirt by means of a stiff hair-brush, without removing the glassware from the fixture. When it is desired to more thoroughly clean the glassware, as well as make it sparkle like new, it should be dipped several times in a bucket of water containing one ounce of nitric acid to each gallon of water; no brush or cloth need be used in this case as a rule.

Digitized by Google

Electric Air Warmers.

The approach of cool weather is directing attention to the subject of convenient electrical means for warming rooms. To the variety of these equipments now available there has been added recently a new line of electric portable and fireplace heaters, which is made by the Majestic Electric Development Company, 428 O'Farrell Street, San Francisco, Cal. A complete assortment of these is on display in the Manufacturers Building at the Panama-Pacific International Exposition.

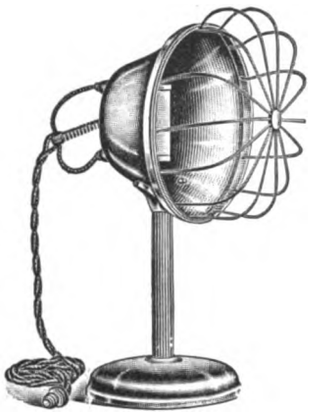


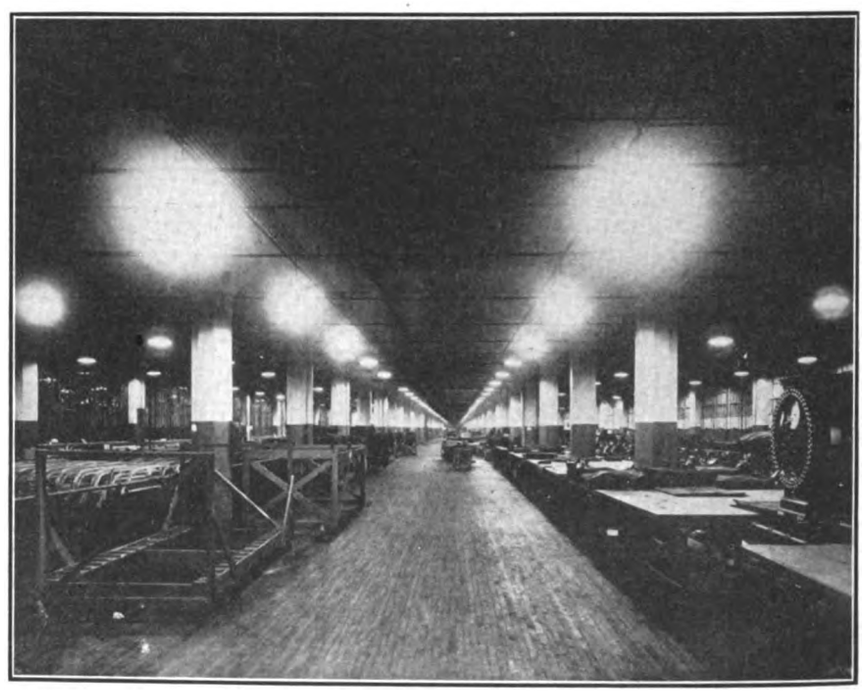
Fig. 1.—Handy Portable Electric Air Warmer.

These Majestic heaters are all of unique construction, with one or more heating units. The one shown in Fig. 1 resembles an enlarged desk telephone stand, and has one heating unit consuming 615 watts. It is made of brass, highly nickeled. The height of the outfit is 16 inches, and the base is 6.5 inches in diameter. The weight is about five pounds, making this a very handy device that can be readily placed where desired. The reflector behind the heating unit directs the heat to the point where it is needed.

Fig. 2.—Portable Electric Heater.

The heater shown in Fig. 2 is of somewhat larger size, and has two units taking 960 watts total. It is finished with the body either in black or white enamel, and the dome and reflector nickel-plated. The guard in front protects from contact with the heating units. This set is mounted on a neat base and provided with a handle, by means of which it can be moved about. Its height is 28 inches and weight about 13 pounds.

In both these units, as well as in others of the Majestic line, the heating units have a very cheerful glow while in operation. Some of these sets are arranged for being mounted in a fireplace similar to the gas logs that have come into more or less use. However, they are vastly superior to any gas-burning device, because they do not vitiate the air with products of combustion, nor deplete the amount of oxygen in the air. Their current consumption is moderate and cost of operation low where reasonably low rates for heating current are in vogue.



Illumination of Trimming Department, Dodge Brothers Motor Car Company.

Noteworthy Reflector Installation.

During recent years lighting interests have emphasized the need of efficient and thorough lighting of industrial establishments in order to reduce accidents and to increase the quantity and quality of production during the dark hours of the day. As a result most of the modern large shops are already or are being equipped with high-efficiency lighting equipment.

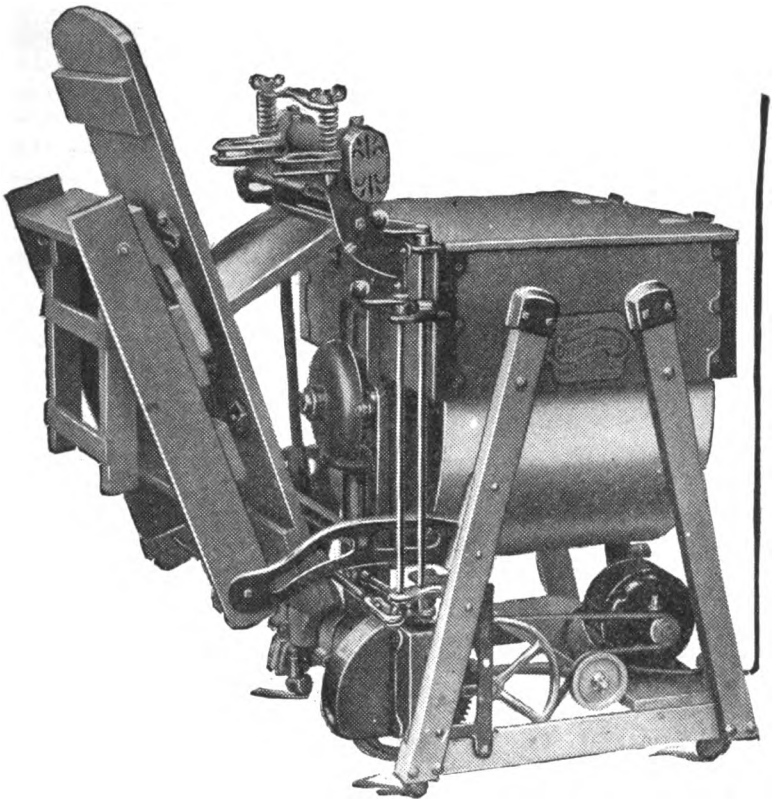
A noteworthy installation of this type is that of the recently completed part of the new automobile factory of the Dodge Brothers Motor Car Company, Detroit, Mich. This establishment when completed in full will be one of the largest in the country. In the illustration herewith is shown one floor of the automobile trimming department. The length of the room shown is 1,066 feet; the width of the room is 67 feet. For the illumination of this large area there are provided about 450 Mazda vacuum tungsten lamps of 150 watts each, making an energy consumption per square foot 0.96 watt. Each lamp is surmounted by an enameled steel reflector of the distributing type, known as Benjamin No. 5425. These reflectors are entirely white both inside and outside. The mounting height of the lamps is 10 feet 11 inches above the floor. The lamps are placed 12 feet apart in one direction and 14 feet in the other. Although no illumination values have as yet been obtained, it is evident that illumination is high in intensity as well as very uniform in distribution. This can be noticed from the view of the aisle in the center of the picture. There is a substantial complete absence of shadows throughout the large room.

The entire plant of the Dodge Brothers Company will be similarly equipped, requiring a total of 4,500 reflectors before the first large section of the plant is complete. These reflectors were furnished by the Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.

New White Washing Machine.

The White Lily Manufacturing Company, of Davenport, Iowa, is just placing on the market a washing machine known as White's de Luxe, Jr. The

Digitized by Google



The White de Luxe, Junior, Electric Washer With Bench.

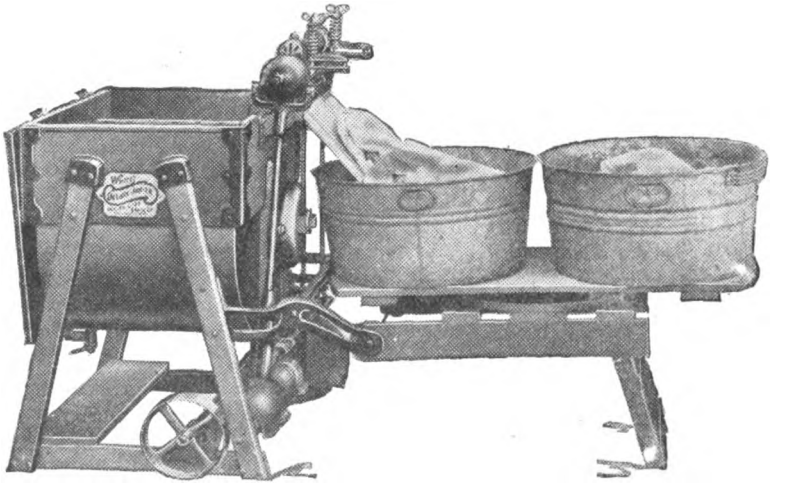
manufacturers claim that this machine will make a marked impression in the washing-machine business, principally on account of the fact that it is a cylinder machine that costs very little more than the ordinary tub machine, and that it is the only cylinder machine on the market with a bench attached. Sam. T. White, the well known president of the White Lily Manufacturing Company, is the inventor of this machine. He has devoted a lifetime to the development of washing machines, and as this is his pet machine, the company naturally feels that its success is assured.

Like all other machines of the power type built by this company they can either be operated by electric motor, gasoline engine, or any other power. The two illustrations given herewith show one driven by electricity and the other fitted with flat-faced pulley, to be driven by any power. The machines are identical in construction, the only difference being in the name and the pulley.

The inventor has satisfied himself, after a very exhaustive study of the washing-machine business, that the cylinder type of machine is the best washing machine. As a proof of this he cites the fact that laundries are a commercial proposition, and to make them pay as a commercial proposition they must use a machine that will take out the dirt in the shortest space of time; now every commercial laundry today is using a cylinder type of machine, with the exception of the laundries known as hand laundries, and a majority of these are using White's de Luxe machines. The laundry washes in two or three minutes what it would take 10 to 15 minutes to wash in the home, but when it is washed in the home it is washed in pure soap and water, and the clothes are washed separately, instead of having them mixed in with every one's, as is done in the ordinary laundry. There is no question, therefore, but what the cylinder machine will take the dirt out under the same conditions with soap and water much quicker than any other type of machine, and at the same time with less wear and tear on the clothes, and one can wash the finest fabrics.

It is said that the new machine can be bought at a lower price than any other cylinder machine of anywhere near the same capacity. This is due to particularly favorable manufacturing facilities. The revolving bench is also one of the features of this machine, and is the invention of Howard Power, secretary of the White Lily Company, and also a deep student of the washing-machine industry. The advantages to be gained from this revolving bench are numerous. It is claimed to be really less work to do a washing with a revolving bench attached to the machine than in any other manner. The operator sets her tubs on the bench. By a hose connection she can run the water from the faucet into the tubs. One of the tubs can be used for bluing water and one for rinsing water. After washing one tub full of clothes, the clothes can be wrung out into the rinsing water, which would be nearest the machine. Then the machine is filled up for a second washing, started to operating, and the lid closed which makes a perfectly clean table. Then without having to move a wringer or step around anywhere the operator can reverse the wringer and wring the clothes out of the rinsing water right onto the table or lid of the machine. When the clothes have all been wrung out the bench can be swung around, since it is on roller bearings, and this can be done with one finger, and the bluing tub brought to where the rinsing tub was. The operator takes the clothes piece by piece without any water in them, spreads them apart properly and puts them into the bluing water as they should be put in to avoid streaking. When they are properly blued they are wrung back onto the table and are then ready to hang on the line. The operator does not have to move from her standing position to do the entire washing.

When the machine is not in use the bench can be folded up, as shown in one of the illustrations, and it takes up very little more room than an ordinary hand machine.



Power-Driven Washer With Bench in Use.

Digitized by Google

Service Switch Arranged for Disconnection of Fuses Before Handling.

The accompanying illustrations show a type of fused switch in which the fuses cannot be touched except when entirely disconnected from the circuit, as suggested under the proposed Electrical Safety Code of the United States Bureau of Standards.

The advantage in the use of a device of this general character is that the operator cannot come in contact with current-carrying parts when replacing a blown fuse, and it is claimed for the particular device described and illustrated herewith that while the switch and cutout are readily accessible no current-carrying parts are made accessible by opening the switch either for the purpose of interrupting the circuit or exposing the fuses for inspection.

Referring to the illustrations, in

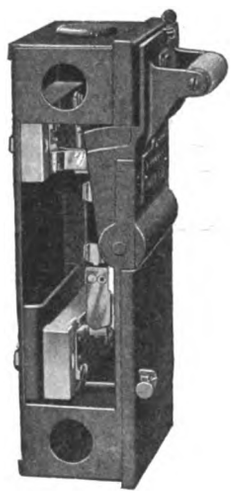


Fig. 1.—Fused Switch in Closed Position.

which one side of the box has been cut away to show the arrangement of the switch and cutout, and particularly to Fig. 2, in which the various parts of the device are lettered for identification, it will be seen that the cover of the box is hinged at its middle point, *H*, the upper portion of the cover swinging out of and the lower part into the box. The flange, *I*, on the cover projects a sufficient distance into the box to keep it effectively closed during the opening motion until the moving contact *A* has broken connection with the fixed live contact *C*.

The porcelain base *B* (which is shown cut away to expose *A* and *C*), swings in close relation with the service-contact base *D*, the baffle plate *F* and the bottom of the box, effectively blocking all access to the service terminal block *D* of the switch on which the service contacts *C* are mounted.

The box is provided with six conduit holes and interchangeable knockout buttons, *G*, the arrangement being such that a conduit hole is available from any direction to any direction.

The cover of the terminal chamber and the upper front cover are arranged for sealing and may be readily removed to facilitate wiring. These seals, however, do not in any way hamper the normal operation of the switch, which is intended for use as a service switch, or for other industrial applications.

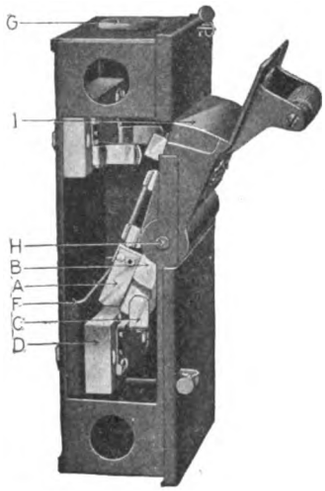


Fig. 2.—Switch Partly Opened.

The device is manufactured by the Palmer Electric & Manufacturing Company, Boston, Mass.

"Home Electrical" Awarded Two Gold Medals.

The "Home Electrical," an exhibit of the General Electric Company in the Palace of Manufactures at the Panama-Pacific International Exposition, described in the issue of June 5, has

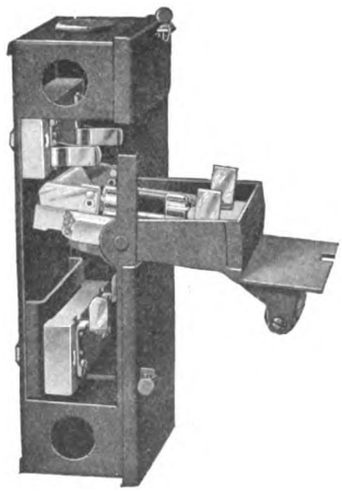


Fig. 3.—Switch Fully Opened.

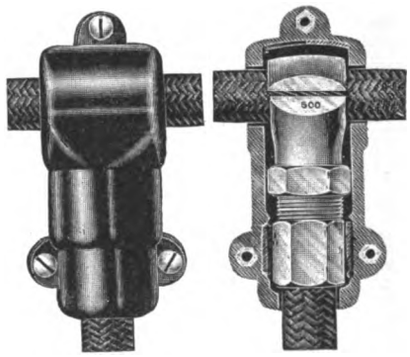
received the unique distinction of being awarded two gold medals by the International Jury of Awards.

This is but one of the exhibits of the company at the Exposition and consists of a full-sized, model home of simple, Spanish-California, bungalow design, in which electricity is made to perform practically all the domestic tasks and labors and to conduce to many of the household comforts of

One of the gold medals was awarded the "Home Electrical" by the Department of Manufactures for the completeness of the exhibit and as an Exposition attraction. The second gold medal was awarded by the Department of Education in recognition of the high educational value of the exhibit.

Insulating Cover for Dossert Cable Taps.

The accompanying illustrations show a new type of insulating cover for branch connections when made with Dossert cable taps. As shown, the covers are in two parts which, when joined together, are held by threaded bolts acting upon metal inserts in the insulating material. The facility with which connector and cover can be connected or disconnected is noteworthy. These devices are being largely installed in industrial plants at points where taps for motors are taken off the main feeders, and on switchboards where taps are taken off the



Top and Interior View of Tap With Cover.

busbars. The insulation possesses good mechanical strength and will not expand, contract or deteriorate in service. Tests have established its safety up to a maximum of 28,000 volts.

These connectors and insulating covers are manufactured by Dossert & Company, 242 West Forty-first Street, New York City.

Tennis Court Lighting With Bryan-Marsh Lamps.

In the issue of August 21, page 320, there was published a description of the successful lighting installation for a public tennis court at Central Park, Louisville, Ky. In publishing this description and the illustrations which accompanied it, mention of the fact that the four 1,000-watt type C Mazda lamps which supplied the illumination, were furnished by the Bryan-Marsh Division of the National Lamp Works through the H. C. Taefel Company, of Louisville, who handled the installation, was overlooked.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

CAPE MAY, N. J.—On Tuesday, September 7, the city will vote upon the question of building a municipal electric lighting plant.

FREEMANSBURG, PA.—Construction work will be started shortly for the entire rebuilding of the Shimer foundry near here, destroyed by fire some time ago. The plans call for one large structure of brick and steel. The entire plant will be motor operated with current furnished by the Lehigh Valley Light and Power Company. M. J. Shimer and Stanley Shimer comprise the firm.

AYDEN, N. C.—Bonds amounting to $50,000 have been voted for electric light, sewers and water works improvements. Address mayor.

HICKORY, N. C.—The Council offers a 30-year electric franchise for sale. Address S. C. Cornwell, city manager.

BACONTON, GA.—The amount of $5,000 will be expended for establishing an electric light plant. Address J. B. Miller, mayor.

COOLIDGE, GA.—Bonds to the amount of $15,000 for improving light plant have been voted. Address mayor.

OCALA, FLA.—The Council has accepted specifications for establishing an electric light plant. Address mayor.

NORTH CENTRAL STATES.

BELLEFONTAINE, O.—The Council is considering a report covering an ornamental lighting sytem of 49 iron posts, with underground conduits, etc., at an estimated cost of $6,237. L.

BREWSTER, O.—Bids will be received until September 9, for the construction of a municipal lighting plant, to cost about $21,000. Bids were opened recently for the same work, but none of the 15 received came within the limit fixed. L.

CINCINNATI, O.—The electrical work involved in the remodeling of the Lincoln and Washburn public schools, and in the construction of a new manual training building, will be bid on until September 13, and that on the new East Side High School until September 20. Plans and specifications can be had of the clerk of the Board of Education, City Hall, or of C. W. Handman, business manager, 511 West Court Street, to whom requests for information should be addressed. L.

CINCINNATI, O.—Part of the mechanical equipment of the new Hamilton County courthouse, the contract for which has been let to the Standard Engineering Company, at $203,855, will consist of a complete lighting plant, with a considerable amount of other electrical work. The company's office is in Washington, D. C. L.

CINCINNATI, O.—The York Ice Machine Company, of York, Pa., has been commissioned by local men interested in a new 50-ton ice plant, to be controlled by independent dealers, to prepare plans and specifications for that purpose. The plant will be constructed on Jefferson Avenue. L.

HAMILTON, O.—The conversion of the present dam at Woodsdale, near here, owned by the Chatfield & Woods Company, of Cincinnati, into the site for a large electric plant, is proposed by interests which are forming a company for that purpose, with the backing of New York interests. Surveys have been made which demonstrate that there is ample water for the purpose of generating power at all seasons. L.

LONDON, O.—Several thousand dollars will be spent by the city on ornamental street lighting in the business section, according to resolutions adopted by the Council declaring the improvement necessary. L.

SPRINGFIELD, O.—Steps are being taken by the city toward the construction of an ornamental street-lighting system, to be paid for partly by property-owners on the streets improved. Work will begin early in the fall. L.

SOUTH BEND, IND.—Members of the Board of Works will meet with the lighting committee of the Chamber of Commerce to discuss further the proposition of installing cluster lights in the down-town section and removing the arc lights. Address city clerk.

GIBSON, ILL.—The Gibson Commercial Club is interested in the matter of establishing an ornamental lighting system. Address President Arrowsmith, of the Gibson Commercial Club.

LORAINE, ILL.—A franchise has been granted to Bert Van Blair for the erection of a light and power plant. Work will begin on the plant at once.

MT. PLEASANT, MICH.—The City Council is looking into the matter of owning and operating its own lighting plant. Address city clerk.

DURAND, WIS.—The Durand Light and Power Company has increased its capital stock from $35,000 to $70,000.

KENOSHA, WIS.—The municipal water plant has been sold to the Simmons Manufacturing Company. Work is to be started immediately on the erection of a modern plant which will cost about $250,000.

ST. CLOUD, MINN.—The Public Service Company, recently reincorporated and bonded for $4,000,000, will start work at once on improvements and extensions to cost half a million. It includes the construction of a new power house on the east end of the St. Cloud dam, the building of a dam and power house at Sauk Rapids, Minn., the extension of transmission lines into all of the territory within 60 miles of St. Cloud, the extension of the gas mains to East St. Cloud and Sauk Rapids, and the extension of the street car lines in the city of St. Cloud. The corporation already has two hydroelectric plants on the west end of the St. Cloud dam. The new one will have a capacity of 4,000 horsepower and will cost $200,000. The Sauk Rapids plant will cost $700,000. Extension of the transmission lines is already under way. The company, of which A. G. Whitney is president, now has wires running to Sauk Rapids, Waite Park, Rockville, Cold Springs, Richmond and St. Joseph. Lines are being run and lights will be operated within 90 days in Roscoe, Paynesville, Eden Valley, Watkins, Kimball, Annandale, Maple Lake, Buffalo, Dassel, Cokato, Howard Lake, and Waverly, combining a population of about 30,000. The first transmission lines were built in 1913.

MARATHON, IOWA.—An election will be held some time in September to vote on a bond issue of $12,000, for a municipal lighting plant. Address town clerk.

WALL LAKE, IOWA.—Bonds amounting to $7,500 have been voted to pay for the construction of a transmission line from Lake View, and the installation of the necessary distributing plant in this city. Also, the purchase of the current from Sac City Electric Company. Address city clerk.

DRAYTON, N. D.—A company of business men has been organized for the purpose of installing an electric light plant. Address the viilage clerk.

TOWNER, N. D.—C. S. Rygh, of Alexandria, Minn., has been granted a franchise for establishing an electric light plant. The specifications include 60-watt lights and four 5-cluster lamps.

BARNSTON, NEBR.—A hydroelectric power plant will be installed to supply electricity to towns along Blue River. Address George H. Steinmeyer, promoter.

MAGNET, NEBR.—P. J. Sandberg is planning to purchase supplies and material for an electric light and water plant.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The long-distance power transmission line being built by the Consolidation Coal Company has been completed from Jenkins, Ky., via Wayland and Allen, to Prestonburg, Floyd County, Ky. A number of the towns in the Big Sandy Valley will receive service from this line, designed primarily to supply mining operations.

COLUMBIA, TENN.—Ways and means are under consideration for a new white way. Address President Sloan, of the board of trade.

PASS CHRISTIAN, MISS.—Bonds for a municipal electric light plant and water works system were indorsed by a committee of citizens at the meeting of the Pass Christian Council. Address mayor.

WHITE CASTLE, LA.—The sum of $25,000 will be expended for a light and water system. Address mayor.

TONKAWA, OKLA.—The city is planning to purchase and install a 20-ampere three-phase, 2,300-volt, 60-cycle generator for an electric light plant; also, to change present arc-lamp street lighting system to incandescent lamps. Address V. K. Stanley, superintendent.

Digitized by Google

DENISON, TEX.—The Texas Power and Light Company has purchased a site on Red River, near Denison, on which to build a power plant to cost approximately $750,000.

HIGHLAND PARK, TEX.—An issue of $10,000 of bonds has been voted here, the proceeds to be used in installing a system of ornamental street lighting. D.

MARBLE FALLS, TEX.—E. M. Turner, of Dallas, has been appointed receiver of the Colorado Power Company, which is constructing a large dam across the Colorado River here as a means of providing power for a large hydroelectric plant that it planned to build. The same interests, headed by C. H. Alexander, of Dallas, own dam and power sites at other points on the Colorado River. Their scheme involved the building of a system of transmission lines and the furnishing of electric current for lighting and power purposes for a big scope of territory. The appointment of a receiver was made by Judge N. T. Stubbs, of Burnet, on application of Mr. Alexander. It is reported that Mr. Turner will carry out the original construction purposes of the company as rapidly as possible. D.

WESTERN STATES.

ROUNDUP, MONT.—The City Council tabled the resolution for the construction of an ornamental lighting system on account of protests. The estimated cost was $10,000.

BLACKFOOT, IDAHO.—The City Council has under consideration the construction of a system of street lights.

RUPERT, IDAHO.—City officials are considering taking over the local electric light plant and making improvements.

SOCORRO, N. M.—The Socorro Light and Power Company has been organized here with a capital stock of $50,000, for the purpose of building an electric light plant. C. T. Brown is interested. D.

PEACH SPRINGS, ARIZ.—The United States Department of Interior has granted permission to Col. Epes Randolph, of Tucson, and associates, to make preliminary surveys of the proposed dams that they plan to build across the Colorado River in the Grand Canyon, near Peach Springs, and the construction of a series of hydroelectric plants which are to have a total capacity of 400,000 horsepower. The first dam and hydroelectric plant will be located in Diamond Canyon, which is a part of the Grand Canyon. It will develop about 50,000 horsepower. J. B. Girand, city engineer of Phoenix, is one of the promoters of the big project. He will have charge of the surveys that are to be made. D.

PHOENIX, ARIZ.—The land owners of Electrical District No. 1 plan to issue $100,000 of bonds for the purpose of constructing converter stations, electrical equipment and about 80 miles of transmission lines so as to reach practically every farm on the district. D.

ORANGE, CAL.—The mayor has appointed E. H. Smith, C. F. Newton and O. E. Gunther a committee to investigate designs for an ornamental lighting system for the business district of the city.

THE DALLES, ORE.—Robert A. Foster was here recently representing the Lewiston (Idaho) Chamber of Commerce. He stated that $400,000 will be raised in Lewiston toward a $500,000 power and canal project on Snake River, if the government will furnish $100,000.

ROSEBURG, ORE.—Petitions are in circulation requesting the Council to proceed, under authority given it by the city charter, to issue bonds and install a light and water system. The Council is authorized to spend $250,000 on the project.

CHINOOK, WASH.—A 50-year franchise to construct, maintain and operate electric transmission lines over certain highways in Pacific County, viz., the Prest Road and the Columbia North Bank Road, has been granted by the commissioners to E. S. Lakeman. Construction must begin in 30 days, and the lines must be ready for operation within six months, according to the terms of the franchise.

COULEE CITY, WASH.—Oscar Ellefson has been granted a franchise to install an electric light system in this town.

EVERETT, WASH.—At a special election held in this city on August 24, the City Council was authorized by voters to procure necessary data and information concerning the feasibility of the development and construction of a plant for the generation of electric current from the waters of the Sultan River. According to investigations made, the proposed site will produce 60,000 horsepower. For several years this city has considered the installation of a municipal plant, which would supply current for both light and power for the use of the city. O.

MORTON, WASH.—It is reported the Lewis County Light and Power Company, of Morton, will make extensions to its power lines in this city and vicinity, some of the work to be done in the immediate future and the remainder early next year. The main lines of the company, including telephone wires, are being removed from the business streets to the alleys, at this time. O.

OLYMPIA, WASH.—A franchise has been granted to George Tilden, of Seattle, to run power lines in Thurston County from his proposed plant on the Skokomish River. Lines will be run from Aberdeen to Olympia, and will supply many small communities and farming districts.

SEQUIM, WASH.—Articles of incorporation have been filed with the Secretary of State, Olympia, by the Sequim Light and Power Company, here, naming Joseph Keller and Paul C. Farmer, both of Sequim, as incorporators, and the capital stock at $3,500. It is understood the company will engage in the light and power business in this city.

STANWOOD, WASH.—G. W. Kunze will not purchase the holdings of the Stanwood Light and Power Company, in this city, as heretofore reported. However, it is understood the improvements and extensions planned by Kunze, should he take over the property, will be made by the present owners. The plant is valued at about $15,000, and several thousand dollars, according to reports, will be expended in improving and extending the service. O.

SUMNER, WASH.—A new lighting system will be installed here by the Puget Sound Light and Power Company, as the result of a change in the contract allowed by the City Council.

NEW PUBLICATIONS.

PHILADELPHIA ELECTRICAL BUREAU.—The annual report of the Electrical Bureau of Philadelphia for the year 1914 has been issued by the chief of the Bureau, Clayton W. Pike. This covers the lighting of streets and public buildings, the police telephone and fire-alarm system, operation of the power plant in the City Hall, electrical inspection, etc.

SMITHSONIAN INSTITUTION.—The annual report of the Smithsonian Institution for the year 1914 has been published by the secretary, Charles D. Walcott. Among the papers printed in the appendix is one by Preston S. Millar, which was presented before the Franklin Institute of Pennsylvania, entitled "Recent Developments in the Art of Illumination."

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,076. ELECTRIC TRANSMISSION POSTS.—A supply company in Honduras writes an American consular officer that it wishes to receive prices and descriptive catalogs of electric steel transmission posts. The maximum height of the posts should be 30 feet. Weights should be indicated and quotations should be made f. o. b. New York or New Orleans.

NO. 18,083. INCANDESCENT LAMPS.—A firm in Serbia informs an American consular officer that it desires to purchase large quantities of incandescent lamps for ordinary use. Catalogs and full information should be sent, so that orders may be placed by cable. Correspondence should be in German or French.

NO. 18,093. ELECTRIC WIRE.—A buyer of telephone and electric light wire in an insular possession informs an American consular officer that he desires to establish commercial relation with American exporters of galvanized-iron wire 0.07874 inch in diameter for telephone lines; noninsulated hard copper wire for electric lights, 0.23622 inch in diameter. He wishes to receive prices on various kinds of noninsulated copper wires and cables for electric light and power transmission. He states that he had hitherto been given 30 days' credit, but is willing to make payment against shipping documents upon arrival of goods in the foreign port.

NO. 18,100. GLASS BULBS, WIRE, ETC.—A firm of incandescent-lamp manufacturers in Brazil informs an American consular officer that it desires to receive catalogs, prices, and full information from American manufacturers of glass bulbs of various sizes; molybdenum filament; straight and spiral tungsten filaments; copper, nickel, and platinum wire; tin bases for electric lamps; chemicals for ground glass; anhydrous phosphorus; pure "amorpho" phosphorus; modern machinery for the manufacture of electric incandescent lamps, including vacuum pumps, and rubber hose. Correspondence should be in Portuguese.

NO. 18,120. ELECTRICAL SUPPLIES.—A firm in Portugal is anxious to make agency connections with American manufacturers of electrical supplies.

NO. 18,144. CONDUIT AND FITTINGS.—A mechanical engineer in France informs an American consular officer that he desires to be placed in direct communication with American manufacturers of iron and steel pipe and conduit for gas, electric, water, and heating installations, as well as accessories for these systems. He desires to arrange for an exclusive agency. Quotations should be made c. i. f. destination. Samples, catalogs, and descriptive matter should be in French.

Digitized by Google

FINANCIAL NOTES.

The Union Gas & Electric Company, a subsidiary of Columbia Gas & Electric Company, has substituted $600,000 in cash for bonds of the Columbia Gas & Electric Company in the fund deposited to guarantee dividends on the stock of Cincinnati Gas & Electric Company under the lease of the latter property. The amount of cash provided to be deposited under the guarantee was $3,000,000, but several years Columbia Gas & Electric bonds were substituted for a part of the cash. The fund now comprises $1,000,000 cash and Columbia Gas & Electric bonds at a valuation of $2,000,000.

The board of directors of the Mexican Northern Power Company state that with the proceeds realized from the sale of a part of the $3,000,000 six-per-cent 30-year prior-lien bonds authorized last May and from loans made with the prior-lien bonds as security, the company has been able to make considerable progress on the completion of the company's dam and transmission lines to Parral. It is hoped that the company will be able to deliver power to customers by October 1. The directors state that it is manifest, however, that the company will not be able to meet the interest coupons due January 1, 1916, on the $10,000,000 30-year five-per-cent first-mortgage and default will again take place on that date. A committee has been formed to receive deposits of these bonds and it is hoped that all holders will make such deposits by October 1. These deposits are being asked as a preliminary to arranging a plan of reorganization for the company, the troubles of which came about through the internal difficulties of Mexico.

Dividends.

	Term.	Rate.	Payable.
B'klyn Rapid Tran.....	Q	1.5 %	Oct. 1
Chicago Tel.	—	$2.00	Sept. 30
Colorado Power	Q	1.75%	Sept. 15
Conn. Power pf.....	Q	$1.50	Sept. 1
Mackay Cos. pf.....	Q	1 %	Oct. 1
Mackay Cos. com.....	Q	1.25%	Oct. 1
Montana Power pf.....	Q	1.75%	Oct. 1
Montana Power com...	Q	1 %	Oct. 1
N. Y. Transit.....	—	$4.00	Oct. 15
N. Y. & Queens Elec. Lt. & Pr. pf.....	Q	1 %	Sept. 1

Reports of Earnings.

PACIFIC GAS & ELECTRIC.

	1915	1914
July gross .....$	1,482,707	$ 1,325,579
Net after taxes.....	587,545	504,358
Other income	35,426	24,743
Total income	622,971	529,101
Surplus after charges	353,138	177,374
Balance after bond and note discount and expense	339,595	137,058
Seven months' gross..	10,686,205	9,753,892
Net after taxes.....	4,681,700	4,001,218
Other income	217,297	184,421
Total income	4,898,997	4,185,638
Surplus after charges and discount	2,458,777	1,439,051
Balance after preferred dividends	1,733,132	989,051
Twelve months' gross	17,845,001	16,544,431
Net after taxes.....	7,679,249	6,250,809
Other income	340,692	339,349
Total income	8,019,941	6,590,158
Surplus after charges	3,665,392	2,013,090
Balance after preferred dividends	2,774,764	1,413,090

REPUBLIC RAILWAY & LIGHT.

	1915	1914
July gross .....$	250,908	$ 252,217
Net after taxes.....	107,081	106,050
Surplus after charges..	47,828	48,967
Balance after preferred dividends	21,871	23,010
Seven months' gross...	1,707,827	1,747,950
Net after taxes.....	648,462	673,383
Surplus after charges...	247,373	280,275
Balance after preferred dividends	65,674	98,576

NORTHERN STATES POWER.

July gross .....$	369,903	$ 327,405
Net after taxes.....	191,888	168,304
Seven months' gross...	2,827,560	2,525,303
Net after taxes.....	1,550,510	1,321,246
Twelve months' gross...	4,807,594	.....
Net after taxes.....	2,661,255	.....
Surplus after charges...	1,177,686	.....
Balance after preferred dividends	590,617	.....

PROPOSALS.

FIRING MAGNETOS.—Sealed proposals will be received at the office of the Chief of Ordnance, United States Army, War Department, Washington, D. C., until September 17, for furnishing and delivering f. o. b. contractor's works 353 firing magnetos, type GA. Further particulars may be had on application to the above office.

ELECTRIC MOTOR-DRIVEN HOIST.—Sealed proposals will be received September 10, at room 406 City Hall, Chicago, Ill., for furnishing and delivering at 4850 Wilson Avenue, one double-drum electric motor-driven hoist, according to plans and specifications on file in the office of the Department of Public Works. Address W. R. Moorhouse, Commissioner of Public Works.

ELECTRIC ELEVATOR PLANT.—Sealed proposals will be received by the Supervising Architect, Treasury Department, Washington, D. C., until October 8, 1915, for the installation complete of an electric elevator plant in the United States appraiser's stores at Boston, Mass. Copies of drawings and specifications may be had upon application to James A. Wetmore, Acting Supervising Architect, Washington, D. C.

PERSONAL MENTION.

MR. ABBOTT S. COOKE, president of the Cooke-Wilson Electric Supply Company, Philadelphia, Pa., has been elected a vice-president and member of the council of the National Historical Society.

MR. ROBERT K. SHEPPARD, formerly manager of sales for the insulated-wire department of the B. F. Goodrich Company, Akron, O., is now associated with the Simplex Wire & Cable Company, Boston, Mass., as sales manager.

MR. DENNIS O'NEILL, who has been with Armour & Company, Chicago, Ill., for the past 26 years, has been made chief electrician of that company, taking the place made vacant by the recent death of Mr. James Malia. Mr. O'Neill was born in the County Antrim, Ireland, 53 years ago, and was assistant to Mr. Malia for 25 years. He has had a wide experience in the handling of alternating-current and direct-current motors and motor-driven machinery, and before his employment with Armour & Company was in charge of the plant of E. Rothschild & Company, Chicago.

MR. H. V. JAMISON, advertising manager of the American Sheet and Tin Plate Company, Pittsburgh, Pa., has been awarded a gold medal by the Panama-Pacific International Exposition Society for valuable services rendered in the installation of the large exhibits of the United States Steel Corporation and its subsidiary companies. When the Steel Corporation decided to make an extensive exhibit at San Francisco, Mr. Jamison was appointed Director of Exhibits. The results were so successful that the Steel Corporation and its subsidiaries were accorded the Grand Prize, for the excellence of their exhibits and Mr. Jamison was awarded a gold medal in recognition of his services.

MR. HOWARD A. LOEB, chairman of the executive committee of the Pennsylvania Lighting Company, of Shamokin, Pa., and of the Kentucky Traction Company, of Lexington, Ky., has been elected to the presidency of the Tradesmen's National Bank, of Philadelphia, succeeding his father, the late August B. Loeb. The new president is one of the youngest bank heads in Philadelphia, being only 40 years old. After his graduation from the engineering department of the University of Pennsylvania, he accepted a position with a contracting engineering firm. In 1907 he went to the Tradesmen's National Bank as vice-president.

GENERAL GEORGE H. HARRIES, president of the Louisville Gas and Electric Company, received high honors from the members of the District of Columbia National Guards on the occasion of his recent retirement from the post of commander of that organization. With elaborate ceremonies he was presented with the equipment of his rank, consisting of a Major-General's presentation saber, appropriately inscribed; a full-dress belt, a full-dress sash, a gold belt knot and a pair of silver spurs. Presentation, in the name of the officers of the District's Guards, was made by Brigadier-General Harvey. In his acceptance General Harries advocated a universal volunteer army for the United States, with 30 days of military training each year for every able-bodied male between the ages of 18 and 25. He developed his plan in some detail.

MR. F. J. DERGE, who has been manager of the light, heat and power departments of the Toledo Railways and Light Company, for some time past, has been advanced and will leave Toledo on October 1, to go to New York, where he has accepted a position as chief engineer for the Henry L. Doherty Company. He will take the place vacated by Mr. M. R. Bump, who resigned to become vice-president of the Picher Lead Company, of Joplin, Mo. Mr. Derge will thus hold one of the biggest engineering jobs in the country and will have 100 properties to supervise. He began with the Doherty organization at the bottom of the ladder. The position in Toledo to be vacated by Mr. Derge, will be filled by Mr. R. E. Burger, manager of the Elyria, O., property of the Doherty company. Mr. J. B. Johnson, superintendent of the Elyria

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Aug. 30.	Aug. 23.
American Tel. & Tel. (New York)	123½	121
Commonwealth Edison (Chicago)	135	135
Edison Electric Illuminating (Boston)	232½	230
Electric Storage Battery common (Philadelphia)	63	62¾
Electric Storage Battery preferred (Philadelphia)	63	62¾
General Electric (New York)	175⅛	168
Kings County Electric (New York)	119	119
Massachusetts Electric common (Boston)	4⅞	4⅝
Massachusetts Electric preferred (Boston)	33	33¾
National Carbon common (Chicago)	140	140
National Carbon preferred (Chicago)	119¾	119¾
New England Telephone (Boston)	130	131
Philadelphia Electric (Philadelphia)	24½	24¼
Postal Telegraph and Cables common (New York)	75	70
Postal Telegraph and Cables preferred (New York)	65½	66¾
Western Union (New York)	72	69⅞
Westinghouse common (New York)	116¼	111⅛
Westinghouse preferred (New York)	135	135

Digitized by Google

company, will become manager at that place.

MR. BERTRAM SMITH, well known in the storage battery business for the past 15 years, has been appointed manager of the Detroit office of the Edison Storage Battery Company. About a year and a half ago, Mr. Smith joined the Edison interests as assistant manager of the Edison Storage Battery Supply Company of San Francisco, the distributor for the Edison nickel-iron-alkaline battery on the Pacific Coast. Directly previous to his connection with the Edison Company he was manager of the battery department in the Chicago branch of the United States Light and Heating Company. He was formerly secretary and treasurer of the National Battery Company of Buffalo until its consolidation with the United

Bertram Smith.

States Light and Heating Company. In taking up his new duties in Detroit, therefore, he is returning to familiar territory. In order to better serve its customers in eastern Michigan, as well as Ohio and adjoining territory, the Edison Storage Battery Company recently moved its Cleveland office to Detroit, where it has located in the new David Whitney Building on Woodward Avenue. The appointment of Mr. Smith as manager, together with the Company's rapidly growing business in this section, is expected to make the Detroit office one of the most important branches.

OBITUARY.

MR. JOHN R. GRAHAM, one of the foremost men in the electrical industry in New England, died at his summer home, Intervale, N. H., August 24. For the past 13 years Mr. Graham has made his home in Bangor, Me., where he was at the head of the Bangor Railway and Electric Company and a director in the Bar Harbor & Union River Power Company, which operates extensive hydroelectric plants. The deceased began his career in the street railway business while a shoe manufacturer at Quincy, Mass. He reorganized the Quincy Street Railway, which was merged with the Bay State system. He was one of the first Rapid Transit Commissioners of Massachusetts, in 1893. Mr. Graham was a native of the north of Ireland, being born in 1847. He came to America at the age of five years and, with his parents, settled in Boston. When but 17 years of age, he enlisted in the 42nd Massachusetts Infantry, later re-enlisting in the Fourth Cavalry, with which he served until the end of the Civil War. Returning to Massachusetts, he began the manufacture of shoes; which business his sons now conduct. His removal to Bangor was in 1902. He became a large real estate owner and had a large experimental farm near the city. Mr. Graham was twice married. The widow and ten children by the first marriage survive.

DATES AHEAD.

Indiana Electric Light Association. Annual convention, Hotel Deming, Terre Haute, Ind., September 8-10. Secretary, T. Donahue, La Fayette, Ind.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., September 8-10. Secretary, H. N. Mueller, 435 Sixth Avenue, Pittsburgh, Pa.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

Northwest Section, National Electric Light Association. Annual convention, Multnomah Hotel, Portland, Ore., September 8-10. Secretary, N. W. Brockett, Pioneer Building, Seattle Wash.

Association of Edison Illuminating Companies. Annual convention, Spring Lake, N. J., September 13-16. Secretary, George C. Holberton, San Francisco, Cal.

Electrical Supply Jobbers' Association. Quarterly meeting. Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, Native Sons of the Golden West Building, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society, Twenty-eighth general meeting. Clift Hotel, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

International Engineering Congress, Civic Auditorium, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention, San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electric Railway Association. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The Westinghouse Electric and Manufacturing Company, Chicago, Ill., announces the removal of its Chicago ofces to the twenty-first floor of the Conway Building, Clark and Washington Streets. These offices are also used by Westinghouse Machine Company and Westinghouse Lamp Company.

H. S. Thomas, engineer, Compania Electrica de Concepcion, Casilla 997, Concepcion, Chile, South America, announces that he will be glad to receive catalogs of electrical material carried by manufacturers in the United States, with a view to opening up business connections.

Steel City Electric Company, 1219 Columbus Avenue, Pittsburgh, Pa., has issued leaflet No. 151 dealing with Steel City outlet boxes and covers. Each of these devices is conveniently listed with a brief description, catalog number and small diagram to show the construction. A very complete line of

Digitized by Google

boxes and covers is included, also bushings and locknuts.

The R. Thomas & Sons Company, East Liverpool, O., has issued a circular relating to the testing of Thomas insulators. This describes the testing equipment used by the company and the method of conducting routine and standard design tests of all of the product. A number of illustrations show the apparatus and method of testing.

The Marion Insulated Wire and Cable Company, Marion, Ind., has, among other contracts, secured one from The Ford Motor Company, Detroit, covering about 300,000 feet of insulated wire of all dimensions—some of it as large as 300,000 circular mils. This wire is to be used in a large addition to the Ford plant. The Marion company states that it is quite busy and while it has a fairly good stock of wire on hand, the demand for certain sizes has exhausted its stock.

General Bakelite Company, 100 William Street, New York City, has issued a booklet entitled "Oxybenzylmethylenglycolanhydride." This striking name is nothing more than the full chemical name for the interesting condensation product commonly known as Bakelite. The booklet sets forth some of the distinctive properties of this compound, which was originated by Dr. L. H. Baekeland. Illustrations are shown of a variety of products made of this material, of which quite a number are electrical parts.

Edwards & Company, Incorporated, 140th and Exterior Streets, New York City, has issued a series of advertising cards relating to its line of Dixie products. No. 1 and 3 of this series illustrate and point out some of the interesting features of the Dixie bell. No. 2 similarly deals with the Dixie annunciator. No. 4 is an attractive calendar card showing a Dixie belle; the calendar covers the remaining months of this year and all of 1916. Pertinent reference is made to Dixie bells, buzzers and annunciators.

D. & W. Fuse Company, Providence, R. I., has issued a new book on the D. & W. enclosed fuses. This sets forth the advantages and distinctive features of construction of this well known line of cartridge fuses. Particular attention is given to the external appearance and to the various forms of link construction, especially the air-drum link, the multiple link and the cylinder link types. Fuse filling is commented on and the importance of proper attention to this feature is emphasized. The strong mechanical construction of these fuses is pointed out, as well as the accuracy of their fuse rating, which is strictly in accordance with the exacting requirements of the National Board of Fire Underwriters. Some suggestions on the fusing of motors are also given. Then follow tables of the standard D. & W. fuses from 3 to 1,000 amperes.

The Pan Electric Manufacturing Company, St. Louis, Mo., has recently designed and machined complete two commutators for a large Portland cement company in Iowa. These commutators were for two 150-horsepower slow-speed motors and the entire work, including drawings, patterns, etc., was completed within three weeks. The company has on hand an order for twenty 32-volt armatures from the L. B. Jones Company, Kansas City, manufacturer of the Jones system of farm-lighting sets. The generator end of this equipment was designed by I. P. Chandeysson, president and general manager of the Pan Electric Manufacturing Company, in conjunction with L. B. Jones. The company is located in its own building at the northwest corner of Fourth and Gratiot Streets, and was incorporated in 1902. For the past eight years it has specialized in the manufacture of direct-current motors, standard and low-voltage dynamos for farm and suburban plants, moving-picture theaters, etc. It also makes a specialty of electroplating generators and special direct-current apparatus. Besides these lines the original object of the company, the repairing of electrical apparatus, has been continued as a separate department with greatly improved equipment and facilities. The Chandeysson motors, which is the trade name under which the line is marketed, are sold under an absolute guarantee to be free from electrical and mechanical defects for a period of two years from date of sale, and further guaranteed to come within the specifications of the Standardization Committee of the American Institute of Electrical Engineers. Despite the general business depression and the absence of Mr. Chandeysson, who is still a member of the French military service, the company has been running at approximately 75 per cent full capacity.

Record of Electrical Patents

Issued by the United States Patent Office, August 24, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,150,872. Signaling Mechanism for Automobiles. S. W. Meredith and T. Walsh, Philadelphia, Pa. Comprises a lamp and electromagnetically operated semaphore.

1,150,894. Lighting Fixture. M. W. Singer, Chicago, and D. Woodhead, Evanston, Ill. Arrangement of binding posts in ceiling plate for indirect or semi-direct fixtures.

1,150,895. Condenser. A. K. Sloan, Brooklyn, N. Y. Plates in the form of concentric, nested cups.

1,150,902. System of Electric Despatch. K. E. Stuart, Philadelphia, Pa. Field and armature of car-propelling motor have separate connections to external circuit and are controlled from fixed point.

1,150,903. Automatic Controller for Flying Machines. W. W. Swan, Frankfort, S. D. Hydrostatic means operated by tilting electromagnetically controls stabilizing mechanism.

1,150,907. Lightning-Rod Terminal. G. E. Thompson, Owatosna, Minn. Structure of ground connection.

1,150,911. Gathering Locomotive. C. J. E. Waxbom, assignor to Jeffrey Mfg. Co., Columbus, O. Gearing, etc., for reel for supply conductor on electric locomotive.

1,150,917. Storage Battery. T. A. Willard, assignor to Willard Storage Battery Co., Cleveland, O. Structure of battery-jar cover.

1,150,918. Connector for Storage Batteries. T. A. Willard, assignor to Willard Storage Battery Co. Special structure of connector adapted for use with above cover.

1,150,919. Storage-Battery Connector. T. A. Willard, assignor to Willard Storage Battery Co. Has tapered socket, for receiving terminal, reinforced by spiral conductor imbedded in connector.

1,150,926. Protective Apparatus for Electric Circuits. W. E. Britton, Muskegon, Mich. Grounded spark-gap device for relieving line when there is abnormally heavy current.

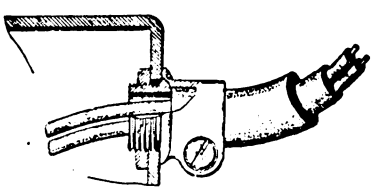
1,150,932. Combined Safety Door and Signaling System for Railway Trains. J. S. Doyle, New York, N. Y. Starting signal to motorman prevented unless car door is closed.

1,150,935. Electric-Wiring Fitting. S. R. Fralick, Chicago, Ill. For bushing flexible conduit into junction box or the like. (See cut.)

1,150,939. Electric Heating System. L. P. Hynes, assignor to Railway Utility Co., Chicago, Ill. Circuit arrangements of thermostatically controlled electric heating for cars, heating circuit being cut out during acceleration.

1,150,945. Fire-Alarm Guard. S. Jarozs, assignor of one-half to A. Grzezinski, Detroit, Mich. Has means for gripping hand of and holding operator upon attempted operation of box.

1,150,953. Selenium-Cell Regulator. M. Moskowitz, assignor to Central Trust Co., New York, N. Y. A lighting system regulated by selenium-controlled resistance, responsive to light conditions of system.



No. 1,150,935.—Loom Clamp.

1,150,968. Electric Sadiron. H. Rosenthal, assignor of one-half to J. J. Baylson, Philadelphia, Pa. Ventilation of, and mounting of resistor in, hollow body portion.

1,150,973. Automatic Current Cutoff for Electrical Appliances. U. S. Smith, assignor of one-half to A. C. Kaufman, Sacramento, Cal. Fuse, on overheating, releases tension device which disconnects plug of flatiron.

1,150,979. Electric Clock. W. H. Thompson, asignor to Thompson Electric Clock Co., Memphis, Tenn. Structure for connecting and disconnecting electromagnetic movement as it is inserted in and withdrawn from casing.

1,151,003. Catalytic Material and Process of Making Same. C. Ellis, Montclair, N. J. For hydrogenating fatty oils; comprises electrolytically deposited nickel supported on a hydrogen-occluding carrier.

1,151,011. Pedestal. W. Hegenscheidt, Chicago, Ill. Special structure of plastic material provided with conduits, etc., for electric portable lamp.

1,151,025, 1,151,026 and 1,151,027. Railway Train Controlling System. J. C. McDonald, New York, N. Y. First patent, sectional conductor system; clear signal permits energizing of section by car. Second and third patents, modifications.

1,151,038. Attachment Plug. C. D. Platt, Bridgeport, Conn. Has plug at one end and socket at other.

1,151,045. Process of Hydrogenating Oils or Fats. W. D. Richardson, assignor to Swift & Co., Chicago, Ill. Comprises mixing oil or fat with electrically disintegrated catalytic metal produced in an inorganic liquid and treating the mixture with hydrogen to produce absorption thereof.

1,151,077. Storage Battery. T. A. Willard, assignor to Willard Storage Battery Co. Venting means in battery cover.

1,151,098. Radiotelegraphic Plant. E. Girardeau, assignor of one-half to J. Bethenod, Paris, France. Receiver has a number of induction jiggers, one or more of which are switched in according to the waves received.

1,151,114. Flashlight. G. Matthies and A. Rehberg, Jr., San Antonio, Texas. Tubular, pocket type arranged in handle of umbrella or the like.

1,151,118. Apparatus for Checking Electro-Cardiographs, Oscillographs, and the Like. G. Mylo, assignor to Siemens & Halske A. G., Berlin, Germany. Reflecting galvanometer, having adjustable oscillatory system with means for visually indicating movements of the system, is alternately connected with circuit to be tested and local circuit of known wave form.

1,151,129. Electrical Gas Lamp and Method of Producing Light by Means of

Digitized by Google

the Same. F. Skaupy, assignor to Deutsche Gasglühlicht Aktiengesellschaft, Berlin, Germany. Gas lamp operated by arc-like discharges has cathode of alkali metal, a light tube containing a rare gas capable of acting as a conductor adjacent the cathode and means for preventing metal vapors from entering the tube.

1,151,135. Fuse Cartridge. E. Stranszky, New York, N. Y. Has central rotatable fuse carrier carrying a number of fuses which may be brought successively into operation by rotating the carrier.

1,151,142. Thermo Circuit-Closer. L. L. White, assignor to Platinum Electric Incubator Co., Dorris, Cal. Thermostat in casing adjustable from exterior thereof.

1,151,149. Alarm Lock. J. A. Alfred, Jeffersonville, Ind. Catch holding door open may be released by electromagnet and push-button and latch holding door closed sounds bell when operated.

1,151,162. Electric Switch. C. Carson, New Rochelle, N. Y. Particular structure of switch for mounting at top of casing inclosing dry cell and carrying lamp.

1,151,179. Insulator. E. D. Harris, assignor of one-half to A. A. Mueller, Sycamore, Ill. Has groove opening at side to receive wire and axial bore to give access to wire to press it back of retaining shoulder.

1,151,185. Electrical Apparatus. F. C. Jamieson, Cleveland, O. Valve members of nitrous oxide apparatus are electrically heated to prevent freezing of the expanding gas.

1,151,189. Electrically Heated Cooker. A. J. Kercher, assignor to Berkeley Electric Cooker Co., Berkeley, Cal. Heat-insulated structure having cooking chamber heated by electrically heated steam and water jacket thermostatically controlled.

1,151,194. Device for Signaling to and Automatically Stopping Running Trains. O. Kropp, West Hoboken, N. J. Display of different colored lights in cab of locomotive electromagnetically controlled by device mounted on track.

1,151,195. Signaling and Train-Stopping Device. O. Kropp. Structure of track device for above.

1,151,201. Flashlight. L. B. Lincoln, Chicago, Ill. Arrangement of contacts and switch in tubular battery pocket lamp.

1,151,203. Drying or Roasting Apparatus or the Like. H. Löfquist, Stockholm, Sweden. Electric resistors in agitators on inner surface of electrically rotated drum containing material to be roasted.

1,151,214. Combined Attachment Plug and Base. M. Norden, assignor to J. Norden, New York, N. Y. Plug secured in base by right-angled contacts overlapping base and which make and break contact by rotating plug in base.

1,151,215. Torsional-Grip Cable Hanger. J. E. Ogden, Brooklyn, N. Y. Single strip of wire for suspending cable from messenger has specially formed ends to engage the messenger with a torsional-grip helix.

1,151,216. Selective Electrical Signaling Apparatus. L. M. Potts, assignor to A. McLanahan, Baltimore, Md. Device for transmitting to line a succession of impulses of different character has successively operated switches for controlling order of impulses, a time element controlling switches for determining duration of impulses and means for automatically stopping operation of time element at end of each signal period.

1,151,219. Electric Bulb Holder. H. Scherer, Billings, Mont. Spring wire device engages socket and bulb tip to hold lamp in socket.

1,151,241. Magnetic Short-Circuiting Switch. L. Bradley and H. L. Bradley, Milwaukee, Wis. Electromagnetic means controlled by voltage conditions for controlling compression resistance and its connection with circuit for automatic motor operation.

1,151,249. Electric Lamp. H. A. Douglas, Bronson, Mich. Lamp can be adjusted along focal axis of reflector by turning it, good connection being maintained.

1,151,264. Automobile Alarm. R. C. Groh, assignor to T. P. McKay, P. Gottfried and O. O. Rindal, St. Paul, Minn. Alarm circuit is connected with main circuit of automobile by key-operated plunger.

1,151,267. Apparatus for Sterilizing Liquids by Means of Ultra-Violet Rays. V. Henri, A. Helbronner and M. von Recklinghausen, assignors to R. U. V. Co., New York, N. Y. Liquid is continually agitated while subjected to sterilizing influence of rays from quartz lamp.

1,151,269. Electric Automatic Bowling Alley. D. E. Huntley and W. H. Bentine, Wellston, O. Pin-resetting mechanism with visual and audible signals for indicating the condition of the pins.

1,151,273. Contact Feeding Mechanism for Base-Making Machines. W. Jost, assignor to General Electric Co., Schenectady, N. Y. For manipulating the contacts entering into structure of lamp bases.

1,151,274. Cleaning Tool for Jack Contacts. W. Kaisling, assignor to Kellogg switchboard & Supply Co., Chicago, Ill. Adapted to enter within the jacks and thoroughly clean the contacts.

1,151,317 and 1,151,318. Method of Reproducing Intaglioprinting Surfaces. H. A. W. Wood, assignor to Wood & Nathan Co., New York, N. Y. First patent, printing surface is forced by electrodeposition of metal on negative mold. Second patent, modification.

1,151,319. Insulated Wire-Stripping Device. S. G. Wood, Brooklyn, N. Y. Specially constructed pliers.

1,151,345. Vapor Electric Device. W. W. Crawford, assignor to General Electric Co. Mercury-vapor lamp has specially formed tube having a vertical portion, the lower end being bent at an angle. Steadying of the arc is secured, no special vapor condensing means is required and the mercury is out of line with the arc in vertical portions of tube.

1,151,377. Light Unit. A. D. Nash, New York, N. Y. Lamp base is provided with extra threads for securing a decorative globe about lamp bulb. (See cut.)

1,151,380. Cable Clamp. J. E. Ogden, Mountainville, N. Y. For clamping cable to wall; also has bridle-ring extension.

1,151,385. Railway Safety Appliance. V. W. Owles and J. A. McKinley, Jr., New York, N. Y. Indicating devices on locomotive are selectively operated by semaphore along track according to its position.

No. 1,151,377.—Lamp With Globe.

1,151,390. Electrical Amusement Device. W. Prina, West Hoboken, N. J., and F. Prina, Jersey City, N. J. Board has lamps indicating players' positions on ball field, the lamps being successively lighted.

1,151,401. Double Reflecting Lamp. A. Rousch, Peekskill, N. Y. Special structure of tail light for automobiles for throwing light rearwardly and also downwardly on license plate.

1,151,403. Electric Heater. E. B. Ryce and W. Wallace, Louisiana, Mo. Arrangement of resistors and insulation in cylindrical device having insulating handle at one end.

1,151,419. Speed Controller for Aeroplanes. A. B. Thaw, Pittsburgh, Pa. Comprises automatic electrical control of the balance members by diving plane.

1,151,439. Electric Starter for Internal-Combustion Engines. B. Brooks and W. Holt, Birmingham, England. Gearing of motor to engine shaft automatically disconnected after starting.

1,151,453. Electric Storage Battery. B. Ford, Philadelphia, and J. L. Phillips, Haverford, Pa. Terminal post for securing to terminal pillar of battery plate.

1,151,479. Electric Door-Unlocking and Opening and Closing Means for Automobiles. K. W. Kurta, Scranton, Pa. Rear door normally disconnected from motor gearing can be geared to motor and latter operated to open and close door by push button within reach of chauffeur.

1,151,497. Mounting for Relays or the Like. E. A. Reinke, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Relays supported on bar extending between and slidable upon I-beams.

1,151,516. Time Recorder. J. F. Engle, Cleveland, O. Electromagnetically operated device for printing time of day.

1,151,530. Motorcycle Lighting System. A. H. Neuland, assignor to Neuland Magneto Co., San Francisco, Cal. Special structure of magneto to maintain constant current in constant-resistance circuit through wide ranges of speed.

1,151,541. Calling Device for Automatic Telephone Exchanges. A. E. Keith, J. Erickson, and C. J. Erickson, assignors to First Trust & Savings Bank, Chicago, Ill. Arrangement for controlling circuit interrupter and release circuit by receiver hook.

1,151,542. Automatic Telephone-Exchange System. A. E. Keith, and T. G. Martin, assignors to First Trust & Savings Bank. Lockout arrangements for party lines in automatic common-battery system.

1,151,543. Telephone-Exchange Trunking System. A. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. Arrangement and connections of automatic switch for connecting subscriber's line with idle trunk.

1,151,544. Non-Interfering Extension Party-Line Telephone System. T. G. Martin, assignor to First Trust & Savings Bank. In automatic system calls are sent through ground connections, attempted use of subscriber's instrument breaking its connection if line is in use.

1,151,545. Lockout for Extension or Party-Line Telephones. T. G. Martin and J. Erickson, assignors to First Trust & Savings Bank. Modification of above; making ground connection at any instrument disconnects all other instruments on line.

1,151,546. Automatic Common-Battery Party-Line Telephone System. T. G. Martin, assignor to First Trust & Savings Bank. Arrangement of automatic switch, lines, etc., with provision for non-interference.

1,151,547. Automatic Extension Telephone System. T. G. Martin, and F. Lubberger, assignors to First Trust & Savings Bank. Automatic trunking for line controlled from master or extension instrument; any extension may call master and be connected thereat with any other extension.

1,151,550. Motor-Starter. G. H. Whittingham, assignor to Monitor Controller Co., Baltimore, Md. Separate electromagnetically operated resistance-short-circuiting switches are separately restrained from closing if current is excessive.

Reissue 13,970. Electric Deposition of Metals by Fusion. A. P. Strohmenger, assignor to Slaughter & Co., Ltd., London, England. Original No. 1,073,543, dated Sept. 1, 1913. Structure and manipulation of electrode in arc brazing.

Patents Expired.

The following United States electrical patents expired on August 30, 1915:

609,851. Electric Locomotive. H. Van Hoevenbergh, New York, N. Y.

609,853. Railway Rail Joint. A. Vietor, Wiesbaden, Germany.

609,875. Electrode for Medical Purposes. M. N. Clarke, Wilkes-Barre, Pa.

609,877. Tension Regulator for Electrical Transmission of Speech. A. C. Cousens, Newark, N. J.

609,888. Clamp for Electric Wires. S. S. Leonard, Chicago, Ill.

609,924. Incandescent Lamp Shade or Cover. W. H. Wells, Brasher Falls, N. Y.

609,972. Hanger for Electric Lamps. W. F. Murphy, Iowa City, Ia.

609,977. Electric Railway Motor. A. Schmid, Pittsburgh, Pa.

609,990. Means for Controlling Non-synchronous Alternating-Current Motors. B. G. Lamme, Pittsburgh, Pa.

609,991. Method of and Means for Securing Constant Torque in Polyphase Motors. B. G. Lamme.

610,004. Rail Bond. W. H. Talley, Waco, Texas.

610,007. Contact Device for Electric Railways. L. E. Walkins, Springfield, Mass.

610,008. Contact-Rail Appliance for Electric Railways. L. E. Walkins.

610,009. Electric Railway. L. E. Walkins.

610 016. Electric Switch. R. A. Baldwin, South Norwalk, Conn.

610,023. Automatic Cutout for Magneto Generators. W. J. Bowen and C. A. Federer, Cleveland, O.

610,025. Alternating-Current Motor. C. S. Bradley, Avon, N. Y.

610,067. Induction Motor. B. G. Lamme, Pittsburgh, Pa.

610,077. Ship's Log and Registering Mechanism. W. H. McCurdy, Boston, Mass.

610,090. Electric Railroad. B. C. Seaton, St. Louis, Mo.

610,091. Third Rail for Electric Railways. B. C. Seaton.

610,092. Contact Device for Electric Railways. B. C. Seaton.

610,093. Third Rail for Electric Railways. B. C. Seaton.

610,094. Electric Railway. B. C. Seaton.

610,124. Controller for Electric Motors. H. P. Davis, Pittsburgh, Pa.

Digitized by Google

Electric Vehicle Section

Electric Vehicle Association of America Convention.

The plans for the sixth annual convention, which will be held in the Hotel Statler, Cleveland, Monday and Tuesday, October 18 and 19, are rapidly nearing completion. There was held in Cleveland on Thursday, August 19, a meeting which was attended by M. E. Turner, T. P. Cagwin, J. P. Lyons, representing M. R. Berry, H. N. Sibbald, M. H. Moffett, R. S. Dunning, secretary of the Cleveland Section, G. E. Miller and A. Jackson Marshall, executive secretary of the Electric Vehicle Association of America.

Transportation Committee.

H. N. Sibbald, chairman of the Transportation Committee, is planning desirable transportation for convention delegates. Mr. Sibbald, who may be addressed care National Lamp Works of the General Electric Company, Nela Park, Cleveland, Ohio, is desirous of hearing from all those who are likely to attend the convention as there is a possibility that special trains might be secured from New York, Chicago, St. Louis, and other points. Such facilities are not definitely promised, being contingent upon a required number of people traveling to Cleveland from any one or more points along the lines that a special train would travel. The special trains would add immeasurably to the comfort and convenience of convention delegates. Furthermore, they would assist in advertising the convention and electric vehicles generally. All those who would be interested in such service are urged to communicate with Mr. Sibbald.

Entertainment Committee.

G. E. Miller, chairman of the Entertainment Committee, reported progress. The entertainment program is as yet not complete and further announcements in this respect will be made later. In connection with the entertainment, it might be interesting to state at this point that in recognition of the great drain on business organizations of the "convention habit," the Association has decided to reduce its forthcoming convention at Cleveland to the lowest possible terms so that executives and other busy men having important interests at stake can gather its benefits with a minimum expenditure of time. To this end, the sessions will be run on efficiency lines and supplementary entertainments, such as form a conspicuous part of so many society gatherings, will be subordinated to business. The Transportation and Entertainment Committees contemplate providing transportation and guides for those delegates remaining over to Wednesday after the convention, which officially closes Tuesday night, so that they may visit the manufacturers' plants, show rooms, and points of interest in Cleveland. It is thought that a number of the attending delegates might want this opportunity and it is expected that their desires in this matter will be satisfied in an informal way at the close of the convention.

Exhibition Committee.

M. R. Berry, chairman of the Exhibition Committee, reported that there should be a strong demand for an exhibition of electric vehicle batteries, charging apparatus, measuring and registering instruments, tires, accessories, etc., and consequently tentative plans are under way to hold exhibitions at the Hotel Statler, the headquarters of the convention. It is expected that the exhibit will prove one of the most interesting features of the convention, attracting a large number of delegates who otherwise might not attend. It is a little too early to announce details in the development, but a statement will be forthcoming as soon as the Exhibition Committee has the work fully in hand.

Papers Committee.

George H. Jones, chairman of the Papers Committee, reports the following tentative and partial program developed to date:

"Industrial Trucks in the Service of the Pennsylvania Railway Company," by T. V. Buckwolter, Pennsylvania Railway Company.

"The Electric Taxicab," by I. S. Scrimger, secretary and general manager, Detroit Taxicab and Transfer Company.

"The Hartford Electric Company's Experience with the Battery-Maintenance and Battery-Exchange System," by Samuel Ferguson, vice-president, Hartford Electric Light Company.

"The Function of the Electric Garage," by R. Macrae, of the Commonwealth Edison Company, Chicago.

"Comparative Development of General Power and Commercial Electric Vehicle Loads and Function of Power Salesmen as Electric Vehicle Solicitors," by H. H. Holding, general car representative, and S. G. Thompson, general electric vehicle representative, Public Service Electric Company.

"Problems We Are Facing and How They May be Met," by George H. Kelly, secretary, Baker-Rauch & Lang Company and president, Electric Automobile Manufacturers' Association.

"Field for the Small Electric Delivery Vehicle," by Charles A. Ward, secretary-treasurer, Ward Motor Vehicle Company.

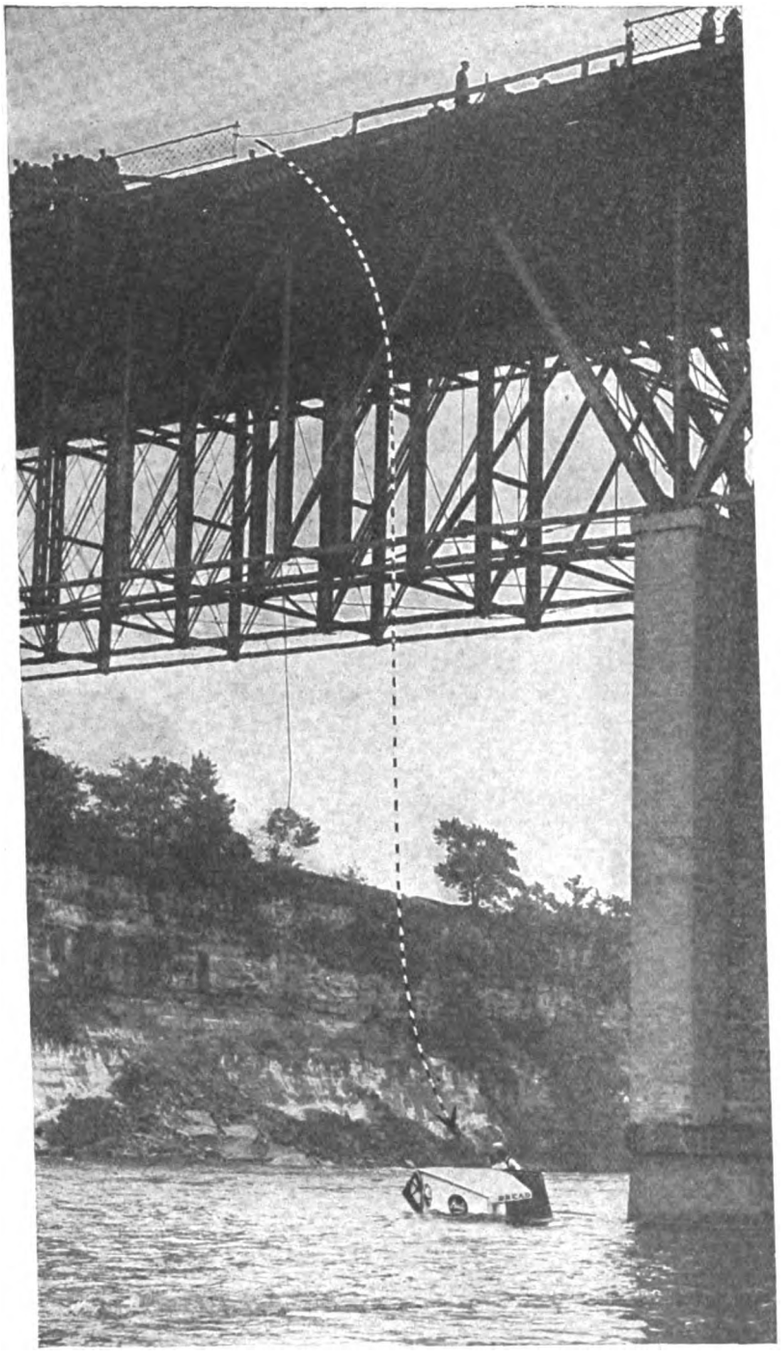
"Electric Vehicles in Municipal Service," by Arthur J. Slade, consulting engineer, New York City.

Electric Vehicle Association Handles Many Sales Prospects.

The Electric Vehicle Association of America is a clearing house for a great number of sales prospects secured not only from different points in the United States, but also from practically all foreign countries. When inquires for electric-vehicle information or other sales data is requested, same is satisfied immediately through the medium of letters and literature, and the information contained in these inquiries is placed on what is termed "Common" and "Preferred" prospect sheets and immediately mailed out to all manufacturers of electric vehicles, batteries, tires, accessories, industrial trucks, etc., which organizations supply inquirers with detailed and specific sales data. It is interesting to note as a partial result of the Association's extensive publicity campaigns conducted in many of the foreign countries that it is receiving a large number of excellent letters from almost all points in the world, seeking information about electric vehicles, and in many instances, indicating a desire to purchase some type or model. This is interesting because to many people the Electric Vehicle Association is regarded solely as a national body, whereas it is conducting quite an aggressive international campaign which is assisting the manufacturers in selling their commodities abroad.

Digitized by Google

Another Example of EDISON BATTERY RUGGEDNESS



One of the 36 Edison-Equipped Electric Delivery Wagons of the **Purity Baking Co., St. Paul,** recently left the roadway of a bridge, mounted the sidewalk, crashed through the iron side railing and plunged **100 FEET into the Mississippi.**

Some of the cans were considerably bent and dented and the wooden trays showed the effect of the fall but BEFORE ANY REPAIRS WHATEVER HAD BEEN MADE TO THE EDISON BATTERY IT WAS PUT ON "BENCH TEST" AND **EVERY CELL WAS WELL ABOVE RATED CAPACITY ON A NORMAL CHARGE.**

This indestructibility of the Edison Storage Battery permits its use in

Commercial Trucks
Industrial Trucks
Baggage Trucks
Mining Locomotives
Safety Mine Lamps
Railway Train Lighting
Heavy Duty Tractors

with no liability to mechanical injury.

Bulletin 1125 describes the manufacture of Edison Cells and many of their applications.

Bulletin 1023 shows why over 75 per cent of the Electrical Industrial Trucks and Tractors are equipped with Edison.

WRITE FOR BOTH.

You cannot break the Jars, Plates or Separators of Edison Non-Acid Storage Batteries in service and they have passed practically unharmed through wrecks, collisions, fires, floods, cyclones, short-circuits and every other form of mechanical and electrical abuse.

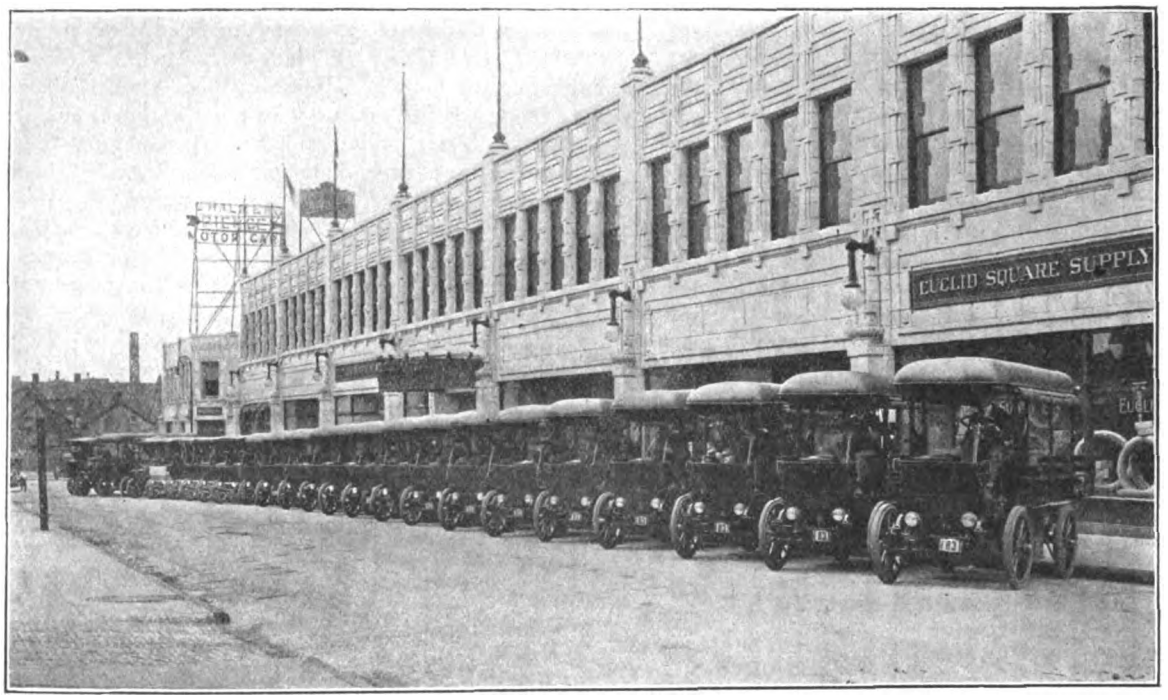
EDISON STORAGE BATTERY COMPANY

Main Office and Factory, ORANGE, NEW JERSEY

Distributors in

New York Boston Chicago Detroit Washington
San Francisco Los Angeles Portland, Ore. Seattle

Digitized by Google



The "Electric" Fleet of The Delivery Co., Cleveland, Ohio

HERE is a photograph of a fleet of electric delivery wagons and trucks operated by The Delivery Company of Cleveland, Ohio. Every electric in this fleet is equipped with an "Ironclad-Exide" Battery.

During the month of November, 1913, which was the first month the Delivery Company operated these trucks, they averaged 41 miles per day and carried an average of 181 packages per car per day.

Here is a letter received from the above company a few months ago:

> *"We are pleased to advise, that we are using some twenty-three sets of your 'Ironclad' batteries in our delivery trucks in Cleveland. The service required of this equipment is rather severe, as we operate upon schedule time for the majority of the Department Stores, and our general delivery system, which serves some two hundred customers.*
>
> *"A mileage of from fifty to sixty miles per charge is not unusual for some of the longer routes and we find the 'Ironclad' battery rendering a very faithful performance, even under the severe road conditions of this City and after ten months' usage we are very glad to report entire satisfaction with their record."*

Electric vehicles equipped with "Ironclad-Exide" Batteries offer a dependable and economical delivery system.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator" The "Tudor Accumulator"
The "Exide" "Hycap-Exide" "Thin-Exide" and "Ironclad-Exide" Batteries

New York, Boston, Chicago, Washington
Cleveland, Atlanta, Pittsburgh, Detroit

PHILADELPHIA, PA.
1888-1915

Denver, San Francisco, Seattle, St. Louis
Rochester, Los Angeles, Toronto

Digitized by Google

The Battery-Service System.

The General Vehicle Company has produced an interesting bulletin describing its Battery Service System, written by Frank B. Rae, Jr., editor of *Electrical Merchandise*. The following abstract will be found worth studying:

The Battery Service System is simply a method of selling electric motor car transportation by the car-mile instead of trying to sell electric current for battery charging by the kilowatt-hour. It is a method which relieves electric trucking of all uncertainty. Under the Battery Service System, the electric light man says to the merchant or manufacturer: "It will cost you so much per mile to operate this electric motor truck." That's all there is to it.

Boiled down, the proposition is this:

The customer buys his electric wagon or truck without batteries. That saves him about 20 per cent to 25 per cent on his original investment. The lighting company owns and keeps ready for service a sufficient number of batteries to keep all the cars running all the time. When a battery is about exhausted, the customer brings his car to the garage for a "battery exchange" and in three minutes is on the street again with a fresh battery.

In a sense, it is like the modern milk delivery system. Years ago the milkman ladled out milk from the can into the family pitcher; today he delivers it in a company-owned bottle. Similarly, the common practice has been for an electric lighting company to deliver current to the customer's battery; the new system delivers the current "bottled" in a company-owned battery. In other words, the company is selling "canned" current instead of "loose" current.

The customer pays so much per mile for whatever distance his car travels, and he can travel as far as he wants to, using up the energy in several batteries a day if his business demands it. Thus there is no mileage limitation whatever placed upon any electric car that uses the Battery Service System. The customer has no reason to worry about hills, snow, mud or axle grease. All the uncertainty which exists in the layman's mind regarding the efficiency, life and care of batteries is also removed.

There is nothing philanthropic about the company's doing this; the Battery Service System is a business proposition in averages. The schedule of rates is figured as scientifically as a schedule of insurance rates, and upon the same principle. The element of chance or hazard is not a gamble, but is business risk reduced to a percentage basis. Without doubt, service is sometimes rendered at a loss, but then, insurance companies sometimes pay claims for thousands when they have received only a few dollars in premiums. Similarly a merchant averages his loss on a slow-moving line of goods against his profits on a quick turn-over; a manufacturer fixes his selling prices to take care of emergency items, such as broken machinery and spoilage; a street-car company averages long hauls against short hauls. With the Battery Service System the car-mile rate is based upon the average car-mile cost, with all the variables figured in. And because the electric light company is caring for and charging a great number of batteries under the expert supervision of specialists, in a garage and charging station wherein every possible facility for economy is provided, the car-mile rate they charge under the Battery Service System averages less through the year than the kilowatt-hour rate would come to, except in garages approximately as large and as well equipped.

The Battery Service System is not new. It has been in operation for two and one-half years in Hartford, Conn., and for shorter periods in other places. It is a success. If proof of this success were needed it is contained in the fact that Hartford is buying a car per year for each 7,000 of population, whereas the records show that a good general average of sales in cities which do not have a Battery Service System is a car to each 125,000 of population. Any proposition that results in 18 times the normal amouunt of sales may safely be termed successful. And another proof of success is that over half the electric vehicles purchased in Hartford have replaced gasoline cars.

The wide variety of service given under the System in Hartford is suggested by the reproduction of a full-page newspaper advertisement which the company printed in its local papers about a year ago. Here we find pictures of wagons and trucks used to handle coal, milk, groceries (wholesale and retail), ice cream, men's furnishings, baked goods, laundry and for general expressage and trucking. The cars sold have traveled 1,056,525 miles, to March 1, 1915.

Among the most interesting cases is that of a 2,000-pound wagon owned by W. F. Griswold, a dairy farmer located seven miles from the charging station. The following description of this machine and its work appeared in *The Motor Truck*.

"W. F. Griswold has a farm at Rocky Hill, seven miles distant. He has nearly 100 cows, and produces more than 1,000 quarts of milk daily, which is distributed by two routes in Hartford. The longest route was 25 miles, on which was delivered about 625 quarts of milk and cream, and serving this in the summer three horses were used, each making 25 miles for two days and resting the third day. In winter four horses were used, each pair working alternate days. On the other route the work was not as hard, and the animals could be worked fairly regularly in summer, and alternated in winter, as conditions required.

"Milk was delivered each day at the store of the Boston Branch Grocery, which operates the largest number of electric wagons in service in Hartford. After observing these for a considerable period, and learning of the Battery Service System, Mr. Griswold ordered a 2,000-pound wagon, which was delivered July 18, 1914. This machine has been operated each day since delivery, being driven by a son of the owner. * * * and each day at noon the battery is exchanged. The mileage at this season is approximately 25 a day.

"The young man serves 325 customers, which means that many stops. With a boy he leaves the farm at 6 o'clock, and is back by 1:30. A typical load was 22 cases of 12 quarts, 12 cases of 20 pints, in bottles, four 40-quart, one 30-quart and two 10-quart cans. This was a total of 594 quarts of milk and cream, weighing, with the containers, about 2,500 pounds. The wagon is driven under a shed at the farm, there not even being a garage.

"During the period of the year when the crops are harvested, the wagon is loaded with produce or fruit and makes a second trip to Hartford, this bringing the mileage for the extra trip days to 40 or 45, but during the winter the route alone is covered. The monthly mileage will range from 750 to 800 in winter and from 150 to 200 miles more in the warm weather. Since the electric wagon was purchased the number of horses used for the farm has been reduced from 16 to 10, so the machine can be regarded as practically replacing six of them. Since the wagon has been in use but one delay, for a half hour, has been experienced, and the driver says that he never could have done as well with animals."

This is but one example of many in Hartford. It is chosen because it represents hard operating conditions, as is evident from the figures—a route of 25 miles with 325 stops to be covered in seven and one-half hours—the wagon starting with 25 per cent overload and going its route for seven days a week with only a single half-hour delay within the first eight months. Contrast this hard, wearing service with the service or operating conditions of a wholesale grocer's truck, for example. It might travel but 25 miles, not in seven and one-half hours, but in 10 hours,

Digitized by Google

Heavy Duty Electrics

"General Vehicle"—of course

Heavy duty G. V. Trucks are used in over 90 lines of business. Some cover 60 miles per day, some but 12 miles. They pay on the longer city runs and they pay also in the mill yard where the hauls are not over 100 yards each. Adapting trucks to the *individual needs of the user* comes only through long experience. "Over 5,000 G. V. Electrics in service" explains why we seldom fail.

The Electric truck is not a competitor of the gasoline truck. Each has its economic field —the Electric for short haul frequent stop work, the gasoline truck for the long hauls with few stops.

In the city where heavy loads and frequent stops must contend with street congestion and waits at warehouses and terminals, the Electric is by far the most efficient, satisfactory and economical truck. Let us prove this to you.

Catalogue on request.

General Vehicle Company, Inc.

Long Island City, N.Y.

New York, Chicago, Boston, Philadelphia

Copyright, 1915

2519

Digitized by Google

over good city pavements and have to make only 100 stops. Obviously if a high-grade electric truck can beat out the horse on a milk route where operating conditions are abnormal, it can give the horse even a better run for its money on congested city streets. For the electric is at its best in the thick of the fight. The electric is more than a shunting engine, but it isn't a through freight engine. That honor falls to the gasoline truck. The trouble is that a lot of firms have been burning up money by using the through freight engine in the yard, namely, the city, forgetting that about 80 per cent of all the average city trucking can be done by the electric truck. That is, such work is in the field of the electric, and that being the case no other machine can do the work so well or so cheaply.

On February 14, 1912, there were 14 cars operating under the Battery Service System in Hartford; on January 1, 1914, the total increase was over 300 per cent, while January 1, 1915, showed a 50 per cent gain over 1914. Considering the size of Hartford, that is a record for continuous, uninterrupted vehicle success which is as yet unmatched anywhere in the world. Yet in half-a-dozen other cities where the system is now being established it seems probably that Hartford's wonderful record will be speedily overshadowed.

And why?

Simply because the Battery Service System removes the misunderstandings that heretofore have always existed between the man with goods to move and the man with current to sell. The removal of misunderstanding removes the troubles and disappointments which were caused by this misunderstanding. Under the new system, the electric light company provides what the customer wants—that is, electric transportation, measured in car-miles.

The Battery Service System removes every disadvantage to electric motor car transportation, and leaves only its advantages. As every man knows who has ever talked electric trucks to a prospective purchaser, the contra arguments are only four: (1) High first cost of vehicle. (2) Limited mileage on one battery charge. (3) Uncertainty as to efficiency, life and care of batteries. (4) Uncertainty as to actual cost of operating the car. The new system eliminates these arguments—wipes out these objections. (1) The vehicle minus battery is not high in cost. (2) Mileage under the Battery Service System is unlimited. (3) The battery and its troubles, if any, no longer concern the vehicle owner, but are of interest only to the lighting company. (4) The cost of operation is a fixed rate per car-mile.

So the whole proposition simmers down to a simple little question in arithmetc, thus: Find out how much it costs to deliver or truck goods under old methods; subtract the amount it would cost to do the same amount of work electrically under the schedule of the Battery Service System, and the difference between the two amounts is the net saving effected by the truck owner.

"But what if there is no saving?" asks the skeptical man.

Then study the figures and find what has been left out of the costs under the old method. If *all* the costs are figured in, the chances are about 100 to 1 that trouble-proof trucking by electricity shows a definite economy in dollars and cents, and this without taking into consideration such items as:

Reliability. Flexibility. Cleanliness. Ability to operate in both blizzard and heat. Capacity to handle occasional heavy overload.

The man who sells—or the man who buys—electric transportation under the Battery Service System is dealing in proven figures, not in estimates. He is dealing with definite facts, not in arguments. And that is another advantage of the system—it saves a lot of talk.

Chicago Section, Electric Vehicle Association to Hold Annual Meeting October 5.

The annual meeting of the Chicago Section of the Electric Vehicle Association of America will be held on October 5. The first meeting of the fall and winter season of 1915-1916 will be held on September 7, at the Metropole Hotel, 2300 Michigan Avenue.

In connection with the work of the Chicago Section, the secretary of the Electric Vehicle Association of America has made the following announcement: "The General Office of the Association desires to express publicly in this manner its very great appreciation for the practical work of great value which the Chicago Section is accomplishing in the matter of their so-called parking system whereby users of electric vehicles may leave their vehicles at the Electric Shop of the Commonwealth Edison Company where uniformed, licensed chauffeurs take them to the park and return them whenever ordered. This co-operative service has done as much, if not more than any one single thing to emphasize the practical value of a local section of the Association, because the service, much desired, is being extended under the auspices of the Chicago Section. It is expected that other cities, and especially those cities in which the Association has its 16 sections, where city ordinances deny the privilege of cars standing stationary for any length of time at the curb in the city streets, will develop some such scheme as being successfully carried out in Chicago. F. E. McCall, secretary of the Chicago Section, of the Commonwealth Edison Company, 120 West Adams Street, Chicago, Ill., is preparing a detailed outline of the methods employed in the extension of this service and same will be released by the General Office of the Association to all other section secretaries. In the meantime it is felt that Mr. McCall would gladly satisfy any request for information in this work."

Electric Makes Fifteen Hundred Miles in Fourteen Days.

Over 1,500 miles in 14 days is a recent performance of an electric. This record in electric-vehicle efficiency was made in the recent endurance test held by the Beardsley Electric Company, of Los Angeles, Cal. Mrs. Volney Beardsley, wife of the president of the company, volunteered to drive the car for the first 10 days, being accompanied each day by different women representing the press and acting as observers. During the last four days the car was driven by owners of Beardsley electrics, to further demonstrate the possibilities of an electric when driven by any careful operator. Mrs. Beardsley timed her days so successfully that in no case did the daily run fall below 100 miles, the average daily mileage being 106.6.

On the tenth day, when she believed the test was coming to an end, she decided to make the longest record of the 10 days, and registered 117 miles. In each case the day's run was made on a single charge of the batteries. The last four days increased the average to 107.5 miles per day, or a total of 1,505.6 miles covered in 14 days.

As to the battery efficiency, the owners themselves were not sure at the beginning whether the batteries, after being practically exhausted on 100-mile run each day, could be charged over night, ready to repeat the performance the following day. They proved, however, that this could be done, not only for a second day, but for a steady two weeks' grind, and upon examination of the batteries at the completion of this 1,500-mile run, the plates were in excellent condition, showing that the car was probably capable of keeping up this same average for a long time. The runs were made over all kinds of California roads, covering different routes, the greater part of which were country runs over hilly ground.

Digitized by Google

Books on Electric Vehicles

"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr. and Frank W. Smith

Fellow Am. Inst. Elec. Engrs. Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America.

President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

362 Pages, Fully Illustrated, Flexible Leather Cover, Pocket Size. Price, $2.00.

CHAPTERS

I.—Electric Vehicle Development. By William P. Kennedy, Consulting Transportation Engineer.
II.—Lead Storage Batteries; Descriptive Lead Batteries; Charge and Discharge Rates; Care of Storage Batteries.
III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
XIII.—Comparative Cost Data.

The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 820 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.

The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 820 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

PRACTICAL AUTOMOBILE DICTIONARY. By S. KRAUSZ

English-French-German; French-English-German; German-French-English. With an introduction by C. J. Glidden. Twelve thousand technical terms and other words employed in connection with motor cars and motoring. For use in office, factory, repair shop and touring in foreign countries. 16mo. Leather. 129 pp. Price $2.00.

SELF-PROPELLED VEHICLES. By JAMES E. HOMANS

A practical treatise on the theory, construction, operation, care, and management of all forms of automobiles. Seventh Edition, revised. 500 illustrations. 6x9. Cloth. 667 pp. Price $2.00.

The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

THE AUTOMOBILE. By P. N. HASLUCK

A practical treatise on the construction of modern motor-cars, steam, petrol, electric and petrol-electric. Three volumes. Special Edition, enlarged. 1,260 illustrations. 8vo. Cloth. 1,800 pp. Price $10.00.

A very handsome set of instructive books brought up to date in the third volume containing many elaborate illustrations of cars now in use.

Electrical Review and Western Electrician

Western Headquarters for Electrical Books

608 S. Dearborn St.
CHICAGO

The Electric Flusher

Means Money to the Central Station

The electric street flusher is one of the most interesting and successful applications of the electric power vehicle. There are GMC electric flushers in active service that are daily demonstrating their ability to do more and better work than horse flushers and at less cost.

Progressive central stations will find it profitable to investigate the electric flusher with a view to its adoption in their own municipalities. We are in a position to give facts and figures regarding horse-drawn flushers and motor-driven flushers.

Write for information concerning street flushers or electric trucks to meet the demands of any service condition. Our line includes sizes from 1000 lbs. to six tons.

GENERAL MOTORS TRUCK CO

One of the Units of General Motors Company

PONTIAC MICHIGAN

Direct Factory Branches: New York, Boston, Chicago, Philadelphia St. Louis, Kansas City

(31)

Digitized by Google

EDUCATIONAL VALUE OF SOCIABILITY RUNS.

By A. Jackson Marshall.[1]

When we hear repeatedly of the many successful tests made of the endurance and country-running ability of the electric vehicle by various manufacturers, we must conclude definitely that the use of an electric is no longer confined to city streets and boulevards. We have so long been accustomed to thinking of the electric as the town car, par excellence, that it has not occurred to us that it will give just as delightful and satisfactory service on rural trips in this day, when charging facilities have become so well developed and numerous. While it will always remain the favorite car for city use, the electric in time will become just as great a favorite for interurban trips and short tours. It is a matter of educating the owners of electrics to operate their cars with greater reliance and to make wider and more general use of them. Such series of runs as the Anderson Electric Car Company carried on not long ago in Detroit when one of its stock model broughams made as much as 112 miles on a single battery charge, and the recent endurance runs conducted by the Beardsley Electric Company, of Los Angeles, Cal., when the car registered over 1,500 miles in 14 days, show that there should be no doubts about the electric's ability to cover ground. The solution of the problem of getting electric owners to use their cars more extensively lies in the Sociability Run.

There is nothing new about the idea. It has been tried sporadically for a number of years, but the time has come for a more systematic and continuous effort to introduce them into all parts of the country. The problem of organizing such runs in cities where the number of electrics warrant such a performance is being met and solved by various sections of the Electric Vehicle Association of America. With an organization of live and progressive men to start the ball rolling and the co-operation of electricity supply stations, manufacturers, garages and owners themselves, everything should conspire to make the runs a success.

In emphasizing Sociability Runs, the writer does not mean to recommend stunts in the nature of mileage test runs, speed contests and the long cross-country tours. These are all variations of the Sociability Run, and have this advertising value, but are not so educational as where the owners themselves take part. When the owners of electrics and their friends participate they not only learn the advantages and capabilities of the electric, but they also familiarize themselves with traffic regulations while passing through town and city streets on their way to the country districts.

In anticipation of Electrical Prosperity Week, scheduled for November 29 to December 4, 1915, the Electric Vehicle Association of America has gathered together various data on how to organize and conduct Sociability Runs. It is the firm conviction of the Association that the introduction of such runs is the very best way to educate the public in the country-running ability of the electric and dispel the idea that it is necessarily a car for city streets only. It is hoped that many runs of this nature will be organized during Electrical Prosperity Week, and that the results will be far-reaching in breaking down existing prejudice.

The following suggestions for conducting runs are based on the experiences that several sections of the Electric Vehicle Association have had in successfully organizing them, especially the Washington Section, whose runs have met with great popularity and success. In cities where the Association has a section it has not been found necessary to have a special committee to handle the work, the run being managed by members of the main Executive Committee—those members who are car dealers taking the most active part. The preliminary work to be done is divided up and consists in making provision for the following: Pennants, badges for committee, prizes, refreshments, and the selection of the route. The entries are made by individual owners, no dealer being allowed to enter his car in competition.

To cover the expenses of the run an entry fee is charged—$1 for cars carrying one or two passengers, and $2 for cars carrying three or four passengers. Subscriptions of from $5 to $15 are solicited from central stations, garages, car dealers, battery manufacturers, etc., to cover other expenses.

One of the most successful features of the Washington Sociability Run was the arrangement made for luncheon. Instead of serving the party at an inn, each car was provided with a luncheon box put up by the best and most fashionable caterer in Washington, and at the finish the participants forming their own groups voted the appetizing luncheons one of the most enjoyable parts of the run.

The prizes were bought from one of the leading jewelers, and while after the first two or three prizes the remaining were necessarily small, they were the best of their kind obtainable.

As a great many of the entrants are usually women, it is considered wiser not to have any contest that would test the skill of the drivers, and contests bringing out any one feature of a car are apt to result in unfavorable comparisons being made for cars not competing. In the Washington runs it was considered that the route selected should not take materially over an hour to negotiate, and any entrant who was unable to complete the route in an hour and one-half was disqualified. The only competition was against average time made by all contestants completing the run within the time limit; that is, instead of having a sealed time, as is so often done in Sociability Runs, the total elapsed time of all cars completing the run within the time limit was added and divided by the number of entries. The car making the nearest to this time was awarded the first prize.

The Association will be glad to furnish any further details on the organization of Sociability Runs. It is the sincere desire to encourage in every possible way a systematized organization of runs, such as will show the public that for any average country run or week-end trip the electric is entirely capable.

1 Secretary, Electric Vehicle Association of America, 29 West Thirty-ninth Street, New York.

Florida Motorist Suggests Road Rules for Lincoln Highway.

Evidently the road rules in the Everglade State are not favorable to the motorist. At least the tourist who sent in the following suggestions to the Lincoln Highway Association as rules of the road to be observed by the thousands of transcontinental tourists of this summer, has had some bitter recollections.

Upon close inspection it will be seen that a gentle vein of satire pervades the suggested list. The motorist says that they are the general rules which must be observed about Jacksonville, and, if they are successful and popular there, why not along the Lincoln Highway?

Rule 1—Upon discovering an approaching team, the automobilist must draw to one side of the road and cover up his machine with a tarpaulin painted to correspond with the scenery.

Rule 2—The speed limit on country roads this year will be secret, and the penalty for violation will be $10 for every mile an offender is caught going in excess of it.

Rule 3—On approaching a corner, the automobilist must stop not less than 100 yards from the turn and the mechanician must be sent ahead to blow a horn, ring a bell, fire a revolver and send up three rockets at intervals of five minutes.

Rule 4—Automobiles running at night must send up a red rocket every mile and then wait ten minutes for the road to clear. They may then proceed carefully, blowing their horns and shooting Roman candles.

Rule 5—In case a horse will not pass an automobile in spite of the tarpaulin, the automobilist will take the machine apart as rapidly as possible and conceal the parts in the grass.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 11. CHICAGO, SATURDAY, SEPTEMBER 11, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
THE SOCIETY FOR ELECTRICAL DEVELOPMENT INC.
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Application of Hooded Lamps.....459
Publicity as a Means of Increasing Residence Business....460
Increasing Usefulness of Electric Passenger Vehicles.....461
Recognition of Engineers in Public Engineering Work.....461
DEPARTMENTS:
Commercial Practice.....466
Electrical Construction.....471
Public Service Commissions.....476
Questions and Answers.....478
New Electrical and Mechanical Appliances.....487
Latest Approved Fittings.....493
Current Electrical News.....494
Record of Electrical Patents.....497
LEADING ARTICLES:
Electricity in Large Steel Warehouses.....463
Shall the Central Station Sell Appliances.—By J. H. Moseley 466
Wiring and Conduit Work at the Panama-Pacific Exposition.—III.—By A. A. Willoughby.....472
Business Hints for the Dealer and Contractor.—By G. D. Crain, Jr.....475
Avoiding Being at Salesmen's or Solicitor's Mercy.—By Elton J. Buckley.....485
LETTER TO THE EDITOR:
Some Interesting and Important Law About Buying Goods. —By H. A. Miles.....485
MISCELLANEOUS:
Special Illumination of "Made In Baltimore" Exposition...462
An Electrical Garden City in Scotland.....462
Investigations in Leclanche Primary Batteries.....462
Chicago Section, Electric Vehicle Association Resumes Weekly Meetings.....462
Advertisements That Sold Many Irons.....469
Reduced Rates in Pepperell.....469
Problem of Free Lamp Renewals in Boston.....469
Electric Irrigation Proposed for Cape Cod District.....470
A. C. Martin.....470
Fees for Wiring Permits in Boston.....471
Examination of Electricians Held in Massachusetts.....471
Among the Contractors.....471
Daily Government Commerce Reports.....477
Scandinavian Railway Electrification.....480
Street Lighting [illegible].....481
Water-Power Utilization in the West Considered by Governors 482
Engineers [illegible] Chairman of New York Constitutional Convention.....484
Projector Lighting for Protection of Bathing Beaches.....485

Copyright, 1915, by Electrical Review Publishing Company, Inc.

APPLICATIONS OF HOODED LAMPS.

In the field of decoration and in the useful arts the opportunities for the application of hooded lamps seem almost unlimited. While every lamp screened to prevent glaring rays striking the observer's eyes is in a sense hooded, the particular class of lighting unit in mind is the small-powered incandescent just enough shielded from observation to call attention to some other object and entirely unobtrusive in itself. Of this class are the whole range of miniature or other low candlepowered units employed in the illumination of instrument dials afloat and ashore, in the concentration of a soft yet compelling pencil of rays upon some feature of a theater wall panel, and in the artistic lighting of dignified signs, signal buttons in hospitals, libraries, offices, and at high-class apartment house doorways.

There is no question that in the future lighting schemes of the best residences low-powered but well-directed lighting of this sort will be effectively employed, and very likely economies of operation will thus be obtained in spaces not ordinarily needing a large flux of light except at certain points. Just as an example, at a recent meeting attended by veterans of the Civil War in an armory a hooded lamp was employed at the foot of a long flight of stairs to facilitate the arrival of the old soldier's at the last step and to save any chance of tripping, electricity thus providing that "last touch" of hospitality which differentiates the thoughtful host from the average householder. These miniature flood lighting effects are extraordinarily effective within their field, and an ingenious central-station lighting salesman will find himself "stumped" if he tries to set a limit to the possible applications of this kind which he can put down in his notebook inside of a few days.

If such an alert salesman and a progressive young architect or interior decorator put their heads together some day, they will soon set an entirely new standard of specialized illumination within their fields of practice. To take one more example, the design of a hooded lamp suitable for operation in following a score or a libretto in the darkened auditorium of an opera house without interfering with one's neighbor would be a distinct triumph. Pocket flashlights are often used in this service. Every such application little by little adds to the popularity of electric service, familiarizes the public with its convenience, and augments the total volume of equipment sales.

Digitized by Google

PUBLICITY AS A MEANS OF INCREASING RESIDENCE BUSINESS.

In practically every central-station system the supply of electric current to residence customers costs very much more per kilowatt-hour than the supply of current to any other class of business. The consequence of this is that the rates for the residence service are necessarily the highest on the entire schedule of rates. The acquisition of residence business is highly desirable, however. Every central station that professes to be at all progressive aims at the complete electrification of the entire community served, which means the supply of electric current to every household as well as all other buildings. The argument has frequently been made that if residence business were to be brought to the saturation point and business men as well as workmen brought to realize the great advantages of electricity in the household, they would be more readily convinced of its adaptability and utility in business and industrial occupations.

Much has already been done in increasing residence business, particularly in the last few years since the use of higher efficiency lamps has very decidedly reduced the cost of electric lighting, which still remains the main use for electric current in the household. Through liberal advertising and other publicity methods the use of electric appliances has also been steadily increasing. The installment method of payment for wiring of houses already built has also had an important effect in increasing the use of electricity among the older residences. Of all of the publicity methods used, however, it may be said that their primary aim was to create a desire to use electricity in the home. As yet but little effort has been directed in the way of what may be called co-operative publicity to reduce the cost of serving residence customers with the idea of promoting more liberal use of current not only for lighting, but for the great multitude of household appliances now available, and also to promote the connection of practically every residence to the central-station lines.

In the last few years there has been a great change on the part of utilities in their attitude toward publicity, particularly to such publicity as aims to educate the public on some of the intracies of the utility business, and which, therefore, makes clear the reasons why certain policies and practices must be employed. Such publicity has been indulged in at times when the utility was confronted with the renewal of a franchise, or had to meet a demand by the municipality to reduce rates. It has been found that educational publicity at those times has been highly beneficial in creating a better feeling between the public and the utility. In connection with the subject being considered, however, it is suggested that educational publicity may also prove highly advantageous by bringing about an approach to saturation in residence business.

Among the many features to be brought out in a publicity campaign, such as here suggested, are: the relatively high cost of distribution-line construction for the comparatively small load met in residence districts at the present time, the high cost of each service connection including a relatively costly meter, also the high cost of reading meters and rendering the monthly bill, which items in many cases may amount to almost half of the total monthly charge. If these points, as well as the relatively low load-factor of residence service, also the need for the best possible voltage regulation so as to give thoroughly satisfactory lighting, are brought to the attention of the public in a proper manner, it is believed that the residence customers will not only see the reasons why residence service requires the highest charges, but will be willing to co-operate with the central station in reasonable efforts to reduce the cost of this service. This can be done in many ways, for example, by friendly efforts of residents to urge their neighbors to take electric service and thus connect up practically every residence in each block; this will bring about a considerable reduction in the cost of distribution system per customer. Co-operation in bringing the expense of meter reading down may readily be brought about by arrangements whereby the inspector will be insured of ready access to the meter without return calls. Realization that an increase in use of current brings about a reduction in the cost of supplying each unit of energy will promote more liberal use of current, if it is suggested to the users that such reduction will be followed by more favorable rates.

It is just this point which probably will be the stumbling block against this proposal. However, there can be no question but that through decided stimulation of residence business to an approach to the saturation point, the cost of rendering it will be materially reduced. There can also be no question but that if the utility shows its good will toward the public by voluntarily reducing the rates for residence service, particularly the maximum or primary rate, this will have a most beneficial effect in still further building up the residence business. Therefore, a hint thrown out judiciously in such a publicity campaign that the co-operation of the public in promoting residence service will prove beneficial to all the residence customers, is certainly a reasonable way to secure their active co-operation. In many small communities the cost of securing new business is very low because those already served advocate the use of electric service among their neighbors and these gradually fall in line and become patrons of the central-station company. A similar state of affairs can be brought about also in larger communities by means of such a co-operative publicity as here suggested.

Great plans are being made in a nation-wide effort to increase the use of electric current and electrical appliances of all kinds through what will be known as Electrical Prosperity Week. Publicity

Digitized by Google

along the lines referred to above would be very timely in connection with the promotion of this great national movement. At any rate, it seems reasonable that a judicious trial of the plan might be made at that time.

INCREASING USEFULNESS OF ELECTRIC PASSENGER VEHICLES.

One of the problems which is being encountered in furthering the adoption of the electric passenger vehicle, especially in the larger cities, is that of increasing its usefulness to women drivers for shopping, theatergoing and for miscellaneous driving about the congested business district. The rapidly increasing use of automobiles resulting in serious traffic congestion in the downtown sections of cities has made strict regulation imperative, and practically all cities now have laws denying the privilege of cars standing stationary for any length of time at the curb in city streets. This, undoubtedly, works considerable hardship, especially if one does not have a chauffeur, and as one of the principal claims for popularity of the electric is its simplicity and ease of operation, the large majority of prospective purchasers contemplate driving their own cars. Parking restrictions, therefore, tend to limit the use of the electric for city service, and many dealers have tried in vain to overcome this objection, which is frequently advanced by a prospective purchaser.

In Chicago, where the traffic congestion in its limited business section is one of the city's most serious problems, laws have recently been enacted prohibiting cars standing at the curb for a longer period than one-half hour on certain streets, and prohibiting parking of any duration on other principal streets. Those interested in the advance of the electric vehicle have recently inaugurated, under the auspices of the Chicago Section, Electric Vehicle Association of America, a parking system which promises to practically eliminate this drawback, in so far as the electric vehicle is concerned, and at the same time give the battery vehicle an advantage over its gasoline competitor.

The system, as mentioned in our issue of August 7, provides for the establishing at prominent business houses, preferably on the boulevards, of stations where cars may be left by the owners with competent attendants who drive them to adjacent locations outside of the restricted area, and return them again whenever ordered by the owner. There is no charge for this service, the car owner simply understands that by taking advantage of it he entirely agrees that the driver was acting only in the capacity of the owners' personal agent. The cost of this service is borne principally by the various garages, who, upon contributing to the fund, are supplied with tags which are in turn sent to their customers entitling them to such parking service.

At the meeting of the Chicago Section on September 7, various garage owners reported that their customers are enthusiastic over the new service. While there are over 3,500 electric passenger cars in use in Chicago, indications point that ample provisions can be made to care for all who apply for the service. While dealers are not as yet willing to attribute sales directly to this feature, they are heartily in accord with the plan and are voluntarily offering to contribute to its permanent continuance. This parking service is practically impossible with any but electric cars and full advantage should be taken of this point in advancing the claims for the electric. It is but another instance of the complete service which the industry is prepared to furnish to the user.

RECOGNITION OF ENGINEERS IN PUBLIC ENGINEERING WORK.

When the revision of the Constitution of the State of New York was taken up this spring, a committee of engineers representing national and local engineering societies was organized to present recommendations to the Constitutional Convention seeking to place in the organic law provisions that would insure the engineering work of the state being conducted by competent engineers. This committee presented its recommendations to the Convention. The Convention committees have not seen fit, however, to incorporate all these recommendations in their report to the main body. The committee of engineers has therefore presented an open letter to the Convention through its chairman, which is reprinted in this issue.

This plea emphasizes the importance of the earlier recommendations and urges that full and favorable consideration be given thereto. The matters involved are principally the management of public works, conservation of the State's natural resources and the regulation of public utilities. As was pointed out in these columns editorially in our issue of May 1, 1915, these matters, being chiefly of an engineering nature, should be conducted by engineers qualified for the purpose. The time has passed when the frequently changing political control of engineering work can be tolerated.

The appeal of the committee of engineers should be given favorable consideration and should be heartily endorsed by all engineers, not only in the Empire State but throughout the country. If the suggestions are incorporated in the organic law of the leading commonwealth of the country a long step in advance will have been taken and other states will be more easily led to follow in its footsteps.

At the time of going to press news comes from Albany that the New York Constitutional Convention is about to adjourn *sine die*, having hastened its concluding labors to permit submission of the revised Constitution to the voters of the State. Even though the efforts of the committee of engineers have not been fully successful, a step in advance has been taken by at least partial recognition of the engineer in directing public engineering work. At any rate the committee's work has aroused engineers to action whereby they are ready to uphold the necessity for their services in an executive capacity of this character.

Digitized by Google

Special Illumination of "Made in Baltimore" Exposition.

When the big door of the Fifth Regiment Armory was raised on September 6 to mark the opening of the second annual "Made in Baltimore" Exposition, which is being held at the Armory until September 29, there was a scene of electrical illumination that rivaled anything heretofore attempted in the city.

In front of the main entrance of the Armory on Hoffman Street a huge electric sign blazed forth, and thousands of incandescent lights formed the letters in "Made in Baltimore Exposition." Inside of the Armory the regular arc lamps were augmented by 10,000 smaller decorative electric lights of various colors.

Each booth was outlined with electric lights placed eight or nine inches apart, in addition to the numerous individual exhibitors' signs. The booths were divided into aisles for the convenience of the spectators, and throughout the entire lengths of these aisles there was placed at every 10 feet a large white column surmounted by a high-candlepower electric light inclosed in a decorative white opalescent globe of special design. The contract was awarded to the Eugene I. Rosenfeld Company, and work was started the latter part of August so that everything was in readiness for the opening night.

An Electrical Garden City in Scotland.

There is what is described as an electrical Garden City at Hazlewood, Dumbreck, a car-ride from Glasgow. It is so described because of the erection there of a number of villas which are installed throughout with electricity for all domestic purposes. The villas comprise four, five, or six apartments and in the chief rooms Carron electric glowing fires are fitted, while the kitchens have electric cookers, and hot-water heaters are placed in the bath-rooms above the taps. The builder of the villas states that from tests made by him in a recent summer month the cost for lighting, heating and cooking for a household of six persons amounted to 16 cents per person per week.

Electrical Progress on the Rand.

During the past year nearly $1,980,000 has been expended by the Victoria Falls and Transvaal Power Company, upon extensions to the Simmerpan power station, the Brakpan station, and upon consumers' substation equipments and transmission lines. The extensions to the air compressing plant at Rosherville have been completed and within the last few weeks the whole of the additions of 33,500 horsepower of electrical plant at Brakpan have been placed in commission. The demand for power is steadily increasing.

Herr Rathenau of the Allgemeine Elektricitäts Gesellschaft of Berlin, whose death occurred a month or two ago in Berlin, was a director of this company up to the outbreak of present war.

Telephone Employees Hold Picnic.

Several hundred employees of the Bell Telephone Company in Springfield and Dayton, O., enjoyed an outing on last Thursday, September 2, at Tecumseh Park, near Springfield, as the guests of the company. Special cars over the Ohio Electric Company carried the crowds to the grounds from both cities, and there was a keen contest between the Dayton and Springfield delegations, each trying to surpass the other in attendance. Reports indicate that it was approximately a draw. A big picnic dinner was naturally the central feature of the outing, which is an annual event, although athletic games and sports served to fill the day.

Sandusky Company Employees Hold Picnic.

Officials and employees of the Sandusky (O.) Gas & Electric Company, went picnicking on August 14, taking their families along for a general romp in the woods bordering on Lake Erie at Rye Beach. The business office was closed at 9 o'clock in the morning, and all employees who could possibly be spared were given a day off. The party, numbering about 150 people, were transported to the Beach in special electric cars furnished at the company's expense, and at the picnic grounds everything was free. The day was passed in bathing, bowling, dancing and disposing of a big picnic dinner.

Municipal Lighting-Plant Bond Issue Declared Invalid.

The $60,000 bond issue of the City of Ellensburg, recently voted for a municipal lighting plant, has been declared invalid by the Oregon Supreme Court, at Olympia, on the ground that the proposition submitted to the voters did not set forth in sufficient detail the conditions of the bond issue. Recently the state of Washington has arranged to purchase these bonds. However, before the bonds were taken over the State insisted upon a test suit. The decision is likely to prove an important one, affecting other similar bond issues.

Investigations in Leclanche Primary Batteries.

A new and commercially valuable investigation of the construction and chemical reactions of the Leclanche cell, the form of primary battery used so extensively for ringing bells, buzzers, etc, and in dry cells operating portable flashlights, bells, igniters, etc., has been undertaken by Ernest G. Crocker, of the graduating class in electrochemistry at Massachusetts Institute of Technology.

The polarization was found to be due to an alkali effect of ammonia, previously referred to hydrogen, and experiments were made with different sizes of the grains of materials contributing the dry battery, and various ratios of one of the materials to the other for efficient work.

It was found that the fineness should be between 1/40 and 1/100 of an inch, and contrary to the custom of some manufacturers, the two constituents should be of the same size. The materials used are carbon and pyrolusite, and the quantity of the latter should be about 60 per cent of the whole mixture.

Mr. Crocker found the best material for removing the alkaline effect is chloride of zinc. The practical result of batteries constructed according to the formulas deduced from the experiments is that they will remain more constant in current production under light continuous use. He further found that no commercial cell is using its materials in the most effective size.

Chicago Section, Electric Vehicle Association Resumes Weekly Meetings.

The first regular meeting of the Chicago Section, Electric Vehicle Association, following the summer vacation period was held at the Hotel Metropole, on September 7. No formal program was arranged, the time being used to discuss the parking system which was inaugurated early in the summer by the Section. Several of the garage owners who are extending free parking service to their patrons highly endorsed the scheme.

Valuation of Springfield Company.

Engineers of the Missouri Public Service Commission began September 1 a valuation of the property of the Springfield (Mo.) Gas & Electric Company. The Commission had employed engineers to make a valuation about two years ago, on which was based its report as to the rates of the company. The present valuation will be used in the defense of the injunction suit now pending in the federal court.

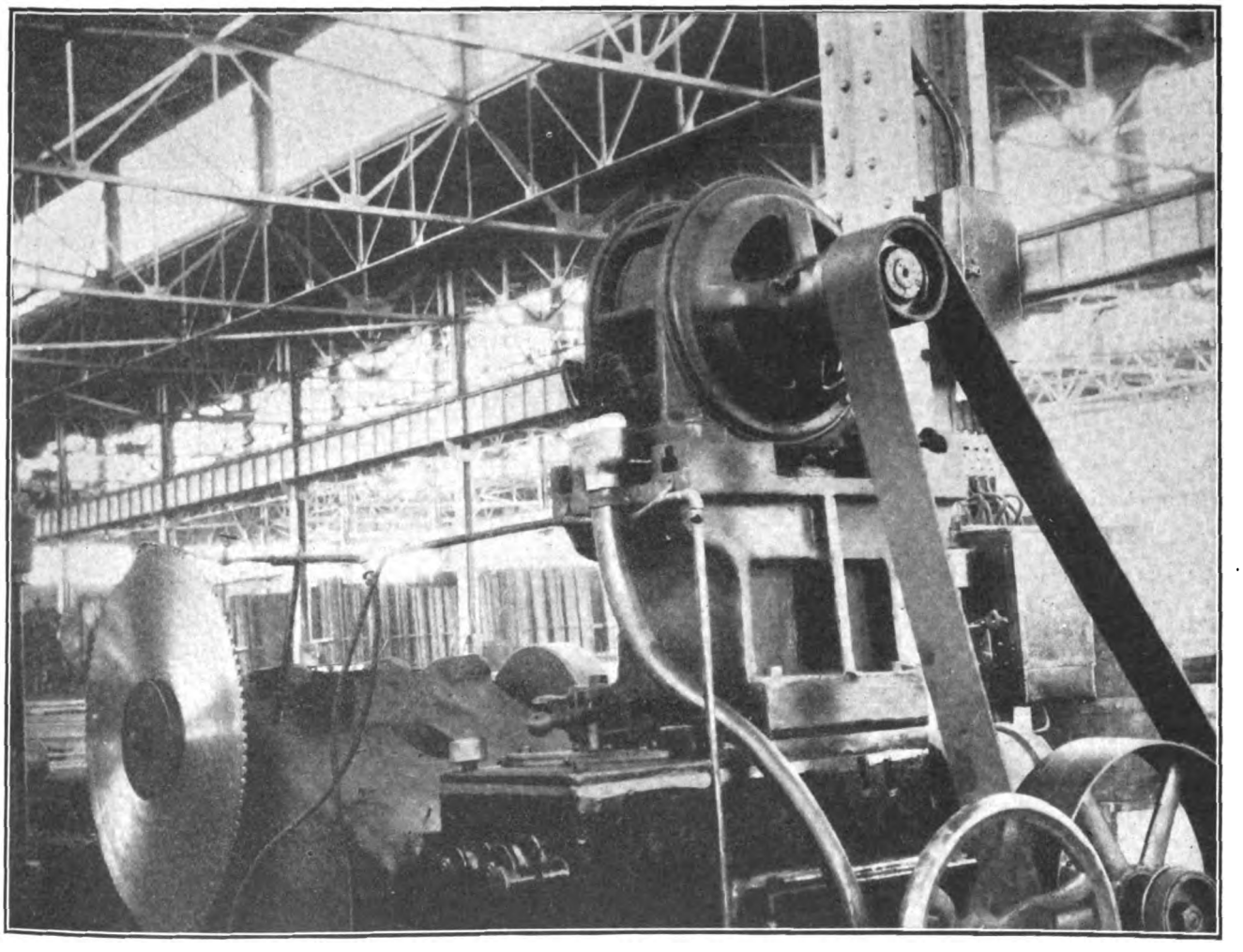
Digitized by Google

Electricity in Large Steel Warehouses.

This article points out that as the operation in the typical steel warehouse is extremely intermittent, central-station service is the logical and only type. Data are given on the motor equipment of the new Carnegie warehouse at Boston where 490 horsepower in motors are connected.

The New England warehouse of the Carnegie Steel Company, which was recently opened at Allston, Boston, Mass., is a noteworthy example of steel and concrete construction, and its mechanical equipment is of the most approved and efficient type.

This plant is the distributing depot for iron and steel products to all parts of New England and a large portion of Canada, and its location, about four miles from the heart of Boston, and on the main line of the Boston & Albany Railroad, gives ideal facilities both to local consumers and to the entire territory.



Motor Driving a 36-Inch Cold Saw in Carnegie Steel Company's Warehouse.

The building is 340 by 420 feet, and is divided lengthwise into five bays, each 68 feet wide. The walls and roof are of steel and cement, with glass set in steel sash. A two-story concrete office building is now under construction, in front of the storehouse. A locker house, with shower baths and other conveniences, will be provided.

The warehouse has a capacity of 30,000 tons. Machinery installed is for the cutting and splitting of bars, plates, beams, etc., and the twisting of reinforcing rods. A machine shop contains a lathe and emery grinders.

Storage provisions are of an approved type which has been adopted as standard in the four warehouses of the company, at Newark, Baltimore, Pittsburgh and Cleveland. Bars are stacked on end in racks constructed of structural steel and angles, each of the racks being 12 feet high and set in a concrete pit.

In the first bay is located a seven-spindle bar twisting machine of the United Foundry & Engineering Company make, with a capacity of seven rods at a time, of sizes up to 0.75-inch square. This machine is direct-connected to a 75-horsepower induction motor operating at 900/865 revolutions per minute and controlled for variable speed through a street-car type controller mounted at the side of the machine, beside an indicator which shows the number of twists given the rods as the operation proceeds.

At the back of the machine are located the rheostats, which are inclosed on three sides for safety by a structure of angle-iron corner posts 5 feet high, with 0.75-inch-mesh iron wire between, the sides being 2 feet 4 inches wide.

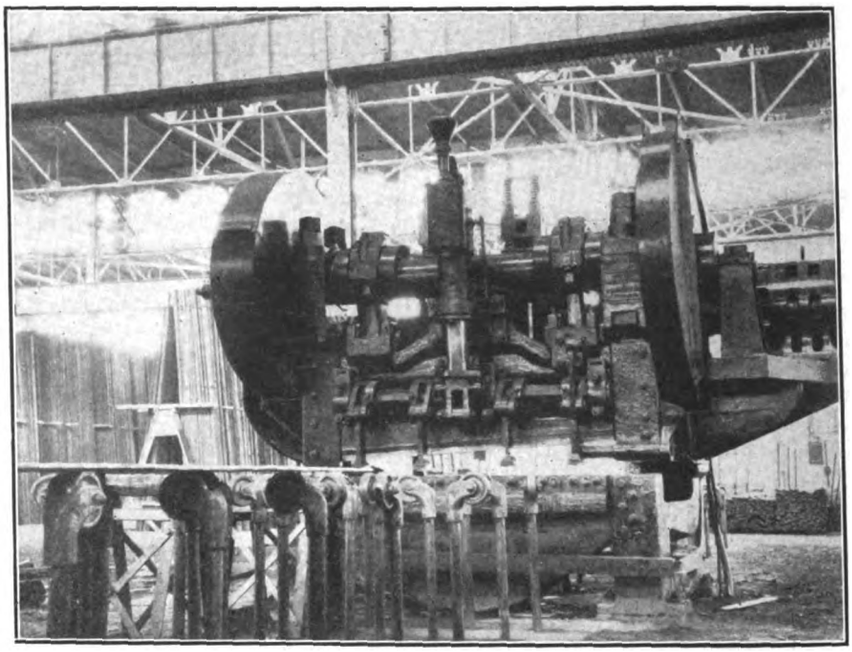
In the second bay, given to merchant bar stock, is a heavy 15-inch bar shear, specially built for this kind of service by the Carnegie Steel Company. This machine is driven by a 10-horsepower motor erected on a platform against one of the steel columns, constructed of a channel-iron base and angle-iron supports and braces. The motor is belted to the machine.

Bay No. 3 is for the storage of plate stock and small shapes, and is provided with a United Engineering & Foundry Company plate shear with a capacity of stock 70 inches wide by

Digitized by Google

one inch thick, and the splitting of a 60-inch plate. Casters on upright supports, the height of the bed of the shear, extend in rows a distance of 40 feet in front of the machine and 20 feet behind it, facilitating the handling of stock through the shear. The machine is direct-connected to a 30-horsepower motor mounted on the machine, controlled by automatic push buttons.

Other metal-working machines are, a Cleveland Punch & Shear Company gag press, for straightening and shaping beams, bars, channels, etc., driven by a 15-horsepower induction motor mounted on its frame; and a Hilles & Jones double-angle shear, with a capacity of angle irons up to 6 by 6 by 0.75 inches. This machine is geared to a 10-horsepower motor, erected on its frame, and operating at 720 revolutions per minute on no load and 660 under full load. A 36-inch Newton cold saw is operated by a 15-horsepower motor mounted on the machine and direct-connected, running at 1,200 revolutions per minute.



Motor Geared Direct to a 70-Inch Shear—Carnegie Warehouse.

The largest and most impressive machine in the warehouse is a high-speed friction saw, which is located between bays 3 and 4. It has a capacity for cutting I-beams up to 24 inches and 115 feet long. This machine is of the United Engineering & Foundry Company make. It is operated from a platform or "pulpit" 4.5 feet high, which gives the operator of the electrical mechanism a view of the saw table and rollers. Beneath the platform are the rheostats for the variable-speed motors which operate the several moving parts.

A 75-horsepower induction motor drives the 42-inch saw, which is mounted on a sliding frame with a four-foot travel. The frame is driven by a 10-horsepower motor, geared to a screw, giving forward motion of four feet per minute and return at 16 feet per minute. By the introduction of resistance into the motor the low speed of 200 revolutions per minute desired for feed to the saw, was obtained.

The two live roll tables, one line on either side of the saw blade, are 70 and 50 feet in length, respectively. Each is driven by a 20-horsepower reversing motor.

The arbor which carries the saw blade is supported on two sets of ball bearings which are mounted in greased ways, succeeding the former ring oiling, water-cooled type of bearing.

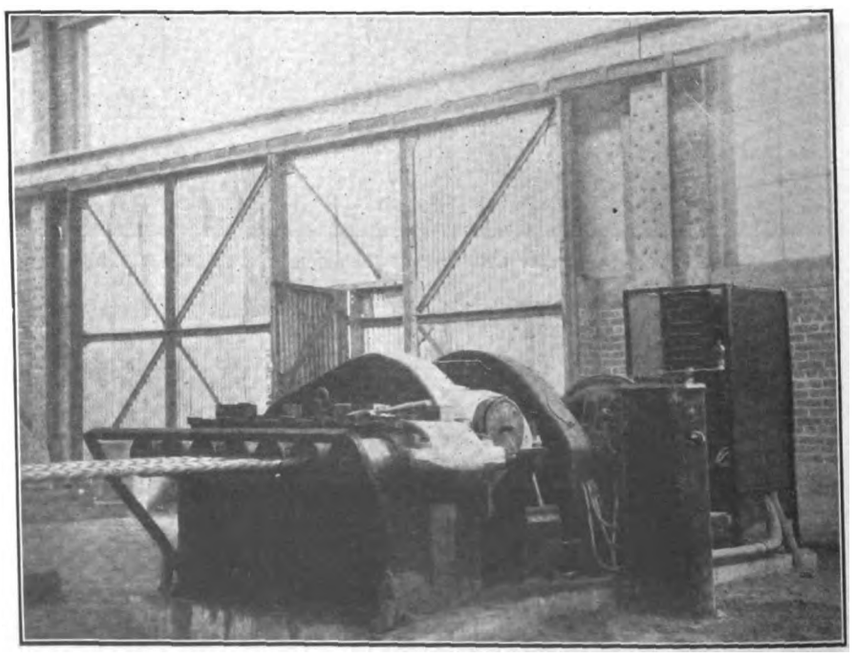
A special four-panel slate switchboard is erected on a structure of angle irons at one side of the operating pulpit. Four knife switches are installed in connection with the starting controllers for the motors, which are of the street-car type. The 75-horsepower saw-blade motor is protected with limit switches which regulate the forward and return stroke.

For the edging of the sawblades a four-foot lathe is located at a side of one bay, with saw-blade cutter, or "hob," this being driven by a two-horsepower motor of 1,800 revolutions per minute, located on the floor and belted through cone pulleys to reduce the speed for the rotating of the hob to about 40 revolutions per minute, to secure a careful and accurate milling of the saw teeth.

A double emery grinder, furnished by Manning, Maxwell & Moore, consists of two 2.5 by 18-inch wheels driven on a single direct-connected shaft by a 5-horsepower motor, at 1,130 revolutions per minute on full load. A Newton Machine Tool Works (Philadelphia) single emery wheel is also provided, this being driven by a 0.5-horsepower motor located on the floor.

A 10-ton travelling crane, of Pawling & Harnischfeger manufacture, serves each of four of the bays. These have a span of 68 feet and are provided with two lifts on the trolley. Each lift is operated by a 15-horsepower motor, the trolley travel is by means of a three-horsepower motor, and the bridge travel by one of 15 horsepower.

The cranes are connected by a platform which runs across the ends of the five bays, with stairs of "Safety



Seven-Spindle Rod-Twisting Machine in Carnegie Warehouse—Motor Driven.

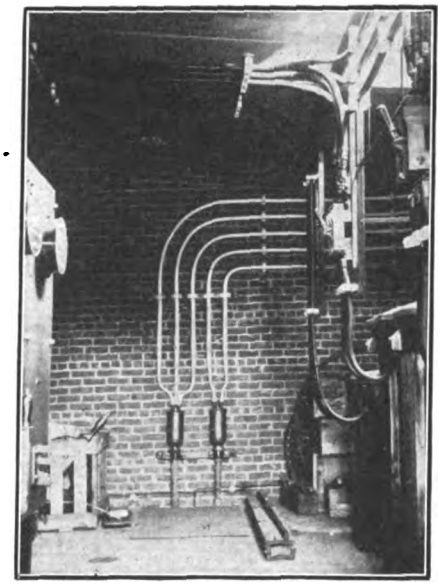
Digitized by Google

First" construction, the treads being of eight-inch channel iron, the open side upward being filled with cement to give a sure grip for the foot. Throughout the warehouse the safety principle has been adopted, the gears on machines and all exposed electrical parts being securely housed either in sheet iron or netting.

Lighting of the warehouse is by means of 250-watt Mazda lamps pendant from centers of each lateral span, installed in 18-inch shallow concave metal shades, with auxiliary lights, on the side walks, of 150 watts each, similarly shaded. Type C lamps of 300 and 200 watts respectively may later be substituted, this being the original design.

The Edison Electric Illuminating Company of Boston furnishes the power and light supply, to a brick transformer house erected against the south wall of the warehouse, about midway of its length. This structure is 23 by 12 feet and is lighted by a glass and steel monitor.

Here are installed two 100-kilowatt step-down transformers, rated 2,200/220, for power service, and one 50-kilowatt unit rated 2,200/220-110 for lighting service. The transformers stand in a shallow concrete pit which is pitched to drain through an outlet to the city sewer. A Trumbull five-panel slate board contains Weston ammeters, a Pennsylvania Appliance Company reverse-phase relay, and a



Interior of Substation at Warehouse of Carnegie Steel Company, Boston, Mass.

General Electric curve-drawing wattmeter.

The lighting company's services enter the building from underground conduit in lead-sheathed cables and are carried to a brass-jacketed pothead. High-tension cables in the station are painted white, and low-tension cables black, to distinguish between them easily.

The connected load of the motors is about 490 horsepower, but the operation of the machines being intermittent the energy consumption is kept at a low figure. Central-station service for a plant of the kind here described is the logical and only economical type.

Cooking-Appliance Campaign at Augusta.

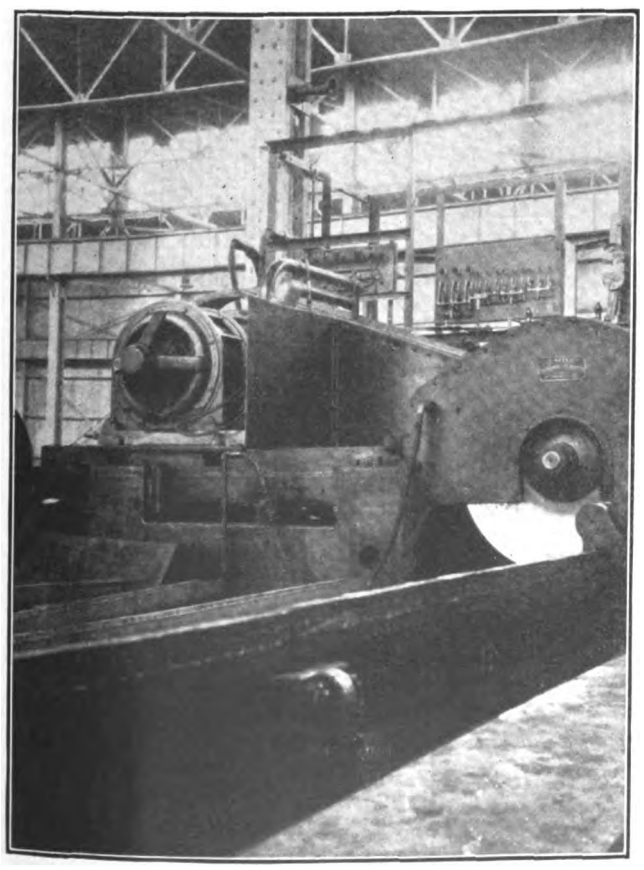
The Central Maine Power Company, whose head office is at Augusta, is advertising the Universal electric grill at $5, procurable at any of the company's stores. The point is made that the device can be operated from any lamp socket. The following are some of the viands which can advantageously be prepared with its use: Grilled chops, steaks, bacon and omeletts; frying fritters, oysters, croquettes, doughnuts; preparing tea or coffee; toasting bread, crackers, cheese; making candies, popping corn, etc. The company is making a special "drive" for cooking business in its extensive territory.

Electric Baking Proves Economical.

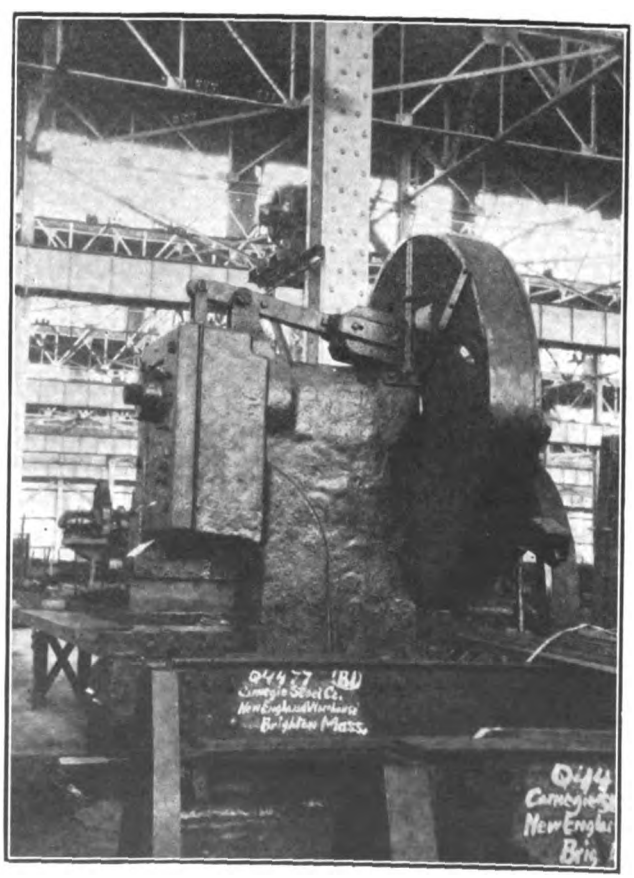
D. H. Heywood, American Fork, Utah, has for some time been using a Hughes electric oven in his bakery. The following is his report of his baking and cost of operation for July, 1915:

10,000 loaves of bread.
260 dozen rolls.
312 layer cakes.
600 dozen small cakes.
130 jelly rolls.

The cost of electric power during the month was $12.00.



Motor Driving High-Speed Friction Saw.



Motor-Operated Heavy Bar Shear.

Digitized by Google

Commercial Practice
Management, Rates, New Business

SHALL THE CENTRAL STATION SELL APPLIANCES?

By J. H. Moseley.

This question, which has been uppermost in the minds of central-station managers for several years, is still in the limelight and although some companies have made decisions in the affirmative and are now conducting appliance shops, others who are on the verge of this move are proceeding cautiously and are hesitating to plunge their company into a policy which may develop into an unwise one.

There are three divisions of central stations in the United States which should be considered in attempting to arrive at an answer to this question.

First, there is the central station in the small town (meaning towns of possibly 3,000 to 5,000 population or under) in which there is necessarily not enough new building going on to justify the existence of a regular contracting business. In towns this size electric wiring is either done by the electric company through necessity or is turned over to some young fellow who has his office on the street and keeps his tools in a bag at his home. This young fellow who does the work primarily through a matter of interest or desire to pick up a few odd dollars has no place to merchandise appliances, and merchandising is the word to use, and if the electric company desires to place such appliances on its service lines it must sell them itself or leave the matter to the local hardware or drug store. These two classes of stores are the ones which naturally drift into this class of business. While there are a great number of companies which will fall into this class, the percentage which have managers aggressive enough to push for the appliance business are so small that this division will not be considered.

Second, there are the central-station companies in towns of from 3,000 or 5,000 to possibly 50,000 population. A real live contractor can make a nice living in a town of 5,000 population, but such a person has a tendency to outgrow a place of this size and leave his business to some other person who is less competent to handle it. In towns and cities of more than 5,000 population there are usually two or more contractors who do wiring and sell appliances. These men are primarily contractors and have made no study whatever of the merchandising game. They are usually so eager to get wiring jobs that price-cutting is a favorite pastime and it is only a short time until the original capital put into the business has disappeared. This is due partly to poor cost systems and also to ideas that a competitor may be "frozen out" so to speak. The net result is that the next man who comes in suffers from the methods employed by his predecessors. In the meantime the appliance business has not been pushed and the central station is the loser as well as the contractor.

What should the central station do in a case like this?

Advertisement of Central-Station Company.

FOR TWO WEEKS ONLY
This Western Electric RITE-HEAT Iron (Guaranteed) is just what you have been looking for. Must be seen to be appreciated. And just think of the price—this week and next—this iron and the Western Electric LEKTRIK Stove shown below
2 FOR $5.00
Each of the Fireless Appliances GUARANTEED
This Western Electric TRIANGLE stove will do your work at a moment's notice. Quick and convenient. This week and next, Rite-Heat Iron and Electric Stove
This Western Electric Triangle stove will FRY, BROIL, BOIL and TOAST.
$5 for the Two
KEEP COOL
Why cook over a hot stove?
Temple Electric Company

Supplementary Advertisement of Local Dealer.

One thing which can be done is to educate the contractor out of the price-cutting idea and at the same time try to teach him something of the merchandising idea. All persons realize that men go into business for a profit and every fair-minded person is willing to allow the business man a reasonable profit on the service rendered him whether it be in the purchase of an iron or a house or building wiring contract. Once the contractors have been educated to this fact and to the fact that they should share in the available business and obtain it at a reasonable profit, it is not such a hard matter to then get them interested in making more money by pushing electric appliances. This sounds very easy, but the actual

Digitized by Google

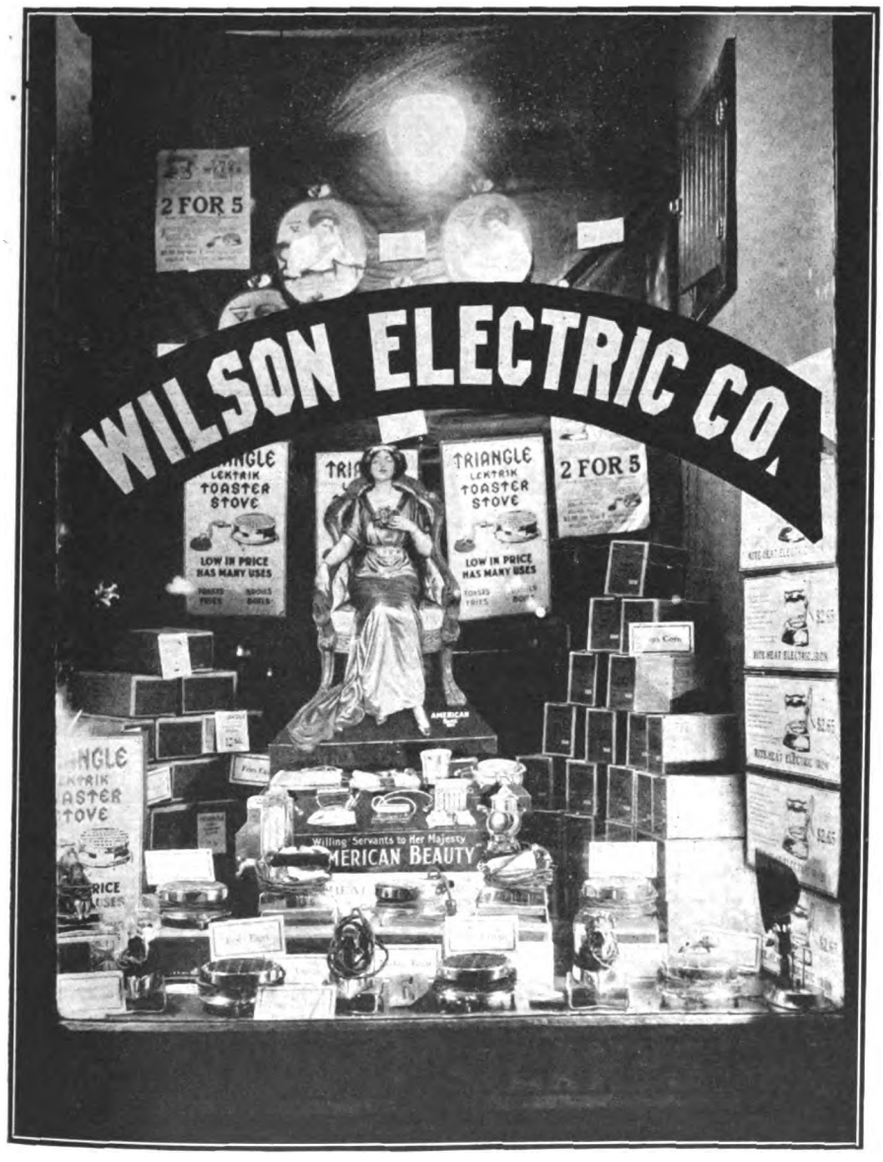
accomplishment of such a policy is a great deal harder to bring about.

As an example of such a policy it might be well to mention an appliance campaign which was recently put on by one of the large manufacturers of heating devices in a number of towns where electrical properties are operated by the Texas Power & Light Company. When this company began operations in Texas it was decided that the appliance business together with the electrical contracting business properly belonged to the local electrical contractors. Stocks of appliances which had been taken over with small properties were turned over to the local contractors at less than cost price and the educational campaign was started. At the present time this policy has been in effect over three years and the results obtained from the campaign mentioned give a fair idea of its success.

The company co-operated with the manufacturer and the local contractors in 21 towns varying in population from 750 to 42,000.

The special offer consisted of a guaranteed electric iron and a toaster stove for $5. While the fact was not advertised the regular price of the iron was only $2.65 and the toaster stove $2.75, which really made no very great bargain. However interest was created by using the slogan "2 for 5" throughout the campaign and to this one fact is attributed the greater part of the results obtained. While this slogan was used to get the people to the stores the policy was not rigidly adhered to and quite a few irons and stoves were sold separately at the regular price, these being included in the figures given. In addition to these figures, however, a number of percolators and appliances of other manufacture were sold during the period, showing that the stimulating effect of the campaign was good.

The campaign was held during the first two weeks in August. An enclosure was used in all customers' bills. This "teaser" was designed to excite curiosity. Approximate 20,000 were sent out.



Show Window of Dealers' Store During Campaign.

Every dealer who participated in the campaign was furnished a window display and these were made use of in practically every case. A typical display is shown in one of the accompanying illustrations.

On the second day after the enclosures had been sent out the first newspaper ad appeared. This, as illustrated, was in the form of a notification that the "2 for 5" had arrived. Attention was called to the fact that these appliances could be obtained "at your electrical contractors." On the same day handbills were distributed in the towns by the contractors. These were of assorted colors and attracted considerable attention. On the fifth day a four column ten-inch newspaper ad was used, and this was followed up five days later by a two column ten-inch ad.

Space was used in 31 papers whose rates varied from 7.5 to 35 cents per inch.

Contractors in four towns out of the 21 pushed the campaign still more by using newspaper space on their own account. One of these used an amount of space equal to that used by the company and used this on the same days, so that double attention was called to the campaign.

All contractors were supplied by the jobber with a canvas sign four by six feet reading "FIRE-less SALE, 2 for 5, Aug. 3-14."

Town	Population	Irons	Stoves
Waco	42,000	15	8
Taylor	7,000	7	6
Temple	13,500	13	12
Brownwood	10,000	12	12
Bonham	7,000	10	8
Honey Grove	2,500	8	6
Roxton	750	9	10
Denison	18,000	26	16
Paris	13,500	20	11
Sherman	17,000	27	17
Van Alstyne	1,500	18	12
Commerce	3,000	6	3
Plano	1,300	5	6
Cleburne	14,000	13	9
Ennis	6,700	6	4
Hillsboro	8,000	6	5
Waxahachie	7,650	2	2
Gainesville	10,000	12	12
Wichita Falls	15,000	13	11
Palestine	13,500	18	16
Tyler	13,000	14	9
Total		260	195
Total both			455

Altogether 455 pieces were sold amounting to an estimated annual revenue to the central station of $2,275. The total expense to the company for newspaper advertising was $215.50. The bill enclosures and handbills were furnished by the manufacturer, and outside of the labor of enclosing the "2 for 5" fliers in the bills and getting up the newspaper ads no expense other than newspaper advertising was incurred. Hence the total expense of the campaign to the company was approximately 9.5 per cent of the estimated annual revenue, which, considering the character of the load and the time of the year in which the campaign was

Digitized by Google

held is as low as could be expected.

With the exception of some few isolated cases it may be said that such campaigns are necessary occasionally in this particular locality, to keep the dealers interested in the appliance business.

One fact is noticeable in the majority of cases observed, and that is the lack of finances on the part of the dealer or contractor. Few are able to discount their bills and thus obtain the lowest prices on their stocks. On this account many of them order in such small quantities that when price and express or freight are considered they have a very small margin left for selling expense and practically none for profit.

An objection to the handling of appliances by central stations in towns

2 for 5
For Two Weeks Only
The Western-Electric RITE HEAT Iron (Guaranteed) is just what you have been looking for. Must be seen to be appreciated. And just think of the price—this week and next—this iron and the Western-Electric LEKTRIK Stove.
Each of these Fireless Appliances GUARANTEED
—See Them In Our Show Window—
Bonham Electric Supply Co.
Bonham, Texas Phone 500
OFFICE WITH TEXAS POWER & LIGHT COMPANY

Newspaper Advertisement of Dealer.

of 10,000 to 15,000 population is the fact that the business is hardly large enough to justify the employment of a special man for this work. The ordinary clerk in such an office is not a salesman, and in most cases will be busiest at the very time the opportunity is offered to interest the customer in an appliance (that is when he comes to the office to pay his bill).

In the case of a company similar to that above mentioned, appliances might be handled by placing a small show case in each office and keeping therein a standard stock of appliances. By standard stock is meant those appliances which the public has been educated to use. One or more special men could be employed to go from town to town and hold introductory sales, a new appliance being offered each time. During this period of say one or two weeks slight reductions for cash could be offered on other standard appliances. In this way the office force could gradually be educated to the merchandising idea. If two special introductory sales were conducted each year, and if during the two weeks before Christmas special efforts were made in all branches of the company there is little doubt that in a few years the customers would be familiar with almost every type of appliance.

In order to compensate for the average clerk's lack of ability it would no doubt be a good idea to make a practice of selling all appliances for a small cash payment, the balance to be paid in monthly installments with the electric bill. The company would have on its books a good indication of the customer's ability to pay and would thus be able to avoid losses due to bad bills which a contractor or dealer might incur.

In lieu of either of the plans referred to a co-operative plan similar to the last one mentioned might be employed with profit to the contractor or dealer and the central station.

The general idea under this system would be to permit the contractor or contractors to furnish a neat show case to be placed in the company's office. The contractors would furnish a stock for this show case, the nature and quantity of the stock to be decided by the company. This stock might consist of three or four styles of irons, two styles of toasters, one style of chafing dish, one style of percolator, etc., as the size of the town and the variety of stocks handled by the dealers might dictate. Each contractor would furnish tags for his appliances with a space left for the name of the appliance and the price at which sold. This tag could have one end perforated so that the company could keep a record of all sales made. If a customer came in and wanted a certain make of iron and both contractors sold this make iron the sale would be made by the contractor who happened to have that style of iron on exhibit. As soon as this iron was sold the clerk could telephone the other contractor to send over an iron like this, and put it on display. Thus the next purchaser who bought this make of iron would buy from the second contractor. In this way the business could be conducted without showing any favoritism.

As to division of profits it is probable that the company could afford to operate under this plan for 50 per cent of the gross profit on any article, with an understanding that an allowance of 5 per cent of the retail price be allowed by the contractor if an appliance were sold on terms.

Under such a plan the company could have its special man or men to go to the different towns and arrange window displays and special introductory sales. On these special sales the appliance introduced would be sold at the contractor's cost price, the company handling the sale without charge, no terms being offered at the special price.

One of the biggest objections to a plan of this kind would be that the clerk or clerks, even though they were strictly neutral, so to speak, might be sooner or later suspected of favoritism by some suspicious contractor or dealer.

Again, under such a plan what policy would the company pursue toward hardware stores or drug stores which were selling appliances?

Would these stores be allowed to display their wares at the company's office under the same conditions? I hardly think this would be necessary.

Newspaper Advertisement of Contractor.

An aggressive company, operating in only one town, might also be able to employ this same plan profitably.

Really the only way the success of such a system could be determined would be to try it. Does it not sound plausible, however, as a possible answer which might be satisfactory to all concerned?

Going from the medium size city of 50,000 let's take the third class, the cities having more than this population.

Here is a place where the establishment of an entirely separate "Electric Shop" selling nothing but electrical appliances is justified. Such a plan as that outlined might even be used in cities this size, and if proper co-operation could be obtained there seems little doubt that the collective publicity campaigns of a large central station and a half dozen or more contractors would be more effective than that of the central-station company alone or

Digitized by Google

of one contractor or electric shop alone.

Here is the place where the business should be organized as a separate department and operated as such for a profit. The main point of issue in such a case seems to be a matter of policy. That is, shall the central station, whose main object is selling service, go into the merchandising business?

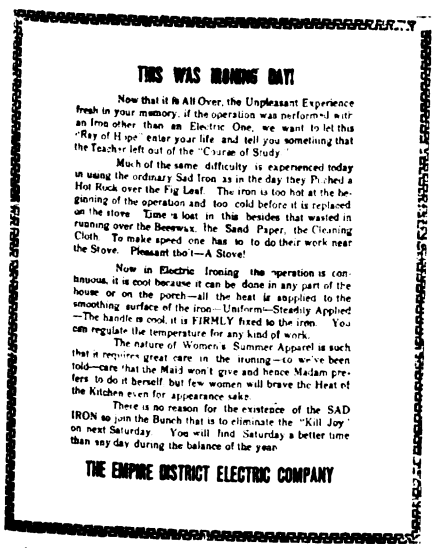
Power engineers argue that it is foolish for a manufacturer to try to make his own power, as his time should be devoted to manufacturing his product which he sells. They say that the central station is a specialist in the manufacture of power, and hence can afford to offer this power, and in addition, certain services at a cost which will make it profitable for the manufacturer to purchase from them.

Do we not back up on this argument when we propose to go into the merchandising business instead of sticking to our main business of selling service?

Or is the sale and introduction of electric appliances a duty of the central-station company?

Advertisements That Sold Many Irons.

The value of newspaper advertising was convincingly demonstrated in a recent iron campaign conducted by the Empire District Electric Company serving Joplin and Webb City, Mo., and Galena, Kas. The company offered a


THIS WAS IRONING DAY!

Now that it is All Over, the Unpleasant Experience fresh in your memory, if the operation was performed with an Iron other than an Electric One, we want to let this Ray of Hope enter your life and tell you something that the Teacher left out of the "Course of Study."

Much of the same difficulty is experienced today in using the ordinary Sad Iron as in the day they Pitched a Hot Rock over the Fig Leaf. The iron is too hot at the beginning of the operation and too cold before it is replaced on the stove. Time is lost in this besides that wasted in running over the Beeswax, the Sand Paper, the Cleaning Cloth. To make speed one has to to do their work near the Stove. Pleasant that—A Stove!

Now in Electric Ironing the operation is continuous, it is cool because it can be done in any part of the house or on the porch—all the heat is supplied to the smoothing surface of the iron—Uniform—Steadily Applied—The handle is cool, it is FIRMLY fixed to the iron. You can regulate the temperature for any kind of work.

The nature of Women's Summer Apparel is such that it requires great care in the ironing—to we've been told—care that the Maid won't give and hence Madam prefers to do it herself but few women will brave the Heat of the Kitchen even for appearance sake.

There is no reason for the existence of the SAD IRON so join the Bunch that is to eliminate the "Kill Joy" on next Saturday. You will find Saturday a better time than any day during the balance of the year.

THE EMPIRE DISTRICT ELECTRIC COMPANY

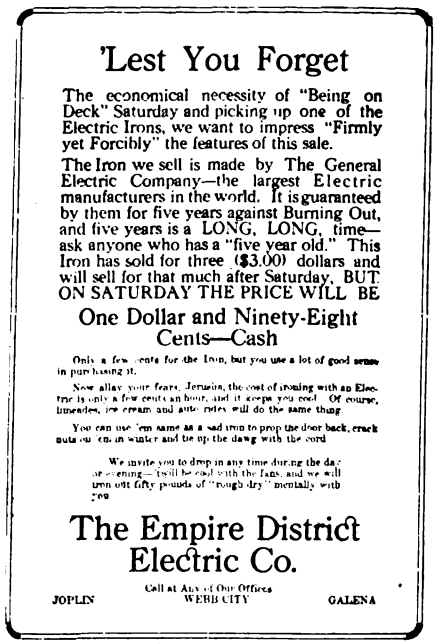
First Advertisement in Campaign.

$3.00 General Electric flat iron for $1.98, the sale being limited to one day only. Newspaper advertising was relied upon entirely in the campaign, a series of advertisements being published, one each day for an entire week. Several hundred irons were disposed of as a result of the company's activities. The accompanying illustrations show three of the advertisements. As will be noted, the copy is cleverly written and particularly appropriate.

Reduced Rates in Pepperell.

The town of Pepperell, Mass., has voted to sell its street-lighting equipment to the Shirley Electric Company, Chirley, Mass., and to purchase energy for public lighting from that company at 10 cents per kilowatt-hour. Commercial lighting will be at the rate of 12 cents, and power 12 cents for the first 100 kilowatt-hours a month, 5 cents for the next 400, 3 cents for the next 1,000, and 2 cents for all over 1,500 kilowatt-hours a month.

Heretofore, the public and private energy supply has been a local paper mill plant, but the paper company wished to discontinue the sale of electricity, and to buy from a distinctly lighting company. The rate heretofore has been 11 cents for street lighting, 15.5 cents for commercial light and power, and free lighting of the public library. The yearly cost for each of the 40-watt street lights operating on a moonlight schedule, has been $17.97, but under the new plan the cost to the town will be $11.75, the maintenance of poles and wires being borne by the company.


'Lest You Forget

The economical necessity of "Being on Deck" Saturday and picking up one of the Electric Irons, we want to impress "Firmly yet Forcibly" the features of this sale.

The Iron we sell is made by The General Electric Company—the largest Electric manufacturers in the world. It is guaranteed by them for five years against Burning Out, and five years is a LONG, LONG, time—ask anyone who has a "five year old." This Iron has sold for three ($3.00) dollars and will sell for that much after Saturday. BUT ON SATURDAY THE PRICE WILL BE

One Dollar and Ninety-Eight Cents—Cash

Only a few cents for the Iron, but you use a lot of good sense in purchasing it.

Now allay your fears, Jemima, the cost of ironing with an Electric is only a few cents an hour, and it keeps you cool. Of course, lunsedes, ice cream and auto rides will do the same thing.

You can use 'em same as a sad iron to prop the door back, crack nuts on 'em in winter and tie up the dawg with the cord.

We invite you to drop in any time during the day or evening—you'll be cool with the fans, and we will iron out fifty pounds of "rough dry" mentally with you.

The Empire District Electric Co.

Call at Any of Our Offices

JOPLIN WEBB CITY GALENA

Final Advertisement in Campaign.

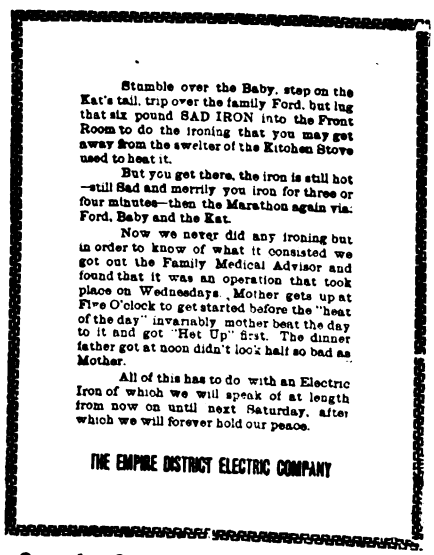
Problem of Free Lamp Renewals in Boston.

Under the Boston Edison Company's free lamp renewal practice new incandescent lamps are supplied in exchange for old lamps returned when burnt out or noticeably dim. It is intended that all lamps shall be returned with whole bulbs. Many companies refuse to accept or credit broken lamps, but the Boston Edison Company has made it a rule to limit stubs received to 20 per cent of the whole number, but has made exceptions in extenuating circumstances.

The rapid increase of Mazda installations, and the extension of the free exchange privilege to lamps of larger sizes, have resulted in the breakage item becoming a serious matter to the company. Lately, the lamp division has adhered strictly to the 20-per-cent rule, counting all stubs above that amount as "lost." The company in applying the rule with strictness, points out that breakage includes new as well as old lamps, and that many of those destroyed burned only a small part of their intended life. The result to the company is not only an economic loss, but also an unwarranted expense in supplying new lamps. It is properly argued that carelessness on the part of the customer should not be a burden on the lighting company, especially when lamps are supplied as liberally as the Boston Edison Company supplies them.

City Map Used for Street-Lighting Chart.

To denote the location of street lights in graphic fashion the lighting company of New Bedford, Mass., has, on the wall of the electrical superintendent's office a plan of the city, indicating streets in detail, 12 feet 6 inches long by 4 feet high, this being a copy of a blue print and on a scale of one inch to 400 feet. Pins 0.5 inch long with colored cloth tops, are placed in the map, which is mounted on a heavy cardboard back and framed in oak, to indicate the exact location of each lamp, the various colors representing lighting units of the several types installed. White represents 100-candlepower tungstens; orange, 250-candlepower tungstens; blue, series inclosed arcs; brown, multiple inclosed arcs; red-and-black check, series flame arcs; red, multiple flame arcs; black and white check, Washington arcs; green, magnetite arcs.


Stumble over the Baby, step on the Kat's tail, trip over the family Ford, but lug that six pound SAD IRON into the Front Room to do the ironing that you may get away from the sweiter of the Kitchen Stove used to heat it.

But you get there, the iron is still hot—still Sad and merrily you iron for three or four minutes—then the Marathon again via: Ford, Baby and the Kat.

Now we never did any ironing but in order to know of what it consisted we got out the Family Medical Advisor and found that it was an operation that took place on Wednesdays. Mother gets up at Five O'clock to get started before the "heat of the day" invariably mother beat the day to it and got "Het Up" first. The dinner father got at noon didn't look half so bad as Mother.

All of this has to do with an Electric Iron of which we will speak of at length from now on until next Saturday, after which we will forever hold our peace.

THE EMPIRE DISTRICT ELECTRIC COMPANY

One of a Series Run During the Week.

Digitized by Google

Electric Irrigation Proposed for Cape Cod District.

The territory of companies owned by the Boston Electric Association, viz., the Buzzards Bay Electric Company, the Martha's Vineyard Street Railway Company, the Vineyard Lighting Company and the Vineyard Haven Gas & Electric Company, comprises upwards of 400 square miles of Cape Cod and Martha's Vineyard Island, Mass.

Power on the Cape is furnished from a power station in Falmouth, from which transmission lines extend north 23 miles to Sandwich, on the Cape Cod Canal, and east 24 miles to the important summer resort of Hyannis. The intermediate territory served is dotted with towns filled with handsome summer homes, and the permanent population devotes its energies largely to fishing. The canal itself is lighted with electricity furnished by the Buzzard's Bay Company, and the demand for electric power for fish freezing in the coast towns is reaching large proportions.

The latent possibilities of the cheap Cape lands for agricultural purposes, especially when developed through irrigation, has been recognized by Eugene Carpenter, the enterprising executive of the allied companies. Mr. Carpenter believes that with the aid of electric power pumping water for irrigating, much of the soil now neglected will yield abundant returns to the agriculturist. With this end in view, he is soon to go to Utah, where he will make a study of the effective co-operative irrigation methods.

The amalgamation of several scattered lighting and traction properties into a successful system is a noteworthy achievement for which Mr. Carpenter is in large measure responsible.

Operating Cost of a Five-Ton Electric Vehicle.

Actual cost data for operating a one-ton truck in service of a New England central station for the past five years on line construction, have been formulated as follows: Original cost, $2.650.

	5 years	1 year	Per Mile
Miles traveled.....	26,620	5,324	.....
Kilowatt-hours used	22,990	.....	0.864
Current cost, at 3.5 cents.....$	804.65	160.93	0.0302
General repairs and painting....	372.23	74.44	0.0140
Battery renewals and repairs.....	1,034.00	206.80	0.0388
Tires	522.83	104.56	0.0197
	$2,733.71	$546.73	0.1027

The truck is today in excellent condition mechanically and runs as economically in current cost as the year it was bought. It has been in constant daily use, in all kinds of weather.

SUCCESSFUL COMMERCIAL MANAGERS.

A. C. Martin.

Everyone in the electrical business knows of the progressiveness and success of the Rockford (Ill.) Electric Company. In fact, this company was a pioneer in the adoption of methods and policies that have since become standard for all modern utilities. Frank H. Golding, now manager of the Atlantic City central station, is largely responsible for the high standing of the company for it was during his term of office as manager that the foundation was laid for the present successes. Mr. Golding, among his other qualifications, had the happy faculty of choosing as his co-workers men who soon came to admire and respect his methods and had the ability to adopt them and when he left Rockford it was with the satisfying knowledge that his work would be carried on without interruption.

A. C. Martin,
Commercial Manager, Rockford Electric Company.

A. C. Martin, commercial manager of the Rockford Electric Company, is one of Mr. Golding's proteges. He has established the Rockford company as one of the first in the country in connected horsepower per capita and this in spite of the fact that a large share of the available power business in the city was woodworking plants.

Mr. Martin had the advantage of receiving an education at the United States Naval Academy, Annapolis, Md., and on resigning from the navy, went to Pittsburgh, first entering the employ of Carnegie Steel Company, at Homestead, and then joining the force of the Westinghouse Machine Company, going through a course in the turbine department, and later becoming erecter of turbines in the southern district.

On leaving this company, he entered the operating field and operated a turbine plant for a land company in Texas, later he became chief engineer of the Sheffield Electric Company, having a power house, operating city water works, city railway and city light and power. After working in the engineering end of the business for three years, he came to the Rockford Electric Company as power engineer in 1910. In 1912 he was made commercial manager of the company and has held that position ever since.

In speaking of his policies, Mr. Martin says: "My policy and principles have always been service to the company, and I believe in this way the public also benefits. For if one gives his entire time, thought and study for the interest of the company, it cannot help but make the company stand well in the public's eye.

"In handling our men we always put the entire responsibility of their territory to them, and never attempt to make a sale where one of them has failed. We believe this has made better men of them, and also believe they appreciate it, as we lose very little business, and when we do lose it, it is only temporarily.

"We have always studied the other fellow's game, very closely, and are trying to adapt merchandising schemes to our own business. Of late we have been working towards the further co-operation of the electrical contractors of the town, and believe that if we all work as one family, it must mean more business for the central station.

"Our methods of advertising have always been to obtain direct results, rather than trying to mold public sentiment. For instance, when we are after house wiring, we advertise for house wiring prospects, and the same method is used for other things."

Ozark Company Secures Large Contract.

The Ozark Water & Power Company has opened offices in the Landers Building, Springfield, Mo., having moved the headquarters of the company from Joplin. C. E. White, vice-president and general manager, is beginning an aggressive campaign for contracts to supply current from the company's hydroelectric plant to the towns of the section, and has recently made such a contract with the Lawrence County Light & Cold Storage Company of Aurora, covering a period of 15 years.

Digitized by Google

Electrical Construction

Examinations of Electricians Held in Massachusetts.

Results of the examinations of employing electricians and journeymen electrical workers in Massachusetts are being formulated by Clerk Dallas of the Examining Board. Of the 450 who took the examination on August 11 about 50 failed to pass. The 147 candidates for certificates in both classes who took the examination of August 25 made better marks, because of the clearer phraseology of the questions requiring answers. Of the 147, 130 men qualified.

A third examination was held in Boston on September 1, when about 100 presented themselves. Of these a number were men who had failed to pass a previous examination, the law giving a second opportunity to meet the required test.

To date 650 Class A certificates have been issued to employing electrical contractors, under the provision which exempts experienced men of five years' experience from the necessity of taking an examination, and also to employers who passed the Class A test. About 4,500 certificates have been issued to journeymen, of which about 500 are the result of successful examination, and 4,000 under the five-years' experience exemption.

Fees for Wiring Permits in Boston.

The following schedule of fees to be charged in connection with the granting of permits by the Wire Department of the City of Boston, authorized by special act of the Legislature of 1915, and effective October 1, has been approved by the Mayor, as submitted by Wire Commissioner Cole:

For installations of incandescent lamps: 1 to 5 50-watt lamps or equivalent, 75 cents; 6 to 10, $1; 11 to 15, $1.25; 16 to 20, $1.50; increasing in steps of 25 cents for each additional 10 units until 100 units is reached, for which the prescribed fee is $3.50. Above 100, for each 25 50-watt lamps or equivalent, 25 cents shall be added.

For fixtures, 10 (or less) 50-watt lamps or equivalent shall require a fee of 75 cents, and each additional 50 units in excess of 10, 25 cents.

For service connections, with converters, the fee shall be 50 cents; for generators of 25-kilowatt capacity or less, $1.50; and for over 25 kilowatts, $2 for each permit.

Permits for temporary work shall be charged for at the rate of one-third of that for permanent construction.

For motion-picture machines, stereopticons or similar apparatus, the fee for permits shall be $1 each. Duplicate permits or certificates will cost 50 cents.

Each 50-watt incandescent lamp, or one of less capacity, except sign lights, shall be rated as one unit. Sign lamps shall be reckoned at actual rating. Arc and mercury-vapor lamps shall each be rated as ten 50-watt lamps. Heating devices shall be rated as two 50-watt incandescent lamps for each ampere or 100-watts capacity.

All motors are to be rated on the basis of ten 50-watt lamps to each horsepower, but charge for simple motors of 25 horsepower or over is not to exceed $5.

Where the number of lamps to be connected to wiring is unknown, each circuit shall be charged for on the basis of 12 lamps per circuit.

The fee for electrical equipment not listed above shall be 75 cents, to cover one inspection. Subsequent inspections, 75 cents an hour, with a minimum of 50 cents.

Among the Contractors.

The Bland Electric Company, Louisville, Ky., has the contract for the electric wiring in the new mercantile building of the Speed estate, which is being erected on Fourth Avenue in Louisville at a cost of several hundred thousand dollars. The contract is one of the largest placed in the city.

The Empire Electric Construction Company, Louisville, Ky., has a contract for the installation of 70 lights for W. Heller at 303 Peterson Avenue, Louisville. This is one of the biggest residence jobs of the season, the work amounting to $300.

The Childers & Waters Company, of Louisville, was awarded the contract for handling all of the electrical work at the Kentucky State Fair in Louisville, September 13-18, for the fifth successive time. The contractors will have entire charge of electrical installations, all varieties of lights being provided, as well as motors for special purposes. The job is a hurry-up proposition, and a crew of five to ten men is kept on the work all during the fair, as well as for several days before and after.

J. R. McCutchan of Kenosha, Wis., has sold his interest in the firm of the Rockwell McCutchan Lighting Fixture Company, and has entered the electrical contracting business at 229 Marion Avenue, Kenosha. He would like to be supplied with catalogs and price-lists by the manufacturers of fixtures and lighting appliances.

The Avery-Loeb Electric Company has received the contract for special street illumination for the Columbus, O., fall festival, September 15-16. This will be confined to a stretch of street 600 feet long, in which 3,500 small lamps and seven of 1,000 candlepower are to be used, largely in overhead festoon effects. This Columbus company has also been successful bidder on three high schools, at Cedarville, Milford Center and Orange Township, which will average $1,500 each. It will likewise do the wiring for booth illumination incident to two national conventions to be held in Columbus in September, one by the stationary engineers and one by the bakers.

Recent contracts secured by the Sacket Mine Supply Company, Columbus, O., include rewiring of the building occupied by the national headquarters of the United Commercial Travelers, Columbus, a $1,200 job; the rebuilding of the 150-horsepower synchronous motors at the Crooksville mine of the Zanesville Coal Company, which were recently destroyed by lightning, and the motor equipment of the Dunlap Manufacturing Company, Columbus.

The Electro-Mechanical Company was awarded the contract for the electrical installation of the Ward Baking Company plant on Hanover Street, Baltimore, Md. The equipment includes a charging plant for the electric motor trucks operated by the Ward Company. This is one of the only industrial companies in Baltimore operating electric trucks.

Digitized by Google

Wiring and Conduit Work at the Panama-Pacific Exposition.—III.

By A. A. Willoughby, Pacific Coast Correspondent.

Installation of Conduit System.

When the condition of the grounds became sufficiently advanced to warrant the installation of the underground conduit system, the Exposition engineers took bids and two contracts were let for this work, following the established policy of letting all work by contract.

The first contract let covered the system in the State and Foreign district and embraced the laying of approximately 36,000 duct-feet of three-inch Linaduct and 46,000 duct-feet of two-inch duct, including 38 wooden manholes. The unit contract prices for additions to or deductions from the amount specified in the contract were as follows:

No. of Section	Ducts per Section		Costs per Trench-feet
	3-inch	2-inch	
1	6	12	$1.32
2	4	6	0.84
3	4	5	0.785
4	4	3	0.675
5	3	6	0.78
6	3	5	0.725
7	3	3	0.615

The second contract let covered the installation of approximately 221,000 duct-feet of three-inch Linaduct. The major portion of the system was wooden sandbox construction and wooden manholes, the latter numbering approximately 100. The main trunk-line section, amounting to approximately 39,600 duct-feet, was laid in concrete. Wooden manholes, however, were used in the latter section. The number of ducts per box section varied from 4 to 21 under this contract and the unit prices for additions to and deductions from this contract were as follows:

No. of Ducts	Cents per Duct-foot
21	8.1
18	8.1
15	9.28
12	9.28
10	9.28
8	11.42
6	11.42
4	11.42

The wooden manholes were made in various sizes, contract prices ranging from $36 to $65 in place.

Before the work on the second contract was half completed, the contractor became involved in financial difficulties and the Exposition had to take over the completion of the contract under a financial arrangement with the contractor's bondholders, who assumed all liabilities. The actual cost records of the Exposition's portion of the work and an analysis of the contractor's costs showed that the work actually cost 25 per cent more than the unit prices allowed in the contract. The principal reason for the additional cost of this work above the contractor's estimates was the fact that general construction activities were everywhere so prevalent that it was impossible to carry on the work of laying the conduit consecutively and interruptions were continually occurring.

No engineering difficulties were experienced in building the boxes or laying the conduit and the chief anxiety of the engineers lest sand would find its way into the conduit, never gave cause for trouble because in the actual installation of the cable system, no sand was in evidence. A mandrel was pulled through every duct after its installation before the work was passed by the inspectors and the ducts were immediately plugged at both manhole ends with wooden plugs to prevent scummy water from entering the ducts during the idle period. One advantage of this type of duct system, developed during the process of installation where in a few minor cases the duct was broken into by contractors working on sewer and water connections, was the ease with which repairs could be made, it being a very simple matter to remove the wooden covers, take out the sand and duct at point of breakage and make repairs.

The minor secondary laterals and underground distribution about the grounds was handled by means of a cheap wooden pump log made up in a molding machine, in two sections in lengths varying from 6 to 14 feet. The sections were bonded together every foot by wire staples, coated on their points with a strongly adhesive solution which preserved the bond between staple and wood as the stock dried out. This conduit was made from untreated fir but with standard socket joints similar to pump log. It was made principally 2.5 inches in inside measurement, which allowed it to be made from standard 2 by 4 or 4 by 4 stock. Where necessary it was also made with a three-inch bore. This conduit was secured for about one-half the cost of standard pump log and due to its extra length, made up much more rapidly in the field. Under the temporary conditions obtaining at the Exposition, its use was very satisfactory and economical.

Fig. 8.—Close View of 18-Inch Duct Section Showing Three Layers of Conduit.

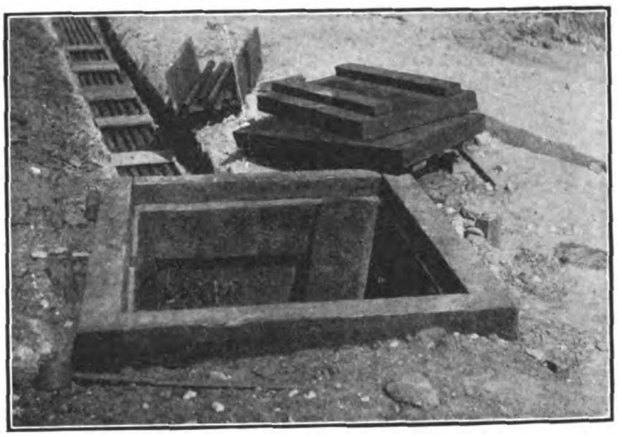


Fig. 9.—Close View of Shallow-Section Manhole Showing Construction Details.

Installation of Cable.

When the time came for installing the cable in the completed duct line, the most serious consideration had to be given to the method of pulling in the cable, due to a clause in the contract between the Exposition Company and the Pacific Gas & Electric Company on the rental of cable and apparatus. This clause reads as follows:

"All cables having the lead sheath scored to a depth in excess of one-third the thickness of the sheath, and all cables that have been flattened or dented so that the minimum diameter

Digitized by Google

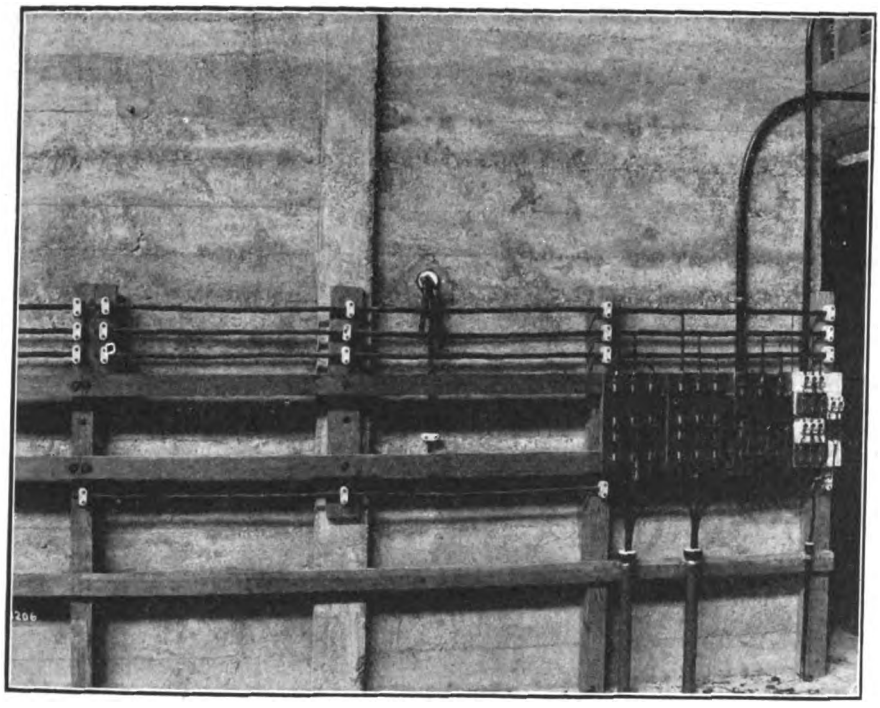


Fig. 10.—Typical Distribution Rack.

is less than 0.8 of the average diameter of the cable, shall have the defects cut out before the cable is measured and reeled as herein provided."

This clause, together with another proviso in the contract which made 300 feet the minimum returnable length, made the question of handling the cable one for serious consideration, both in installing and in the future operations of taking it out.

In order to take no chances of scoring the lead sheath, especially under these conditions where so much sand had been used in the conduit structure, it was decided to pull the cables very slowly. A winch was designed having a 4.5-horsepower gasoline engine with belt drive, which hauled the cable at a speed not exceeding 20 feet per minute. The winch was of a standard pattern used by the Pacific Gas & Electric Company, the prime mover and the operating speeds being the principal points of difference. The gasoline engine proved very satisfactory under the conditions, especially as electricity was not available at all points on the grounds at that period. The unusually slow speed employed required less power in pulling, gave the men at the reel more time in carefully entering the cable in the conduit, and allowed of the cable brushing aside minor obstructions in the duct and avoiding to a considerable degree the possibility of the sheath being cut or stretched as at a higher pulling speed. While the cost was naturally higher than at ordinary speeds of pulling cable, the portion of the time employed in actually pulling was secondary to the time required in the preparatory work of setting up the winch and pulling tackle, and the results as far as the condition of the cable was concerned, were most gratifying. Numerous instances where the cables were pulled through an intermediate manhole gave ample chance for inspection of the lead sheath and in no observed case was there the slightest sign of the sheath being damaged.

Fig. 11.—Cable Switches and Transformers.

Carrying out the idea of carefully safeguarding this cable, the Exposition naturally handled the work of installation with its own men. Cable-pulling equipment was purchased outright and costs were kept on pulling and splicing throughout the main portion of the work. The costs were as follows:

The average costs per splice on 4.0 three-conductor primary cables was $5.80 for labor and $9.50 for material, a total cost of $15.30 per splice.

The average labor cost for pulling in primary cable was 3.7 cents per foot. The investment in cable-pulling equipment, less 25 per cent salvage value, when charged against the amount of primary cable pulled, adds 1.1 cents per foot, making a total pulling cost of 4.8 cents per foot.

These figures are based on actual costs kept on the installation of 94,000 feet of primary cable in the main network.

While these costs are not as low as could have been obtained on standard city distribution, they are reasonable when the conditions of pulling are considered. As stated in a previous section of this article, the majority of the conduit was in terraced lawn, which made it necessary to build special cribbing to get the reels in place and the winch had to be placed on the adjacent roads, the hauling line being pulled around a special swivel sheave built into an appropriate framework designed for these conditions. Of course the very slow speed at which the cable was pulled in added appreciably to the cost.

The splicing was all done with formed paper tubes and the racking was handled by means of simple iron pins driven into the timber uprights of the manholes, the cable resting on a saddle of wooden pump log that was straddled on these pins. This proved a very cheap and, under these conditions, a very efficient method of racking. The terminals of the cable, which were fastened to a wooden framework in the transformer vaults, were insulated and weatherproofed by means of tin funnels built similar to a pothead and fastened to the lead sheath by means of binding wire and a few layers of tape to prevent the running out

Digitized by Google

of the compound. Paraffin was used for filling these funnels instead of the standard and more expensive insulating compound. These terminals have proved entirely satisfactory in operation and were installed at a nominal cost.

Primary cable-junction boxes were installed on the cables feeding the State and Foreign Section wherever a primary tap was to be taken to the transformer vaults in the larger pavilions in this section. These boxes are octagonal in shape and had section links installed to permit sections of cable to be rapidly disconnected in case of trouble.

Installation of Transformer Vaults.

The installation of the transformer vaults was made as simple as possible by the laying-out as previously mentioned of a plain and uniform cantilever framework of wood, the vertical member of this framework being bolted to the concrete wall of the vault and the horizontal member being stayed to the vertical member by means of two standard cross-arm braces. The material for all of these vaults, approximately 50 in number, was ordered at one time, together with a stock of cross-arm bolts and braces, and the only modifications in the field were the number of sections used to accommodate the size of the transformer installation. The buses in each case were made of sufficient length to accommodate future transformers where required. The switch equipment used in the vaults consists of different types and capacities of hand-controlled oil switches, including a number of pole-type line-control switches, shown in Fig. 11. This was done to accommodate future absorption by the power company leasing the equipment.

The secondary distribution was handled on wooden racks of standard arrangement, varying only as to length and quantity of switches to be accommodated. (See Fig. 10.) These racks were fastened to the outer walls of the transformer vaults, where they projected into the building proper. The distribution mains were connected to these switches through a short conduit riser terminating below the floor line, from which point the weatherproof mains were run on single wire cleat supports. The lighting mains underneath the buildings were let by contract as the Exposition's known light load was sufficient to warrant a definite size and plan to cover this requirement and to handle whatever day exhibit load might occur. The Exposition's power mains were only run as required and as the loads developed, the work being handled by the Exposition's own wiremen. A considerable saving was effected in the power mains to the Machinery Palace by making the trolley wires for the cranes operating in the central and side bays of the building, a much larger size than was indicated by the crane load. These wires served the double purpose of handling the pre-Exposition crane load and at a later date handling the exhibit motor load during the Exposition period.

Summarizing the activities of the department, it is noted that approximately 30,000 lineal feet of duct lines were laid to accommodate the primary distribution system throughout the main exhibit and State and Foreign Sections of the grounds, embracing more than a quarter million duct-feet. There are 40 miles of lead-covered primary cable and 101 miles of weatherproof and rubber-covered wire and secondary cable, 2,139 meters, 76 motors aggregating 1,600 horsepower, 139 oil switches, 517 transformers with a total capacity of 15,577 kilowatts and miscellaneous apparatus and materials.

In order to safeguard the power company and to insure the necessary amount of money to properly salvage this amount of material and return it to the warehouses, a sufficient sum of money is impounded each month during the Exposition period. At the close of the period this money is to be applied to the work of salvaging and the difference remaining will be returned to the Exposition Company as a final credit.

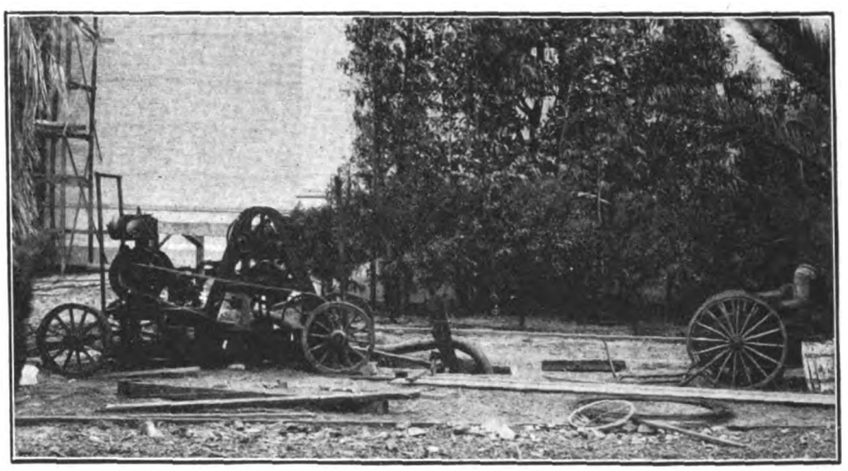
The writer is indebted to Henry Bosch, Jr., of the Pacific Gas & Electric Company, for the photographs shown in Figs. 2, 8 and 9.

Organization of the Department.

The organization of the Department of Mechanical and Electrical Engineering under the Division of Works was completed with the selection of Guy L. Bayley, as its chief and L. F. Leurey as assistant.

Mr. Bayley has been intimately connected with the pioneer development of hydroelectricity on the Pacific Coast. In 1899 he was sent to design and install a power house at Colgate, the first commercial hydroelectric plant in California. He remained in charge of the work until the first machine was put in commission and the first section of the power house had been completed. Following this he spent four years in Japan with the American Trading Company, two years as assistant and two years as general manager of their engineering department. During that time he laid out several of the largest electric railway and lighting plants in Japan and supervised their installation. In 1907 he assumed the position of resident engineer in charge of the power house, pipe lines and forebay reservoir on the Stanislaus power project in California, now an integral portion of the Sierra and San Francisco Power Company.

Mr. Leurey, who is engineer of operation and maintenance, prior to entering the employ of the Exposition was engineer of construction for the British Columbia Electric Railway Company of Victoria. Previous to that he was engineer of construction for Sanderson & Porter, of New York, on the Vancouver Island Power Company development in British Columbia, the Stanislaus project in California, the Spokane and Inland power project in Washington and the New Orleans Railway & Light Company reorganization in New Orleans.



Gasoline-Driven Winch in Operation and Take-Up Reel for Winding and Hauling Line.

A good demand for rectifying equipment has been experienced by the Childers & Waters Company, of Louisville, which has been making a feature of this business. The concern handles the line of the Lincoln Electric Company, of Cleveland, and has been devoting a great deal of attention to installations of this kind. A recent installation was made for V. A. Engelhard at 1128 Cherokee Road. The concern uses one man on this business exclusively, and an automobile is provided for him in order to enable proper service to be rendered.

Digitized by Google

BUSINESS HINTS FOR THE DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

The head of a prominent concern which does a big business in electrical contracting, as well as the sale of electrical merchandise, recently admitted that his credit losses were unreasonably large. Actual study of his books showed that they amounted to nearly 2.5 per cent on a gross business of $75,000. This meant, in effect, that the concern was losing $1,875 a year—certainly an excessive amount. It would be large enough, considered simply as an item against the total volume of business. But, as a matter of fact, this is not the correct way to consider it. The loss really comes out of the net profits, because, if the collections were made, they would be added to the net, inasmuch as all of the expenses of doing business have necessarily been paid from other sources. Thus, considering losses due to bad credits from this angle, it is evident that the contractor or dealer who permits the amount to reach 2 or 2.5 per cent of his gross is in reality forcing himself to charge off 15 to 20 per cent of his net profits. And knocking that large a hole out of net profits is something that nobody can afford—least of all the average contractor, whose expenses are increasing and whose margin of profit is steadily shrinking. The obvious moral of the whole proposition, of course, is that the contractor should be careful to whom he extends credit.

Exercising Mechanic's Liens.

The electrical contractor who has undertaken to install a wiring job is protected, theoretically, at least, in the event of the owner's inability or failure to pay, by a lien on the property. However, every state has a different law on this subject, and the requirements regarding exercising it vary widely. In most cases there is a definite limitation of time, and failure to exercise the lien within the specified period deprives the contractor of the right to secure his claim. The lien can also be used for the purpose of protecting the supply man, and if his materials are going into a job and it appears that the contractor to whom he sold is not going to pay, he can impose a lien and get his money direct from the owner. The operation of mechanic's liens is a more or less technical proposition, surrounded, as suggested, by the special regulations which each state has imposed; and hence it is part of the duty of every contractor and every electrical supply man to familiarize himself with these conditions and prepare to comply with them, in order that he may make use of this protection whenever the need arises. If this is done a long step can be taken toward cutting down credit losses on new work.

Credit Information is Available.

As a matter of fact, there is comparatively little excuse for any large volume of credit losses on the part of any merchant, no matter whether he is handling electrical or dry goods. The retail business, as such, is so well organized that credit information bearing on the rating of retail purchasers is just as easily available, and in as great detail, as it is in the case of wholesale buyers listed by Dun or Bradstreet. The electrical store should have access to this information, and having access to it, should make use of it. That is to say, when people ask for credit, whether it applies to installing a wiring job or delivering a piece of merchandise, the desirability of the account should be determined by consulting the "red book" or the "blue book" or whatever local volume has been compiled covering this feature. In addition, supplementary information may usually be obtained by asking for it, the average credit bureau of the local type having reporters who will get in touch with a large list of merchants and compile their experience regarding the individual under investigation. All this is done at a minimum cost, and, considering the amounts involved, the charge is nominal. The dealer or contractor who makes use of service of this kind forestalls credit losses by making them almost impossible. Of course, people with good credit are constantly losing it because of reverses of one kind or another; but it is always easy to locate and taboo those who have shown themselves to be unworthy of the privilege of credit, which is so thoughtlessly extended by many business men.

Exchanging Credit Information.

General sources of information, like those suggested above, are valuable, and give a good line on the prospective customer. At the same time, special information is always more enlightening than general. That is to say, an electrical contractor would much rather know what the experience of others in his own line has been with a certain customer than what the experience of furniture dealers and department stores may have been. While the experience of these merchants may coincide with that of concerns in the electrical field, it may differ widely. For example, a man who is regularly purchasing goods at a department or clothing store, and who desires to keep in good standing with those concerns, might, as a matter of policy, pay his bills there with reasonable promptness; and then, on the other hand, having one transaction with an electrical concern, which he did not expect to patronize again for years, if ever, he might decide without compunction not to pay the bill until he got ready. Consequently, for purposes of the electrical concern, the experience of others in the business is worth a great deal more than purely general data, valuable as the latter is at times.

This suggests that in every city where there is an organization of electrical interests—and this includes most communities of any size—part of the work be to exchange credit information, with special reference to the tabulation of those with whom the members of the organization have had unfortunate experiences. That is, while the ideal system would be to furnish a report covering every individual, the next best, a far simpler plan, would be simply a list of those who were unworthy of credit, as demonstrated by experience. Then every contractor and dealer could consult this list, which could be kept on file in the office of the secretary or some other central place whenever he secured a new account about which he was in doubt. This, too, would help to cut down losses from bad credits.

Occasional news stories are published about nervous householders firing at supposed invaders of their premises, only to find that they were perfectly innocent, and were either members of their own families, servants or others whose motives were far from criminal. The excitable individual who shoots first and investigates afterwards is usually regarded as a fit subject for satire and criticism.

But how about the contractor who takes a job and after he has got it well underway decides to investigate the credit rating of the customer? This is what a good many members of the trade do, if the statements of prominent contractors are to be taken at their face value.

"My policy," said a successful contractor, "is to investigate the credit rating and general desirability of every customer before starting the work. This is the only safe plan. To put men and materials on a job and actually getting it under way before finding out that it is a dangerous proposition, from a financial standpoint, is equivalent to locking the stable after the horse is stolen; at all events, it amounts to leaving the door open even with a known thief in the neighborhood. One of the reasons why the contractors lose so much money is that they pursue their credit investigations at the wrong time."

Digitized by Google

Getting the Money.

The difference between paper and actual profits is usually the difference between efficient and slovenly methods of billing and collecting.

The average person who owes money is inclined to pay it. Likewise, the average American has so many places to put his suprlus cash that the surplus disappears as rapidly as a June frost. Hence it follows that the merchants who get paid what they are owed are those who lose no time in putting their claims before the customer and keeping them there with a reasonable amount of persistence.

Good collection work, therefore, is just as necessary as good salesmanship or good workmanship on the job. In fact, it is more necessary than either of those, because it is the final step, by means of which the results of the labor that has gone before must be realized.

The electrical concern should not hesitate to use good men in collection work. They can be of service not only in getting the money, but in getting additional work. In other words, they can find out if the first job was satisfactorily performed, and if so, solicit other business, thus combining salesmanship with collections. This is a logical and practical method of handling the proposition and is being successfully employed in a number of notable instances.

To leave accounts that are overdue on the books and include them in paper profits is the poorest of poor policy. If the account is past due, tell the customer so by mail—and then go see him personally. Keep after him with a sharp stick until the money is forthcoming.

That is the final and most necessary link in the chain that is to hold profits in and keep credit losses out.

Public Service Commissions

Conducted by William J. Norton

DISTRICT OF COLUMBIA.

The Potomac Electric Power Company. The Public Utilities Commission has issued notice to the Potomac Electric Power Company and the Washington Railway & Electric Company requiring them to show cause why the rates of the Potomac Electric Power Company to private consumers should not be reduced, the reduction in rates to the private consumers to be made possible by the exacting of proper charges for power furnished the Washington Railway & Electric Company and its subsidiary railways.

The notice states that from the evidence before the Commission "the joint operative arrangement between the two companies is merely a device to cover what is in reality a sale of electric energy by the Potomac Electric Power Company to the Washington Railway & Electric Company," and that the amount paid by the railway company for energy furnished by the power company does not include interest or profit upon the property of the power company employed in its production.

Objection to a former hearing and investigation of the intercorporate relations was made by officials of both companies on the ground that no specific charges were preferred. Anticipating an appeal to the courts, the Commission issued its notice of further proceeding.

Concerning the contention of officials of the power company and railway company that when agreement is made between public utilities concerning the interchange of facilities, the Commission is without authority to act, "even when the rates are unjust or discriminatory," the Commission says:

"It is an ingenious argument to say that such agreements oust the Commission of jurisdiction and similar arguments have been invoked many times to the distortion of the evident intent of the statutes, but the framers of this law have provided against this very interpretation.

"And the framers further say that the provisions of the act are not to be construed strictly as against the Commission, but interpreted and construed liberally, in order to accomplish the purpose thereof."

The Commission cites its authority to make such investigations, as follows:

"The spirit and the letter of the public utilities law charges the Commission with ascertaining and keeping itself informed as to the manner and method in which the business of every public utility is conducted. It is charged with the supervision and regulation of the utility's organization, franchise, property, finances, accounting, rates, operation, and its compliance with every law applicable to it, including the provisions of its own charter.

"It is armed with ample inquisitorial powers to obtain information in any detail, and it is believed that just this sort of an arrangement is one which it is intended it should investigate and correct, if necessary."

GEORGIA.

Macon Railway & Light Company. The Commission has dismissed the application of the Macon Railway & Light Company for an increase in lighting and power rates. The present rates are those put in effect by order of the Commission, issued February 24, 1914. The order provided that, if after one year's trial the rates proved to be inadequate the Commission would "promptly undertake to revise them."

The rates became effective March 1, 1914, and the company entered its petition for a revision of the rates on June 9 of this year. The Commission, in dismissing the petition, holds that the company has failed to show that its "present scale of commercial and residential light rates and its retail power rates is not just and reasonable."

For the purpose of this petition, the company, while protesting that it was low, accepted the valuation placed by the Commission in the previous investigation. The present investigation involved only the ascertainment of the actual net earnings of the company under the new rates.

The Commission states that ascertainment of the net earnings of the company is made difficult by reason of the fact that the lighting business of the company is conducted in connection with its railway business, and the municipal lighting service in Macon is under contract to another company, but actually performed by petitioner, and, further, by the fact that the Macon Railway & Light Company is one of four public service corporations owned by substantially the same interests, with substantially the same general organizations conducting the four businesses jointly, with many expenses in common.

Digitized by Google

These four corporation are, the Central Georgia Power Company, which generates and sells electric current to the Georgia Public Service Corporation and to the Macon Railway & Light Company; the Georgia Public Service Corporation, distributing and selling electric current which it buys from the Power Company; the Macon Gas Light Company, manufacturing and selling gas to the public, and the Macon Railway & Light Company, using the electric current purchased by it from the Power Company in operating its electric railway system, and in serving its light and power patrons. This company also owns the municipal lighting system.

The Central Georgia Power Company is under a term contract to light the city at prices much below the actual cost of the service. Owning no lighting or distribution system, the common owners of it and the Macon Railway & Light Company, which owns the system, require the Railway & Light Company to carry out the Power Company's contract with the city, charging it with the current used, but allowing it to retain the proceeds from the service.

The actual out-of-pocket loss placed upon the Railway & Light Company by the Power Company in the fulfillment of the Power Company's contract is over $6,000 per annum, exclusive of interest on the investment, depreciation of, and taxes on the property in use, and administrative expenses.

The Commission holds: "If the net revenues from the entire business of the company are insufficient to meet fixed charges and pay fair dividends, this deficiency cannot be justly provided by increasing rates in the one department which is earning reasonable returns. If the business of the railway department and of the municipal lighting service is conducted without profit or at a loss, such losses cannot be recouped, under independent and separate rates, at the expense of light and power patrons."

Deducting the operating expenses, as charged in the books of the company, taxes, and depreciation at four and one-half per cent, the Commission finds that the company has earned 6.32 per cent.

Commenting upon this finding, the Commission says: "In considering the business of the company for the period mentioned, it should be borne in mind that the Commission rates, in effect on March 1, 1914, were very much higher than the exceedingly low rates previously prevailing as the result of the bitter contest for existence waged between the Railway & Light Company and the Georgia Public Service Corporation. Such an increase, in numerous instances where long-term contracts had been made, based on the low rates, occasioned some degree of dissatisfaction among the company's patrons, and doubtless for a time affected business.

"Within six months of the promulgation of the Commission rates the European war commenced, followed by depressing effects on business of every character throughout the world, and possibly nowhere in the United States more than in the cotton states. Conditions have not markedly improved as yet in this section.

"Following an increase in rates under such depressed business conditions, it is not surprising that the business of this company for the period under study, has fallen below normal. A return, however, of 6.32 per cent unquestionably compares favorably with returns for the same period in other lines of business in Macon.

"These observations are submitted, not by way of asserting that 6.32 per cent is a fair and proper return, but rather as suggesting that the business of the company during the past 18 months having been subnormal, results cannot and should not be taken as conclusive evidence as to the reasonableness of rates made effective and in operation under such conditions."

However, the Commission does not agree with the apportionment of expenses made by the company. The Commission allocated the expenses between the four companies upon the basis of the percentage of gross earnings of each company to the total of the four, and made a similar apportionment between the railway and electric departments.

The Commission's revision of the expenses for the year result in net earnings of 8.25 per cent on the value including working capital, as fixed by the Commission.

The order of the Commission authorizes the company to make a reasonable reinstallation charge, and it is estimated that this additional charge will furnish new revenue of $1,200 per annum.

INDIANA.

The Merchants Heat & Light Company. The Commission has denied the petition of the Merchants Company for permission to put in effect a schedule of rates for residence lighting on the "active room" basis, and the socket rate, which was fixed in its former order is to remain unchanged.

The Bureau of Navigation has now in the hands of the printer an edition of the "List of Radio Stations of the United States," which will be issued within a short time.

Daily Government Commerce Reports.

For many years there has been published by the United States Bureau of Foreign and Domestic Commerce, Washington, D. C., a little publication known as *Daily Consular Reports*, which contained valuable commercial information gathered by the United States consuls and consular officers throughout the world. Some time ago this was changed in title so that it is now known as *Commerce Reports*, so as to make more clear the nature of the information it contains. Believing that this information is of great value to manufacturing and commercial firms engaged in the export business, the government has recently increased the scope of the publication and thereby made it of still greater value. This is along the line of closer co-operation between the government agents at the principal trade centers in the various countries.

This daily publication is an official newspaper 6 by 9 inches and containing 16 to 32 or more pages, which furnishes the business man with a daily summary of market conditions in the different lines of industry throughout the world's markets. It contains notices of current changes in the tariff and trade-mark laws of foreign countries, direct cable information from American consuls and attachés and contains in almost every issue a list of foreign trade opportunities through which the exporter can get in touch with specific foreign business chances. Although published by the Bureau of Foreign and Domestic Commerce, *Commerce Reports* and its supplements can be obtained through the Superintendent of Documents, Washington, D. C., for the nominal subscription price of $2.50 per annum.

Picnic of Columbus Company's Employees.

At the annual picnic given by the Columbus (O.) Railway, Power & Light Company, August 27, to employees and their families nearly 8,000 buttons were issued granting free transportation over all the city lines, admission to Olentangy Park and the privilege of various amusements there. With the exception of the street car and power service, all activities of the company were discontinued for the day, in order that every employee might have a chance to enjoy the outing. A fine programme of athletic contests was under charge of a joint committee from the various departments. A purse of $15 was awarded in a missing man contest. The attendance at the picnic this year was 3,000 in excess of that of a year ago.

Digitized by Google

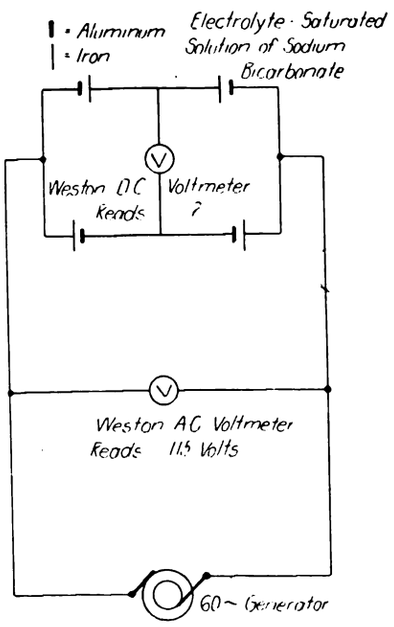
Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 303.—Rewinding Motor for Lower Frequency.—I have a three-phase, 220-volt, 60-cycle, three-horsepower motor which runs at a speed of 1,750 revolutions per minute. I wish to use this motor on a 25-cycle circuit and do not need more than two horsepower. I would be glad to know through the columns of your paper how I could wind this motor to gain this result. What would be its speed and would its efficiency still be high? At the present time it starts under full load with a high degree of torque and I would rather not change it unless I was certain of equally satisfactory results.—F. I. R., Auburn, N. Y.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectified direct-current voltage be?—A. G., Fort Monroe, Va.



No. 304.—Nodon-Valve Voltages.

No. 305.—Test of Ground Plates.—What is the best way to test the effectiveness of ground plates?—F. A. H., Chicago, Ill.

No. 306.—Cleaning Transformer Cooling Coils.—What is the best way to remove the deposit which has accumulated in transformer cooling coils without removing the coils?—F. A. H., Chicago, Ill.

Answers.

No. 296.—High Cost of Rendering Bills.—I understand that in the case of some of the large central-station companies it costs on an average from 16 to 18 cents to render the ordinary monthly bill for current used. What is the reason for this high cost? What efforts have been made to reduce it?—D. L., Chicago, Ill.

Assuming the querist has reference to the total cost of rendering the bill, including meter reading, stationery, postage, office and incidental expense, the statement given seems to be about correct. It agrees closely with that given in the report of a well known light and power company in the West. This particular company operates a transmission system extending over a large territory and supplies about 35 towns. The monthly expense per customer taken over a considerable period of time averages as follows:

Meter reading	6 cents
Office work and billing	7 cents
Stationery and printing	3 cents
Collecting	5 cents
Trouble calls and repairs	4 cents

Considering the first three items only, gives a total of 16 cents per month per customer. The reason for the high cost of billing is evident from these figures.

This subject is being investigated very carefully by many companies and as a result numerous schemes have been worked out. The following will give an idea of the lines along which the various companies are working. One company employs traveling agents whose duty is to make collections, read meters and secure new business. These agents turn in daily reports to the superintendent's office, where all accounting and billing is done. Another company has a system so arranged that the meter reader makes out the bill when reading the meter, submits it to the consumer and makes collections when possible. This method works out very well in the smaller towns where the rates are not complicated. In Topeka, Kans., customers' electric service bills are made out on a postcard and mailed to the addresses without cover. This saves considerable stationery, postage and clerical expense. This plan has also been adopted by the municipal lighting department of North Attleboro, Mass. The saving in postage and clerical expense is reported as being from $700 to $1,000 per year. The form used has been approved by the postal authorities and carries the usual meter record data and amount of bill. In another vicinity the lighting company checks its town customers monthly and the rural-line customers quarterly. For the latter, a lineman is generally selected for reading the meters, for he can also attend to complants and inspect the lines. With him he carries miscellaneous supplies, such as lamps, fuses and other staple commodities. In addition, the meterman carries on each trip some specialty which he demonstrates to the customer. The sales results obtained from this practice have been very gratifying. The amount of study being expended on this subject in general is well shown by a recent development of the Eastman Kodak Company, which has designed a special camera for reading customers' meters. It is claimed the total cost of reading meters including the film and developing will not exceed one-half cent per meter.—G. A. S., San Francisco, Cal.

A method used by the Public Service Company of New Jersey to reduce the cost of rendering bills is to print a detachable coupon giving the essentials of the bill (customer's name, amount of bill and ledger number) with the request that, if a formal receipt is not especially desired, for the customer to detach the coupon and mail with a check and file the stub of the bill. This saves a two-cent stamp on nearly every bill paid by check.—D. M. L., Elizabeth, N. J.

No. 301.—Transformer Winding.—What size of wire should be used for primary and secondary winding for a transformer to step down 220 volts to 110 volts, capacity about 10 amperes? Also what quantity of wire of each size should be used? Does any manufacturer carry such transformers in stock?—R. D. F., Corona, Cal.

Transformers of this small size are generally kept in stock by manufacturers, but it will not be for just the exact output of 110 volts × 10 amperes = 1.1 kilowatts, but probably for 1.0, 1.5 or 2.0 kilowatts. The choice can be made in accordance to the average load wanted; if 10 amperes is required permanently the 1.5 or 2.0-kilowatt transformer ought to be taken. If, however, 10 amperes is used intermittently, the 1-kilowatt transformer will do.

If the enquirer has an iron core and wants simply to put a winding on it, he could take for the secondary coil (110 volts) No. 12 B. & S. copper wire; for the primary coil No. 21 B. & S. wire. The weight of the wire depends of course, to a great extent, on the dimensions of the core; for a normal transformer of this size it will be about five pounds per coil.

Digitized by Google

For the case in question a simpler and cheaper solution would be an autotransformer, which can be applied if there is no objection to having the primary and secondary circuits connected. In this case only one coil is necessary with a tapping in the middle. The total pressure of 220 volts is impressed on the ends of the coil, whilst the supplied circuit is connected to the tapping and one terminal. This method ensures a higher efficiency, half of the current for the supply is taken directly from the line and the other half generated in the transformer (not considering the efficiency). In this case a wire of No. 20 B. & S. for the coil would be right, the weight approximately seven pounds. Since no information is given in the inquiry as to the iron part of the transformer, a more detailed reply as to number of turns, etc., can not be given. —H. A., Pittsburgh, Pa.

From this inquiry the following specifications for the design are understood or assumed: input, 2.2 kilovolt-amperes; frequency, 60 cycles; primary E. M. F., 220 volts; secondary E. M. F., 110 volts; ratio of transformation, 0.5. Since the output is of a comparatively low order, the transformer can be of the self-cooled type, with the coils and core mounted in a sheet-iron or pressed-steel case. Naturally, the design will be of the core type.

Magnetic Flux and Density.—For this capacity and frequency it is known that the flux should be about 0.23 megaline, or 230,000 maxwells. The magnetic density in transformer cores is rather low, especially in those for operation on 60 cycles. In some 60-cycle lighting transformers, the core density is usually from 35,000 to 40,000 maxwells per square inch. Here we will take 35,000 maxwells per square inch.

Design of Coils.—Calling E_p the primary E. M. F., T_p the number of primary turns, Φ the flux, and n the frequency, we have

$$T_p = E_p \times 10^8 / 4.44 \Phi n$$
$$= (220 \times 10^8) / (4.44 \times 230{,}000 \times 60)$$
$$= 360 \text{ turns on the primary (about).}$$

The number of secondary turns will be 360 turns multiplied by the ratio of transformation, or calling the number of secondary turns T_s, we have $T_s = 0.5 \times 360 = 180$ turns on the secondary.

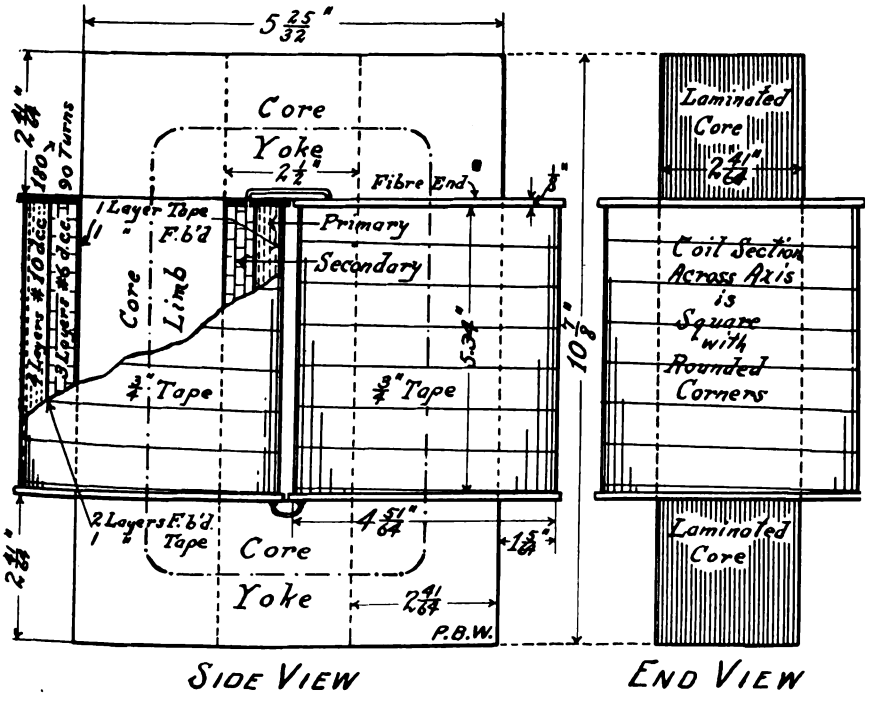
Primary and Secondary Currents.—Neglecting, for the present, the small current required to magnetize the core and supply the core losses, the primary current will be

I_p = watts/primary E. M. F. = 2,200/220 = 10 amperes; and the secondary current will be

$I_s = 10 \times 220/110 = 20$ amperes.

Primary and Secondary Conductors.—In transformers there are no moving parts to set up air currents to carry off the heat; therefore a circulation of oil or air is maintained for that purpose. Because of the difficulty of dissipating the heat losses, and also because the losses must be made small in order to obtain a high efficiency, a liberal cross-section per ampere must be allowed in the primary and secondary conductors. In small core-type transformers the circular mils per ampere in the primary may be from 1,000 to 1,800 and in the secondary from 1,200 to 2,000. The space occupied by insulation in the secondary is usually smaller than that in the primary, and a more liberal cross-section per ampere can be allowed without making the secondary occupy any more room than the primary. Here we will take

Primary current density = 1,000 circular mils per ampere.



No. 301.—Transformer Design.

Secondary current density = 1,313 circular mils per ampere.

In small transformers the primary conductor usually consists of round, double-cotton-covered wire, and, in the present case, the same for the secondary conductor.

Allowing 0.4 ampere for magnetizing and iron-loss currents, we have for the primary current 10.4 amperes, which gives for the cross-section of the primary conductor

$10.4 \times 1{,}000 = 10{,}400$ circular mils;

the secondary conductor should have a cross-section of

$20 \times 1{,}313 = 26{,}260$ circular mils.

Hence we have primary conductor = B. & S. No. 10; secondary conductor = B. & S. No. 6.

Arrangemnt of Coils.—There are 360 turns on the primary and 180 turns on the secondary. Let us assume a core of the type as shown in the accompanying diagram, with 180 primary turns and 90 secondary turns on each limb of the core. Then taking three layers for each secondary coil and allowing for coil-end protection fiber forms one-eighth inch in thickness, the total coil-space length along a limb (since the lineal space of double-cotton-covered No. 6 B. & S. copper wire = 0.178 inch) is $0.178 \times 90/3 + 2 \times 1/8 = 5.34 + 0.25 = 5.59$ inches.

Now No. 10 B. & S. double-cotton-covered wire occupies for one turn the lineal space 0.114 inch; hence the first layer of the primary must contain $5.34/0.114 = 46$ turns, the second layer 45 turns, the third layer 45 turns and the fourth layer 44 turns. The secondary (No. 6 B. & S.) will be wound next the core and the primary wound outside the secondary.

The insulation between the iron and each secondary coil will be a thickness of fullers' board wrapped over with a thickness of tape; and between primary and secondary a thickness of fullers' board wrapped over with a thickness of tape, which in turn may be covered with another thickness of board. The outside of each double coil may be protected by a thickness of board wrapped over with tape. Hence we have for the radial thickness of each assembled double coil:

4 layers No. 10 B. & S. d.c.c. = 0.448 inch.
3 layers No. 6 B. & S. d.c.c. = 0.534 inch.
4 thicknesses fullers' board = 0.050 inch.
3 thicknesses tape (½ lapped) = 0.045 inch.
Total radial thickness = 1.077 inch,

which is practically 1 5/64 inches.

Core Dimensions.—Since the dimensions of the coils have been fixed, the space they will occupy can now be determined. Each core limb (that part about which the coils are wound) must have enough cross-sectional area to carry the flux without exceeding the assumed density of 35,000 maxwells per square inch, that is, the cross-section must be $230{,}000/35{,}000 = 6.56$ square inches net. If only 95 per cent of the cross-sectional area is iron, the gross area must be $6.56/0.95 = 7$ square inches (about), which will give us a

Digitized by Google

square core=2.64 inches or, say, 2 41/64 inches on a side. The core will be made of transformer core laminations.

For the distance between the inside edges of the limbs we have

Twice radial thickness coil=2 5/32 inches
Allowance between coils = 11/32 inch

Inside distance =2½ inches.

Without going into further details of the design, the total length of the primary figures out at 431 feet or about 13.5 pounds; of the secondary 180.5 feet or about 14.4 pounds. The efficiency will range from 92.4 per cent at one-fourth load to 95.3 per cent at full load.—P. B. W., Verbena, Ala.

No. 302.—Air and Electric Rock Drills.—Are electric rock drills used to any extent for preparing holes for blasting in quarries, tunnels and metal mines? How do they compare with air drills? Where air drills are used is it better to supply them from a central compressing plant or from small, portable motor-driven compressors near the place where drilling is being done?—J. B. L., Albuquerque, N. M.

Electric drills are not in use to the extent that one would expect. The chief reason is that the drills first placed on the market were unable to meet the severe conditions imposed upon them, with the result that electric drills in general came into bad repute. The difficulties have now been overcome, however, and there are several drills now on the market that have in the last year or two proved themserves reliable, rugged and practical. These drills are of high first cost, and it is this fact that is the real deterrent at this time; but this will solve itself as time goes on, according to the law of supply and demand. The advantages of the electric drill over the air drill (and they apply even more so to the steam drill) are: saving in power consumption, amounting generally to 70 to 85 per cent; greater flexibility and efficiency of transmission and conversion; cuts from 50 to 100 per cent faster; absence of compressor plant; saving in cost of moving from place to place, it being a simple matter of connecting lengths of wire instead of cutting and fitting lengths of pipe; fewer delays chargeable to either the drill or the transmission system.

Whether it is better to use several small motor-driven compressors or one centralized plant depends upon circumstances, and each case must be decided upon its merits. The more important factors entering into a decision are: the kind of work being done—mining, tunneling or quarrying; the amount of rock thrown down; whether the drilling is being done on the vertical or horizontal; amount of drilling and amount of rock removed per diem; the ease with which the fallen rock may be removed. Usually the centralized compressor plant will show the lower operating costs and the higher efficiency, whereas the smaller units may save quite an appreciable amount of time due to the smaller delay where the work moves rapidly. The fact that one compressor station makes all the air equipment dependent upon it may be a disadvantage. When a blast is made pipes are apt to be covered up with the fallen rock, and damaged, whereas wires can be quickly and easily removed out of the way. The cost of maintaining a piping system may be quite a high item where the speed of travel is high. The loss in transmission is not very serious where large pipes are used, although the leakage and friction losses where the air is distributed to the various machines may become a serious matter, especially if there are many machines to be supplied.

The writer has had some experience in electrically operated stone quarries and in a 7,000-foot tunnel and in both these instances the electric drill was used because it permitted the lower operating costs, the greater flexibility and the greater speed. It seems that there is little excuse for the small motor-driven compressors, unless it be in mine work, or where several drills are to operate together at a distance from the main plant. The electric drill is more efficient than the combined motor, compressor and air drill, it is more transportable and the cost is about the same when all the various factors are taken into consideration. There are cases where the small compressor units would probably mean lower first cost and operating expense probably, but in a general way the electric drill seems the more preferable, especially where only one drill is required to work in the same location at a time. A careful analysis of the costs for the various factors would be necessary before a definite statement could be made. The electric drills are now being used by a number of large contractors for extremely severe, continuous-duty service and are giving satisfaction. Under such conditions they pay for themselves in the saving of power, alone, in a year to eighteen months.—K. R., Chicago, Ill.

Scandinavian Railway Electrification.

The most northerly railway in the world has its terminus at Narvik, on the northwest coast of Norway, latitude about 68½ degrees, 130 miles north of the Arctic Circle. This railroad runs east, across the narrow part of Norway, and then southeast through Kjeronavare and Gellivare, which are the principal iron-ore centers of Sweden; thence it proceeds southeast to Lulea, an important port on the Gulf of Bothnia, and connects at Boden with the railroad to Stockholm. Some iron ore is shipped southeast to Lulea, and thence, by sailboats and steamers, to German ports on the Baltic; but the inland port of Lulea, though in latitude 65½ degrees, is much more obstructed by ice than the more northerly port of Narvik, in Norway, which is called an "ice-free port." Hence, most of this iron ore moves through Narvik, whence it is shipped to both German and Baltic ports. The distance from Kjeronavare to Narvik is 110 miles, of which 85 miles are in Sweden and 25 miles in Norway.

The Swedish portion of this road has recently been electrified, the current being obtained from the Porjus Waterfall, at a distance of about 70 miles from the railroad. At that point 40,000 horsepower is being generated for railroad purposes and carried by overhead wires at 80,000 volts. It is claimed that the installation of electric drive on this railroad has increased the weight of the possible train as much as 40 per cent and has increased the speed 50 per cent. The 25 miles in Norway are still steam-driven, but present a splendid opportunity for electrification. The southern end of this road, from Kjeronavare to Lulea, is 200 miles long. This may also be electrified in the future.

The scarcity of coal throughout the Scandinavian countries and the abundance of water power create an ideal situation for an unlimited development of electric generation and transmission throughout the kingdoms. Much interest is being taken in the electric smelting of iron ores, and it is predicted that before many years the shipment of iron ore from Sweden will give place to that of pig iron. Some pig iron is already being shipped to Germany and to England.

Proposed Municipal Electrical Supply for Baltimore.

The municipal officers of Baltimore, Md., have under consideration a plan by which power for lighting purposes may be drawn from the Jones Falls water supply. If used only for lighting municipal buildings it would save the city approximately $50,000 a year, it is said. The only cost would be the installation of the necessary machinery, which would not be very expensive. It is said that the establishment of the proposed plant will constitute one of the more notable municipal improvements to be effected by the present administration. The plan had its origin in a desire to find some profitable use for the Jones Falls water supply. The details of the plan are being worked out carefully, and until the engineers who are in charge of this work submit their report it will not be known whether the electricity to be supplied by Jones Falls will be utilized only for the illumination of the parks or whether cables will be installed in the electrical subways for street lighting.

Digitized by Google

Street Lighting in Chicago.

The eighteenth annual report of the Department of Gas and Electricity of the City of Chicago, which was recently issued by the former commissioner, Ray Palmer, contains some interesting figures upon the cost of electric lighting in the streets of that city. The accompanying tables show some of the figures in this connection.

Table I gives a summary of the costs, distributed according to type of lamp and to objects of expenditure. These figures cover only what may be termed operating costs. Similar figures are given in Table II in terms of a single lamp as unit.

To arrive at the total cost of this service to the city, an appraisal has been made of the property used in street lighting service, so that a proper allowance may be made for interest, depreciation and other fixed charges. Table III gives the items entering into this appraisal, and Table IV gives the distribution of the fixed charges among the different types of lamp. To the totals for each type are added the maintenance costs already given in Table II to arrive at the total cost to the city per lamp.

To arrive at the values given in Table IV, allowance for ground rent has been made upon the basis of four per cent of the actual value of the ground used by the department and belonging to others. An arbitrary charge has also been made for office rent in the City Hall. The item for taxes is arrived at by applying the actual tax rate to one-third of the estimated value of the plant, according to the legal method in use in taxing all property. Interest upon other property used in the service is charged at the rate of four per cent. An arbitrary charge is made to cover the service rendered by the corporation counsel, the city comptroller and others. The rates of depreciation used ranged from 1.08 per cent on buildings to 6.66 per cent on lamps.

The chart shows the rapid increase in the amount of street lighting provided during a period extending from 1898 to last year. It also shows the enormous decrease in the cost to the city per candlepower supplied.

TABLE I.—COSTS OF MUNICIPAL ELECTRIC STREET LIGHTING SYSTEM—1914.

Items.	Open Direct Current Arc.	Inclosed Alternating Arc.	Flame Arc.	Four-Ampere Tungsten	300-Watt Tungsten	Total
Average number of lamps	935.7	6,253.6	10,168.9	4,920.9	767.4	23,046.5
Sanitary District power	$9,393.50	$62,740.02	$105,183.29	$8,738.61	$5,474.13	$191,529.55
Substation operation	920.32	6,150.84	10,301.88	856.69	536.73	18,766.46
Carbons and renewals	4,522.60	4,872.97	68,351.03	2,205.40	3,534.82	83,486.82
Globes	468.70	2,699.26	6,056.52	1,808.41	107.98	11,140.87
Repairs to lamps	2,220.00	11,698.55	17,544.84	.....	100.00	31,563.39
Trimming, cleaning and patrolling	14,515.00	48,898.75	75,128.55	13,634.50	3,639.88	155,816.68
Repairs to circuits, conduits and posts	4,358.41	29,142.66	47,339.34	22,920.63	3,575.41	107,336.45
Miscellaneous expense, including street car transportation of patrolmen	120.00	1,032.40	1,720.65	100.00	50.00	3,023.05
Supervision (office expense)	327.33	2,188.86	3,551.40	1,722.68	268.65	8,058.92
Total	$36,845.86	$169,424.31	$335,177.50	$51,986.92	$17,287.60	$610,722.19
Cost per lamp	39.38	27.09	32.96	10.56	22.54	.....

TABLE II.—DETAILED COSTS OF ELECTRIC STREET LAMPS—1914.

	Open Direct Current Arc.	Inclosed Alternating Current Arc.	Flame Arc.	Four-Ampere Tungsten.	300-Watt Tungsten.
Sanitary District power	$10.03	$10.03	$10.34	$ 1.77	$ 7.14
Substation operation	.98	.98	1.01	.17	.70
Carbons or renewals	4.83	.78	6.72	.45	4.61†
Globes	.50	.43	.60	.37	.14
Repairs to lamps	2.38	1.87	1.73	....	.13*
Trimming, cleaning and patrolling	15.52	7.82	7.38	2.77	4.74
Repairs to circuits, conduits and posts	4.66	4.66	4.66	4.66	4.66
Miscellaneous expense, including street car transportation of patrolmen	.13	.17	.17	.02	.07
Supervision (office expense)	.35	.35	.35	.35	.35
Total	$39.38	$27.09	$32.96	$10.56	$22.54

*This item will probably increase in future years.
†This is low for this year, as all of the lamps have not been in service for their full renewal period and will be increased by $3.00 under present conditions, though the tendency will be toward a reduction due to decreased cost of and increased life of lamp.

TABLE III.—ORIGINAL COST AND DEPRECIATED VALUE OF CITY ELECTRIC LIGHT SYSTEM.

Distribution.	Cost.	Sale and Dismantling.	Depreciation.	Value.
Ground	$ 86,508.06	$ 23,040.50	.....	$ 63,467.56
Buildings	319,719.97	61,485.31	$ 35,231.46	223,003.20
Steam plant	422,803.44	25,424.98	246,292.29	151,086.17
Electric plant	769,148.09	36,089.98	246,234.82	486,823.29
Crematory	1,630.00	1,630.00	.....	.....
Repair shop equipment	11,386.18	.....	11,386.18	.....
Lamps	629,088.85	.....	225,961.78	403,127.07
Circuits	3,446,225.25	34,645.13	758,723.44	2,652,856.68
Conduits	1,790,483.85	.....	498,686.30	1,291,797.55
Posts	590,307.58	.....	144,224.13	446,083.45
Totals	$8,067,301.27	$182,315.90	$2,166,740.40	$5,718,244.97

TABLE IV.—OPERATING COSTS OF ELECTRIC STREET-LIGHTING SYSTEM DURING 1914, BASED ON AN ESTIMATED VALUATION.

Items.	Direct Current Open Arc.	Alternating Current Inclosed Arc.	Flame Arc.	300-Watt Tungsten.	Four-Ampere Series Tungsten.	Totals.
Ground rent	$ 41.86	$ 274.06	$ 1,031.98	$ 49.33	$ 260.37	$ 1,657.60
Office rent	25.24	165.42	622.56	29.76	157.02	1,000.00
Taxes	1,676.03	10,975.21	41,360.81	1,976.04	10,425.20	66,413.29
Depreciation	5,194.09	34,033.68	128,201.50	6,122.46	32,312.98	205,864.71
Interest	4,074.11	26,708.71	100,522.69	4,807.53	25,349.48	161,462.52
Proportion of other departments' salaries	38.15	249.81	941.05	44.97	237.02	1,511.00
Total	$11,049.48	$72,406.89	$272,680.59	$13,030.09	$68,742.07	$437,909.12
Cost per lamp	11.80	11.58	26.80	17.00	13.99	.....
Cash cost per lamp	39.38	27.09	32.96	22.54	10.56	.....
Total cost per lamp	51.18	38.67	59.76	39.54	24.53	.....

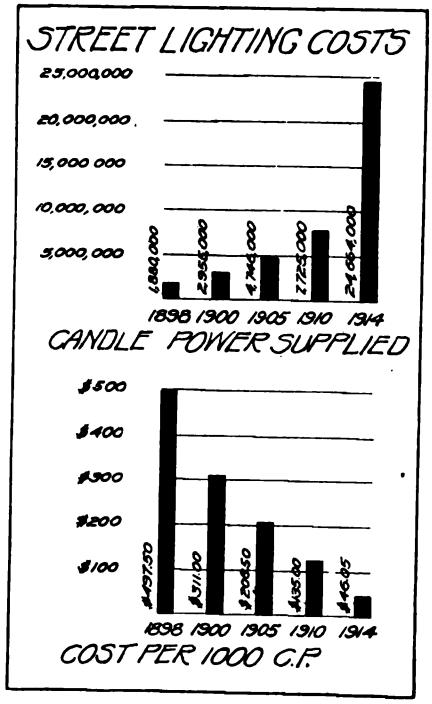


Chart Showing Costs.

New London Electric Railway.

The London and South Western Railway inaugurated the first portion of its electric train service for London suburban lines on Sunday, August 29, the completed lines being between East Putney and Waterloo. The construction is proceeding of the "Kingston Roundabout" as it is termed, including the Kingston, Wimbledon, Richmond, Twickenham and Teddington lines.

Digitized by Google

Water-Power Utilization in the West Considered by Governors.

The eighth annual Conference of Governors was held at Boston, Mass., August 24-27. About 30 present executives and 15 ex-governors, many of them with their wives, were in attendance.

The subjects discussed included national defense and preparedness, the development of the West, the governor's initiative, economy and efficiency in state administration, the abolition of capital punishment and the vital questions relating to the proper utilization of water powers in the arid states of the West.

Gov. George A. Carlson of Colorado was on the program for a paper on "State or National Control of Water-Power Sites," but was unable to be present. Instead, a paper by Ex-Gov. James H. Hawley, of Idaho, was received by the Conference as a part of the proceedings. The following forms part of this paper:

Federal or State Control of Water Power.

"To my mind, the subject presents two phases—(1) a broad question of constitutional law, involving the great potential interests dependent upon the control of the public lands and the unused water power, not yet reduced to private ownership; and (2) a question of sound public policy equally important to the states directly affected and to the nation. Upon both questions a seemingly irreconciliable conflict has developed; theories directly antagonistic are urged. There is apparently no middle ground upon which the contenders can meet and there weld their divergent views into a common idea."

Mr. Hawley holds that the issue involves the idea of state sovereignty as to the control, use and flow of the waters of a state, except navigable streams—a principle in which the Federal Government has concurred, in its policy of admitting new states to the Union.

"The right to use the waters means the right to use the abutting lands necessarily involved in perfecting such use. The conditions existing in the arid regions and mining sections of the West have since their first development necessitated the use of the nearby waters and made it equally necessary to have the right of way over the adjoining lands for the conduits used in conveying the waters to the farm or mining claim. Ordinarily, the places of diversion were in localities where the land was of no intrinsic value and therefore remained the property of the United States.

"The act of 1866 embodied in the statutes of the United States was the first Federal legislation on this subject and did 'grant, acknowledge and confirm' the right of way for the construction of ditches and canals over the public lands 'whenever by priority of possession, rights to the use of water for mining, agricultural, manufacturing or other purposes has vested or accrued, and the same are recognized by the local customs, laws and the decisions of courts, the possessors or owners of such vested rights shall be maintained and protected in the same.'"

Mr. Hawley pointed out that rights of way over public lands do not depend on the section quoted, but on the local laws themselves, the underlying principle of which being the right to acquire, divert and use the streams, and an easement over the lands necessarily crossed by conduits conveying the waters to the place of use.

"The sovereign control of the waters within their territorial limits concededly being in the states, and an easement over adjoining lands being necessary to utilize such waters, and such easement having from time immemorial been recognized by the United States, is there any authority on the part of the general government either through future legislation or by action of its officers under existing statutes, to prevent the full use of such waters under the statutes of the states affected, by reserving the ultimate ownership of the lands necessary to be used in the development of hydroelectric energy, and preventing the use by the state or under its laws of its waters for such purpose?"

It was pointed out that the water powers of most of the inter-mountain states are their most valuable asset. An arbitrary refusal by the national government to dispose of lands so they can be used by owners of the water would render such waters valueless, and places the government in a position to hold up the developer of waterpower, after the manner of the highwayman. The writer characterized the Ferris bill, now pending before the Senate, as a deliberate attempt to deprive the states of the control of their streams.

This act directs the Secretary of the Interior to lease public lands for 50 years for the construction and operation of power houses, dams and conduits, and transmission lines, and provides that no lease shall be granted without the applicant first having obtained the right from the state or states in which the project is located to sufficient water to develop the power. The Interstate Commerce Commission is given the power to regulate and control service, rates, and stock and bond issues, when the lessee operates an inter-state system. Section V of the bill gives the United States the right to take over after three years prior to the expiration of the lease all property dependent on the continuance of the lease. Section VI provides for re-leasing of the property. Section VIII authorizes the Secretary to fix the rental, and provides that 50 per cent shall be paid to the state and 50 per cent to the reclamation fund, and Section IX gives the Secretary full power to regulate rates and service in states where no public utility commission exists.

The objection is made that government regulation and control of properties within a state is a measure of interference not warranted by the Constitution, and that the provision which authorizes the Secretary to fix charges on the amount of power developed and sold by the lessee makes an excise tax on the industry.

"I concede," says Mr. Hawley, "that the general government has full power of regulation and control of matters of this kind devoted to interstate uses, but laws conferring such control should be uniform. * * * No serious attempt is made by the friends of the Ferris bill to deny that by this legislation it is intended to vest in the government powers which have heretofore been exercised wholly by the states. The main argument in favor of the bill is one of expediency.

"The proposed legislation is ostensibly a conditional grant for a limited time of the right of way over the public domain for the uses incidental to the development of hydroelectric power. In reality it amounts to an effort to establish a new system of government for the control of all future water-power industries established on or requiring the use of the public domain, and to vest all authority regarding it in the administrative department of the Federal Government, and divest the states of any power therein.

"The argument is used that waters in arid states are of use only with the land of the public domain, and the United States being the owner, it is proper for it to assume control of industries built up by the combined use of land and water. If this reasoning is correct, then the state might pass a law prohibiting the use of water on the public domain and thus confront us with a situation under which the development of our power resources would be forever impossible."

It was pointed out that the government, in being vested with the ownership of public lands, held them merely as trustee for the future states. An act like the Ferris bill would tend to centralize control in the general gov-

Digitized by Google

ernment, of many matters over which the states heretofore have had sole jurisdiction.

"The theory of renting the abutting lands essential to power sites is an injustice to the renter himself, as against the fortunate ones who have already become owners in fee of similar facilities," the writer of the paper maintained. "The rental system would make values uncertain and prevent the ready sale of bonds for new enterprises. The amount received from rentals would be immaterial to the government. The provision that the state shall receive a part of the proceeds is merely a sop.

"The worst feature of the bill is that under it the ownership of abutting lands will give absolute control over the adjacent water power. The land may be valueless; the water has great value. Still, the control of the valuable asset is attempted to be usurped by the government because it owns the lands.

"The northwestern states are blessed with an almost unlimited amount of water power. The necessities of these states demand the fullest development of their power facilities. The gravity systems of irrigation have practically been completed; the remaining supply of running water is below the lands upon which it should be used, and this water can be put upon these lands only by the use of hydroelectric power. Mining and manufacturing also require cheap power. It is held by some that a definite demand should precede the development of power. This is not a correct doctrine. When electric power is developed, the owners are bound to find markets for it. When opportunities offer, all mining, agricultural and manufacturing machinery will be run by electric power. Our urban and interurban railways, and even transcontinental railroads, can use electricity alone as motive power; the use of electricity will enter into every phase of our domestic and business lives."

The paper concluded with a plea that the states be given the same right of control over power sites as they have now over the water which generates the power. Or, if this is impracticable, suggests Ex-Governor Hawley, give opportunity to investors to acquire absolute title to the sites, in the same easy manner as for government lands for other purposes, and at a reasonable cost, to be determined beforehand by the proper officials. There would be no possibility of hurtful monopoly, with public utility commissions existing in every state.

Conservation of Natural Resources.

Another address of the session was by Governor Ernest Lister, of Washington, on "Conservation of Natural Resources." He said that of the 69,000 square miles of area of his state or 44,241,000 acres, 9,828,000 acres are held by the United States as forest reserve, and 1,831,000 acres are owned by the state or held by private interests as forest reserves. He held that conservation of resources means not withdrawal from use, but development and wise utilization. Great undeveloped water powers are running to waste. Power aggregating 4,932,000 horsepower is available for hydroelectric generation, basing the estimate on an efficiency of but 75 per cent, while developed power amounts to but 306,000 horsepower or only six per cent. In Oregon, 3,148,000 horsepower are available and only 105,000 horsepower, or three per cent used; and in California 3,424,000 horsepower are available and only 430,000 horsepower, or eight per cent utilized.

In Oregon and Washington vast tracts of land could be reclaimed from arid desert by electrically driven pumping. One tract of 160,000 acres could be reclaimed by the utilization of a single hydroelectric project on the Columbia River. Electric power, he claimed, is the only power practicable for reclaiming the dry lands for human habitation; the lands thus irrigated would furnish homes for hundreds of thousands of people.

In Washington are 7,386 miles of steam railroads which could advantageously be operated by hydroelectric power. Governor Lister cited the Chicago, Milwaukee & Puget Sound Railroad, which has undertaken the electrification of 450 miles of main line, which, he said, is proof that electrification is a good business proposition. He quoted John D. Ryan, of the Montana Power Company, who testified before the Public Land Committee of the Senate that this railroad will pay about $550,000 a year for electrical energy. Heretofore its coal has cost about $1,750,000 per annum, besides requiring about one-third of the railroad's equipment to haul the coal. The Butte, Anaconda & Pacific Railroad pays about $96,000 for energy to operate 80 miles of railroad, whereas coal formerly used cost $270,000 a year. It is estimated that all the railways in the three Pacific Coast states would require between 700,000 and 800,000 horsepower for operation, and this amount of power would be but a small part of the available supply. Besides these economies, Governor Lister pointed out that forest fires, now a source of great loss, and in a large measure attributable to steam railroads, would be greatly diminished under electric operation.

In addition to manufacturing, mining and railway operations, the production of fertilizers through atmospheric fixation of nitrogen by means of electric power would be a source of great wealth to the whole country. It is said that the nitrates of Chile are fast being exhausted and will be extinct in about 20 years. The use of 200 pounds of this fertilizer to the acre in Europe, as compared with 28 pounds in the United States, results in wheat crops of thrice the number of bushels per acre. This larger figure would be possible here, if the production of fertilizers were undertaken with the aid of electrical energy.

Governor Lister held that investments in water powers should be assured of a reasonable return. Under present Federal laws, such a condition is lacking, and it should be the work of Congress to legislate favorably to hydroelectric development. He believed state public service commissions should exercise authority over water powers, and that provision should be made for the people to acquire plants at a reasonable value, which should leave out of account the intrinsic value of the waters. He said the streams are the country's "most valuable resources."

Youngstown Dedicates Street-Lighting System.

On August 18, Youngstown, O., dedicated a new street-lighting system which is notable because it is one of the most extensive exclusively Mazda C street-lighting systems in the United States and also because of the short period required for installing a large number of ornamental standards which required the laying of nearly five miles of underground circuits along downtown streets. In addition to the ornamental standards there are 185 miles of streets lighted by lamps supported by brackets extending from wood poles. Operations were begun on March 3, 1915.

The installation consists of 257 1,000-candlepower, 20-ampere series Mazda C lamps and 288 600-candlepower 6.6-ampere series type C lamps mounted on ornamental metal standards and inclosed in Novalux Polycase glassware. The higher candlepower units are confined to and in the immediate vicinity of the downtown section known as "The Diamond," a public square at the intersection of Federal and Market Streets and Wick Avenue.

A feature of the Youngstown installation is the use of a series transformer in the concrete base of each lighting standard which leaves the standard free from high-tension circuits.

Standards are space from 50 to 75 feet, opposed, on downtown streets, which affords an unusually high light intensity. The light center of the lamps is 14 feet 6 inches above the curb.

The installation was made by the Mahoning & Shenango Railway & Light Company, of Youngstown.

Digitized by Google

Engineers Present Open Letter to Chairman of New York Constitutional Convention.

The Committee of Engineers representing national and local engineering societies organized to present recommendations to the New York Constitutional Convention has sent the following open letter to the Convention chairman:

New York, August 25, 1915.

Honorable Elihu Root, *Chairman,*
New York State Constitutional Convention,

Under date of April 20th, this Committee, which has been officially designated by the governing bodies of national and local engineering societies to represent them at your Convention, forwarded an open letter to the Convention, setting forth certain principles which, in its judgment, should be incorporated in the State Constitution when amended, to the end that the engineering work carried on under our State Government might be placed upon a high plane of efficiency, comparable with that essential to the successful management of large undertakings under private control.

The societies represented comprise the American Society of Civil Engineers, the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Consulting Engineers, the New York Section of the American Institute of Mining Engineers, the Municipal Engineers of the City of New York, and the Brooklyn Engineers Club, with a membership collectively of approximately 30,000, of whom about 6,000 reside in the State of New York.

Our recommendations related particularly to the administration of the public works, the control of State lands, conservation of the State's resources, and the regulating of public utilities. Concerning all of these functions bills prepared along the lines suggested have been formally introduced or have been presented for committee consideration.

An examination of the proposed amendments as reported to the Convention by its various committees shows that it is only proposed to adopt in part the principles we urge. Before final action is taken by the Convention we venture to approach you again with the hope that the principles to which we refer, may, after further careful consideration, receive your final support.

Management of Public Works.

In the bill prepared by us and presented by Mr. Latson (Introductory No. 404) we have provided for placing the sole management of the various engineering activities of the State, control of the State lands and buildings, and jurisdiction over all conservation projects, in a "Department of Engineering and Public Works," to be headed by three commissioners, each to hold office for a term of twelve years, and to have qualifications fitting him to fulfill the duties of his office. This measure also provides for the subdivision of the work of the department among suitable bureaus, and for heading each engineering bureau by an engineer selected with sole regard to his qualifications.

The amendment reported by your Committee concentrates these functions, excepting those relating to park control and development, and to conservation, in a "Department of Public Works" to be administered by a Superintendent appointed by and removable by the Governor. It is proposed to place the conservation functions in a separate department, but no provision seems to have been made for assigning definite jurisdiction over the State parks other than the forest preserve. While no term of office is prescribed, it is likely that the past custom will be continued and that a new Superintendent will be appointed by an incoming Governor. By omitting definite provision for engineering bureaus, the way is left open for successive legislatures to bring about changes in the management of the public works of a character fully as radical and injurious as those which have been made in the past.

Continuity of control is absolutely requisite to the successful conduct of the State's public works, the management of public property, and the regulation of public service corporations, but this important principle has been entirely omitted from the provisions recommended by your Committee, although the desirability and practicability of securing such continuity has been recognized by other committees of the Convention in their recommendations concerning conservation and public utilities to which further reference will be made.

We strongly urge upon you the desirability of making radical changes in the plan proposed by your Committee, to the end that the importance of securing continuity of purpose and control will be given recognition.

Conservation.

The present State Constitution deals with this function in an ultra-conservative way, the basic idea being apparently a prohibition against any attempt at scientific forestry or development in order that mismanagement might be avoided. With control over and responsibility for the State lands and forests definitely placed in a well-organized department, such as is proposed by us in the bill presented by Mr. Latson, it would seem reasonable to remove all unnecessary restrictions and to open the way for treating this important factor in the development of the State with the intelligence and businesslike efficiency which it deserves, by making it practicable not only to cut such trees as scientific forestry would require, but also to readjust property holdings whenever public benefit might thereby accrue.

In the amendment proposed by your Committee, provision is made for a nine-headed commission, each member of which would have a nine-year term, and the prohibitive features of the 1894 Constitution are largely retained. While the adoption of this plan may insure honest administration, its restrictive provisions are framed on the idea that the State can only insure itself against wrongdoing by closing the doors to progress. Assignment of responsibility to so large a body, the unpaid members of which cannot be expected to give their sole attention to their office, is not conducive to efficiency. In our judgment the day when corruption of public office will be tolerated is past, and the remedy against such abuse is to insure fitness for office and definite responsibility on the part of department heads.

We urge that the broader view of this question be favored, as more particularly detailed in the drafts prepared by our Committee providing for amendments to Article 1, Section 7, and to Article 7, Section 7, of the Constitution.

Public Utilities.

In our bill, presented by Prof. O. H. Landreth (Introductory No. 688), provision was made for one five-headed commission, each member of which should have a ten-year term of office and possess qualifications which would fit him for his duties. The bill also defined the functions of the commission.

In the amendment proposed by the Committee of the Convention the jurisdiction, powers, and duties of the commission are left subject to determination by the Legislature, two five-headed commissions are proposed, the term of office is made five years, and no qualifications are named for appointees.

In general, the proposition of your Committee is along the lines we have suggested but, in our judgment, greater advantage would result to every public and private interest if the bill above referred to was substituted.

Very respectfully yours,

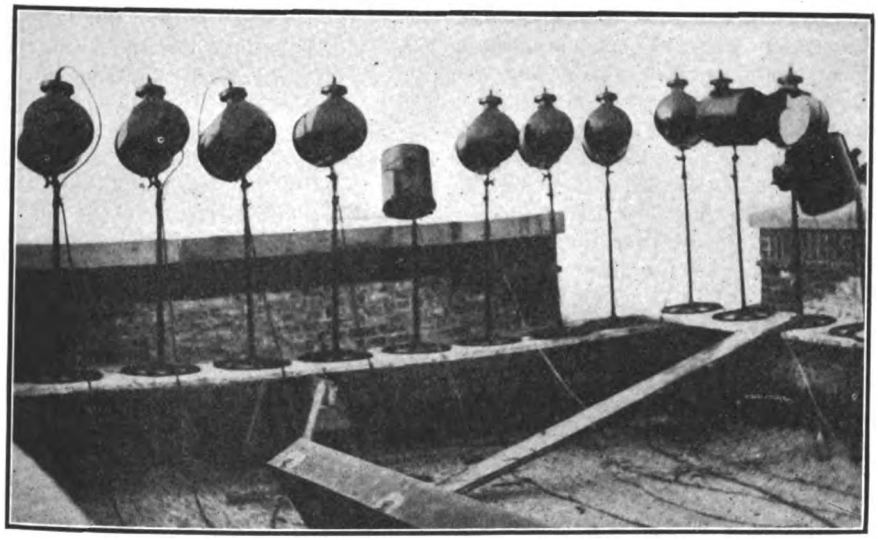
ARTHUR S. TUTTLE, Chairman.
CALVIN W. RICE, Secretary and Treasurer.
E. J. MEHREN, Assistant Secretary.

Digitized by Google

Projector Lighting for the Protection of Bathing Beaches.

For several years the public park and municipal authorities of Chicago have tried to promote the more advantageous use by the public of the city's 22 miles of frontage on Lake Michigan. One means of attaining this was the opening of a number of municipal beaches, which added greatly to the facilities formerly provided by the beaches privately owned. As a result, this summer has seen considerable increase in patronage of both public and private beaches, despite unseasonable weather.

It is believed that fully 90 per cent of the patrons of the lake beaches of the city are employed on week days until five o'clock or later and, therefore, if they wish to indulge in lake bathing on these days they must do so at about dusk or later. Many accidents have happened at night, some fatal, which probably could have been avoided if the beaches had been illuminated sufficiently for efficient rescue work. It has also been found that the cover of darkness provided opportunity for unseemly and improper conduct on the part of a certain element of the frequenters. As it was not possible to prohibit bathing after dark without depriving a very large number of the opportunity of indulging in this sport, plans were considered whereby the beaches could be made safe after dark.



Projector Installation at Bathing Beach.

One of the methods suggested was the illumination by means of powerful electric projecting lamps. This was tried out at the Clarendon Municipal Beach adjoining the city's Lake View Water Pumping Station. The method in which this was carried out is shown in the accompanying illustration. A battery of focusing arc lamps was mounted on top of the coal conveyor shaft of the pumping station. These lamps were so directed that they projected their light so as to illuminate the entire beach proper and a considerable area of the water. The lamps were equipped with deep parabolic reflectors. Constant-potential arc lamps, such as are used in stage projector work, were employed. The lamps were connected to a slate panel with inclosed fuses and knife switches that set near the center of the group for the purpose of control.

At night the entire beach was flooded with a soft light leaving no dark corners and there was practically no glare noticeable from any point on the sand beach or water due to the high mounting of the lamps. This also served to make the illumination quite uniform and eliminated the deep distorted shadows found with most methods of lighting with low hung lamps.

As regards energy expense, the cost is comparable with that of a more localized system of lighting employing numerous posts. It has the advantage of more uniform and better illumination and lower installation cost. Although the installation was of a temporary character, it was entirely successful, and it is believed that this method will be utilized at all of the public beaches next summer, and it is proposed that all of the private beaches be also compelled to provide similar equipment. It is possible, however, that gas-filled trungsten lamps will be used in place of arc lamps.

Outing of Vermont Association.

The annual convention of the Vermont Electrical Association took the form this year of an outing at Rutland, at the same time that the Rutland Fair and Carnival occurred, September 9 and 10. The members and guests were given the exclusive use of the roof garden of the New Bardwell Hotel.

AVOIDING BEING AT SALESMEN'S OR SOLICITORS' MERCY.

By Elton J. Buckley.[1]

A Pittsburgh firm write me that they are facing a very serious problem on which they wish some suggestion through these articles. They do not wish me to reproduce their letter, or to give their name, but I am permitted to state their problem in a general way.

They use a large number of salesmen and are practically depending on them for their business, which appears to be somewhat peculiar, in that very few of their customers ever come into the store. Almost all of their business, therefore, comes in through salesmen, and like many concerns, they are at their salesmen's mercy in a very large degree. I have known of other cases like this. In one of them a concern was practically destroyed over night by a strike of all of its salesmen. In the end it managed to gather something from the wreck, but the condition into which that house was plunged by the leaving of its salesmen was the greatest possible revelation of the danger any concern exposes itself to if it lets its trade go to its salesmen rather than to itself.

The Pittsburgh concern has had considerable trouble with salesmen leaving and joining a rival house in the same line of business. Naturally, their acquaintance with the trade was their chief asset, and they capitalized it all they could. Some efforts had been made by them in past cases to stop salesmen from doing this, but they had not been very successful, and the concern writes that there is some reason for believing that it is going to lose six of its best men, who are talking of forming a company of their own to go into the same business, with of course, if possible, the same customers. I am asked to say how a house dependent wholly or in part on its salesmen can tie those salesmen up so that they may not suddenly depart and take all the trade with them.

I can of course see the very great need of such protection, and I am glad to say to any one who is interested that the thing can be done, not completely, but to a very useful extent, by the right kind of a contract keeping salesmen off their old customers when they take a new place, or even when they engage in business for themselves.

The courts do not like these contracts, for they savor of restraint of

1 *Copyright, 1915, by Elton J. Buckley.*

Digitized by Google

trade, but they will enforce them nevertheless if they are reasonable and properly drawn. I have never known one case, however, in which a salesman was compelled to stay away from his old customers, unless he had contracted to do so, preferably in writing. Let me make that emphatic. A salesman engages with a house to solicit new customers. There is no contract binding him not to solicit the firm's customers if he leaves. He works up a good list, being of course paid for his work. Receiving a better offer, he takes himself—and seeks to take his list—to a new employer. No matter how unfair that may seem, no matter how hurtful it may be to the old employer, the courts will not interfere, because the salesman never contracted not to do that very thing. It is only grudgingly, anyway, that the courts will interfere with a salesman in such a case, and all the conditions must be right before relief will be granted.

Which means not only that a contract must have been made, but that it must have been a reasonable contract. I heard a case argued recently, in which an appeal court, apparently with considerable satisfaction, threw a restraining contract of this sort out of court. It had been made by a big laundry concern with its solicitors, and bound them if they took another position, *never* to solicit their old customers for the new house. The employer had over-reached himself; the court said the contract was unreasonable. Had it bound the solicitors not to go after their customers for six months, or even for nine, it would almost certainly have been upheld.

In a case of this sort which happened recently in my own experience, I had some trouble to convince an employer that six months' protection was plenty. Certainly if a house cannot go in and bind its former salesmen's customers to itself in six months, it can never do it.

The point about a contract like this is that it must go no further than will give the employer proper protection. If it oversteps that line, it will be considered undue restraint of trade and will be thrown out. What will be proper protection varies in different cases. A physician selling his practice, which was all local, would not be held to a contract by which he bound himself not to practice medicine within ten miles for a certain period. Manifestly, the contract was unnecessarily wide. Of course where it is a case of a salesman, calling on certain trade, that part of it is easy—he is simply to keep away from any customers whom he called on for his old house. The period of exclusion is the mooted point then. It is not safe to make it longer than six or nine months, and three months is safer.

I will write here a brief form of agreement which will be upheld, I believe, in any court. The employer is party of the first part and the salesman party of the second:

The party of the second part, in consideration of the premises, and upon being given the said employment, hereby agrees in case he should leave the service of the party of the first part, not to approach, write to, telephone to or solicit in any manner whatever, direct or indirect, the customers of the party of the first part within a period of six months after said leaving.

Ordinary contracts with some salesmen would be unenforceable, because the salesman would be without resources. But you could enforce the above contract with an *injunction,* which would mean imprisonment for contempt of court if he violated it. A contract like this performs two good offices. It not only supplies protection after a salesman leaves, but it makes him much more settled in his position. If he realizes that he cannot capitalize his employer's customers, he will not be so attractive to his employer's rivals.

LETTER TO THE EDITOR.

Some Interesting and Important Law About Buying Goods.

To the Editor:

The article with this title in your publication of August 21, 1915, page 335, was of some interest to the writer in as much as he has had some experience with ordering goods by mail. The writer wishes to take issue with the decision rendered by Elton J. Buckley. While not an attorney or making claim to know many points in law, I wish to cite, first, that Mr. Buckley states that there must be an acceptance before there is a contract; further, "that the thing was done the minute you mailed your letter"; and further, "that the offer was under the law accepted the minute you posted your letter, the mail was regarded as the seller's messenger, not yours."

I agree with Mr. Buckley as to the first statement, viz., that there must be an acceptance before there is a contract. It is a well settled fact that it takes two to make a contract. Now then my contention is that, had Messrs. Morgan & Barnes availed themselves of Section No. 553 of the United States Postal Laws governing the recall of first-class matter, which provides that a letter belongs to and is the property of the sender until actually delivered to the addressee, they could have requested the post master at New York to telegraph the post master at Chicago, requesting the return of the letter to the post master at New York and its final return to the sender. Said firm then in that event would have never known of such an order being sent—hence no contract or acceptance, which would have saved said first firm some money. This provision of the postal laws therefore must refute the statements made by Mr. Buckley regarding the posting or sending of first-class matter.

Durand, Wis., August 24, 1915.

H. A. Miles.

Answer.—The Government regulation has no bearing upon contracts made between individuals by mail, and is not intended to. The rule referred to would not change the law of acceptance; it would simply keep the party addressed from knowing there was an acceptance. It would not alter the fact that there had been an acceptance, and if the party addressed ever found it out he could hold the other party absolutely. This is analogous to a case where *A* and *B* were negotiating together in a matter, and *A* sent a messenger to *B* with a definite offer. *B* wrote an acceptance and handed it to *A*'s messenger. At that minute the contract would ordinarily be complete. If *B*, repenting, ran after the messenger and snatched the acceptance out of his hand, or if he kidnapped the messenger and shipped him to Australia, the fact of the acceptance would remain, and as soon as *A* found it out he could act on it.—Elton J. Buckley.

Students' Camp in Touch with World by Wireless.

Technology Camp, a summer school of students of the Massachusetts Institute of Technology, in the Maine woods, has been in touch with the news of the outside world by means of two wireless receiving outfits, which receive wireless impulses from the same sources that the newspapers and news associations rely upon.

One receiving set was loaned to the students by the Government, and is located in a tent. The second outfit is of students' construction, and has two antennas, which are attached to a flag pole. The ground connection is by a galvanized-iron pail, loaded with stones and sunk in the lake, the copper wires being wound around the pail.

The students are engaged in practical surveying and hydraulic measurement, the latter on a commercial scale. The camp is located on Gardner Lake, East Machias, eight miles from the nearest village.

Digitized by Google

New Electrical and Mechanical Appliances

New Plug Cap for Armored Cord or Cable.

In all industrial plants there is a rapidly increasing use of armored cord and cable for the connection of portable electric tools, trouble lamps, etc. This has caused a demand for a cap on the plug which can be readily connected to the metal armor of the cord.

A cap meeting these requirements has been placed on the market by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn. In this cap a brass ring swivels around a specially formed composition bushing, thus securely gripping the metal covering of the cable or cord and making knotting of the wires unnecessary to eliminate any strain on the conducting wires themselves.

This plug is made in two types; No. 6328, which is shown below, is equipped with the standard contacts; No. 6329 has the small type contacts. Both of these are interchangeable with the entire line of Hubbell T-slot wall and flush receptacles. These caps are suitable for all of the common makes of armored cord and cable. They have been found highly advantageous in industrial plants as means of connecting portable machines and tools without danger of short-circuiting the lead wires where they connect into the plug.

Plug Cap for Armored Cord.

Railroads Increase Telephone Dispatching Facilities.

The Illinois Central and Atlanta & West Point railroads are planning to add additional equipment to their telephone train-dispatching facilities. The plans of the Illinois Central call for ten complete station sets, in addition to the fifty which it has had in service since January.

The plans of the Atlanta & West Point Railroad call for 13 complete stations, which will be added to the 30 the company has had in operation for some time. The equipment in both cases will be furnished by the Western Electric Company.

Insulated Screw-Driver.

For use around electrical machinery, particularly of the low-voltage type, mechanics are liable to be careless with the use of tools, thus frequently short-circuiting parts of the equipment or causing other damage. To meet this contingency there has been placed on the market a new insulated screw-driver in which the handle is made of rubber insulating compound and is all in one piece, as shown in the illustration. The screw-driver has a steel blade of high quality which is six inches long. The stem of this is completely imbedded in the insulating compound forming the handle, which has a good grip. There is no shoulder or obstruction between the blade and handle. The full length of this tool is 11.25 inches.

Insulated Screw-Driver.

This tool is known as rubber-covered screw-driver No. 613, and is made by H. D. Smith & Company, Plantsville, Conn.

Chelten Cord Connector.

The Chelten Electric Company, Philadelphia, Pa., is placing upon the market an additional specialty made from non-breakable composition. The company is at present manufacturing a push-button switch, a receptacle and an attachment plug made of this material, and the new addition is in the way of a cord connector.

This connector is small, neat and compact, and is so designed that it can be readily adjusted. Contacts are strong and heavy, and will allow for an unusual overload. The cap used in connection with the connector is interchangeable with the Chelten receptacle and attachment plug.

Composition Cord Connector.

Electric Steam-Tables for Lunch Counters and Restaurants.

Where commercial electric ranges are used for cooking, or even where cooking is done by other means, the electric steam table should prove a good business-getter for central stations.

S. A. Hoag, commercial agent for the Puget Sound Traction, Light & Power Company, at Everett, Wash., states that recently, while figuring with

Digitized by Google

a prospective customer on the installation of an electric range in his restaurant, the customer desired to eliminate gas entirely, so a steam table was designed to meet the conditions. The operation was so satisfactory that subsequently other restaurants were induced to install them, and the low cost of operation has in each case justified the installation.

A standard gas-operated steam table may easily be changed over for electric operation by suitably insulating the walls and bottom with 1.5 inches of asbestos felt and by installing immersion heaters. The immersion heater used is a Westinghouse eight-inch disk type with two-heat regulation, 1,100-275 watts. The shape and thinness of this particular heater allow it to be used in the narrow water space available between the bottom of the tank and the earthenware food-containers.

In operating this electric table, it is advisable to fill it with warm water at the start, as in this case the three heaters may be used at low heat and the maximum demand on the table reduced to 825 watts, which permits it to be operated on the average central station's power schedule. After the temperature of the water reaches 180 to 200 degrees two heaters may be turned off, as one unit will maintain a sufficient temperature for all ordinary conditions. Operated in this way for twelve hours per day the current consumption is about 7 kilowatt-hours and the daily load factor about 35 per cent, making it very desirable business for central stations.

Automatically Controlled Electric Oven for Testing Shrapnel.

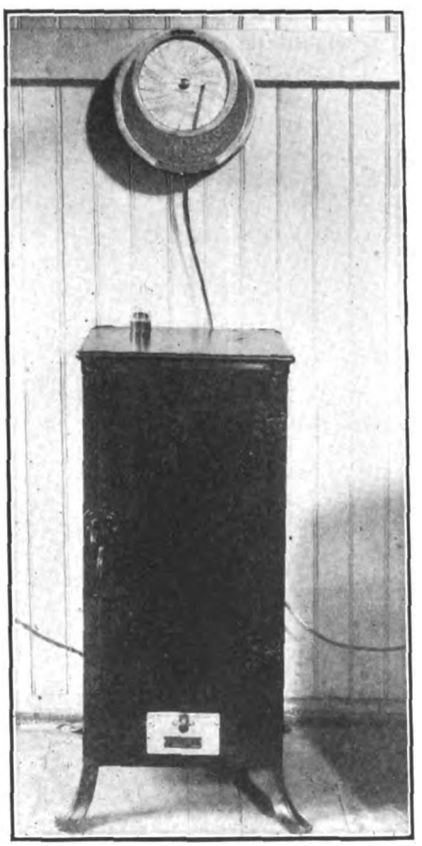
Among the many varied applications of electricity constantly being brought before the public, and one of the most interesting at this time in view of the conflict now raging among the leading nations of Europe, is an automatic thermostatic controlled electric oven manufactured by the Hughes Electric Heating Company of Chicago, Ill.

This oven is for use in one of the government arsenals in Pennsylvania for the testing of shrapnel shells. In the testing of these shells it is necessary that a temperature of 120 degrees Fahrenheit be maintained continuously for 24 hours. This control of temperature is obtained by means of a compact type of thermostat which makes and breaks the heating circuit. One contact point is carried by the expansion member of the device and the other is adjustable by means of a thumb screw which extends outside the case. A condenser across the contact points holds the arcing down to practically nothing.

The oven is fitted with a mercurial thermometer for indicating the temperature. It is also fitted with a pilot lamp, connected in parallel with the heating element, to indicate when the current is on and off. On a continuous test for 24 hours, the temperature of the oven did not vary more than one degree. This temperature reading is shown on the recording thermometer just above the oven, in the accompanying illustration.

The oven is of especially rugged construction and is designed to withstand hard usage. The heating element is of the familiar type as used in all Hughes ranges, and is rated at 200 watts.

Electric ovens have been found to



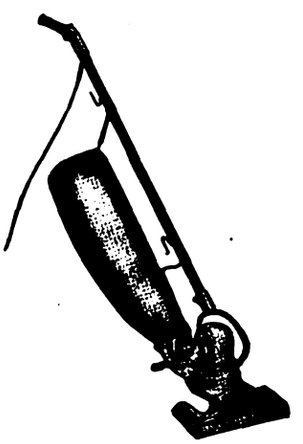
Shrapnel-Testing Oven.

be superior to any other method on account of the perfect heat distribution and the limited space occupied. They can be used for a number of purposes, such as enameling, baking cores, drying, etc.

Hotpoint Electric Vacuum Cleaner.

For many years the Hotpoint Electric Heating Company, Ontario, Cal., has been noted as one of the leading manufacturers of electric heating appliances. Its product has been steadily extended so as to include practically all types of electric heating devices, principally for use in the home. Broadening this policy of specializing in household electrical utilities so as to include other than heating devices, the company has just placed on the market a new type of vacuum cleaner, which is said to have several distinctive features and improvements.

The new cleaner has an air-cooled motor, which keeps it at the proper temperature and eliminates lubricating troubles. The suction shoe is an inch wider than similar models of this type. The cleaner is made of aluminum and nickeled steel, which makes it very light in weight; the complete weight is only 9 pounds. It also has a pistol-grip handle, making it convenient to manipulate; a locking device is provided on the handle so as to permit locking the appliance in an upright position. A push-button switch on the handle makes it convenient to control the motor. This cleaner has rubber-tired wheels and the rear roller is adjustable so as to keep the nozzle at a proper distance from the nap of the carpet. The outfit can be operated from ordinary lighting circuits of either di-



Hotpoint Vacuum Cleaner.

rect current or alternating current. The power consumption is from 200 to 240 watts.

In order to further increase the utility of this appliance seven attachments are supplied at a slight additional cost; these consist of a nickel-plated tube, connecting hose, attachment for cleaning radiators or other narrow spaces, blowing attachment, connection between hose and cleaner, brush for cleaning clothes, and nozzle tool for cleaning walls, curtains, etc.

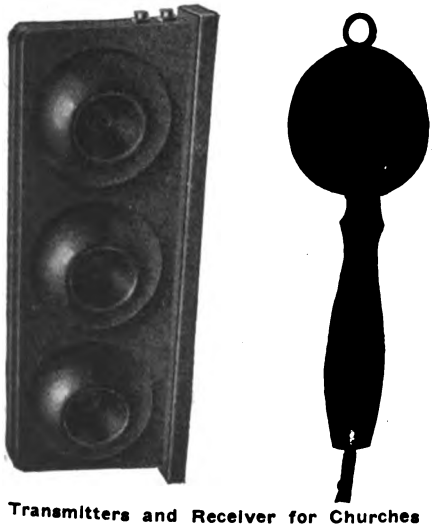
Telephone Equipment for Churches.

A new type of telephone apparatus known as "church telephone equipment" has made its appearance on the market. It will be most useful in churches, lecture halls, and theaters where the acoustic properties are poor, or where there are among the audience men and women whose hearing is not normal.

Digitized by Google

The equipment, which has been developed by the Western Electric Company, consists of a special telephone transmitter for mounting on the pulpit or platform and receivers to be used by those in the audience requiring them. The transmitter consists of three special microphone transmitter units in an ebony-finished case. The receiver is the ordinary watch-case type with a lorgnette handle provided with a special sliding extension to vary its length from four to seven inches. This receiver is convenient to use; it may be held to the ear for any length of time without fatigue.

Each receiver is provided with a cord and plug. A jack, which is connected to the line leading to the transmitter,



Transmitters and Receiver for Churches and Lecture Halls.

is placed in the pews. When the plug attached to the receiver is inserted in the jack, the user is in a position to listen via telephone to everything that transpires on the pulpit or stage, no matter where he or she may be sitting.

Although the apparatus has been designated "church telephone equipment," it can be used equally as well in theater or lecture hall. There is no doubt but that the system will prove a boon to the church-goer whose hearing is defective or whose pew is in a far corner of an edifice with poor acoustic properties.

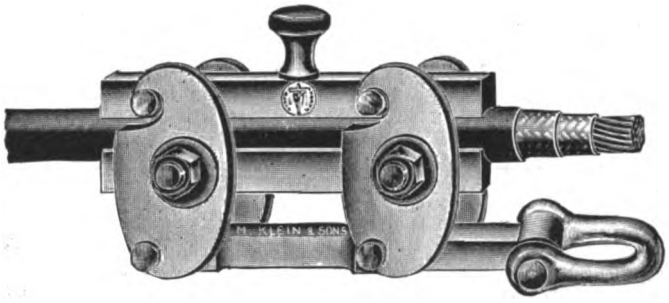
New Grip for Stringing Heavy Cables.

A new grip, known as the Maine Feeder Grip, capable of handling cable from 250,000 to 500,000 circular mils, and obviating the old chain-and-ring method, has just been produced and is now being marketed by Mathias Klein & Sons, tool manufacturers, Chicago, Ill.

This grip is said to solve a troublesome problem in the stringing of large-size cables. It fills the demand for a grip to handle the larger transmission lines which heretofore was done in a more or less cumbersome manner and often with injury by the old chain-and-ring method.

The grip is said to be a radical innovation in the field. The manufacturers claim it is exceedingly rapid in application and release and automatic in action. The grip hold is in direct ratio to the pull exerted. In a recent test in the field by a large operating company 19,500 feet of 500,000 circular-mil insulated feeder cable was pulled in place without the slightest slippage, marring or damage to the insulation.

The Maine feeder grip is also suited to handling lead-covered cable, it is stated, as well as steel messenger wire without injury to either. It is made



Maine Feeder Grip.

in two sizes, one for five-eighth-inch strand and the other for cables of 250,000 to 500,000 circular mils.

The main body construction is of substantial steel casting. Pivoted side plates control the action of the upper and lower jaw. The upper jaw is removable to facilitate application of the cable. It is simply necessary to disengage lugs from notches in the side plates to remove the upper jaw before or after using the grip.

New Electric Washer.

Realizing the demand for a high-grade thoroughly reliable electric washing machine that can be retailed at a price within the reach of the average home, the Boss Washing Machine Company, Cincinnati, O., is offering its well known "Champion" washer equipped with motor drive. It is said that the Champion as a hand-operated machine has been known among housewives for over 30 years and the addition of the motor drive will meet with popular favor among its old friends, as well as meet a long felt want for a first-class moderate-priced electric washer.

The "Champion" electric washer is furnished complete with a Fort Wayne type motor, as illustrated, and is ready for use by screwing the attachment plug into the nearest electric light socket. It needs no attention whatever while running and is claimed to be absolutely troubleproof, but in case of emergency it can be operated by hand by simply attaching a wheel handle furnished with each machine. The Champion electric has every desirable feature, such as metal drain faucet with hose connection, rollers on the legs, self-adjustment cylinder, which makes it possible to wash a large or small batch of clothes at a time, and one of its distinctive features is that the use of the motor is not limited to operating the washer only—it can be used to operate a churn, ice-cream freezer, or any small household appliance adapted for the purpose. It is claimed that the mechanism is extremely simple, having no gears or breakable parts, and it is practically noiseless in operation. Two sizes are made, No. 2 for regular family use, and No. 3 for large families, hotels and laundries.

New Washer.

Gas From Peat.

The municipal gas works at Akkrum, Holland, is extracting gas from peat mixed with coal. It is stated that if peat alone were used, the retorts would become too hot, because of the steam created by the moisture always found in peat. Accordingly the retorts are filled with two parts in weight of coal to one part of peat. The peat—as well as the coal—produces about 30 cubic meters of gas per 100 kilos (220.46 pounds). The gas produced from this mixture is declared to be of excellent quality. The peat is entirely consumed in the process.

Digitized by Google

Improved Head-End Axle Generating System for Train Lighting.

Ever since it became certain that electricity was to be the coming illuminant for railway train lighting as well as for general purposes, the method of its economical and efficient application has been an important problem to steam-railway companies and officials. One of the first results of Edison's development of the incandescent lamp was the application of it to train lighting. Curiously enough the English first made this attempt, in 1881, and the dynamo was placed in baggage car and driven from car axle.

In the intervening years much study has been given the problem and several systems of supplying electricity to the cars have been evolved and put into use. The simplest was the straight-storage system, each car being supplied with a storage battery fully charged prior to the trip. The head-end system came into extensive vogue; in this a dynamo in the baggage car is driven by an engine or turbine supplied with steam from the locomotive. The axle-driven car-lighting sets having an independent generator, storage battery and regulating equipment on each car have also been extensively used. Each of these three systems has its adherents and the two latter systems are most commonly employed on American steam railroads.

Some six years ago trials were begun on the Northern Pacific Railroad of what might be termed a combination of the two most common systems, that is, a single axle-driven set at the head end of the train, or a reversion to the original English attempt referred to above. It was believed that this system had many advantages, if it could be perfected so as to supply all the current needed by the most modern heavy passenger trains, such as are run on the transcontinental lines.

After several years of experimentation, three trains were equipped in 1912 with four-kilowatt, 80-volt, Safety axle generator sets. In the following year seven additional trains were equipped with four-kilowatt axle generator equipments, these being of the Gould Simplex type. These 10 four-kilowatt equipments are still in regular service lighting four-car trains and giving excellent results. In 1914 a 20-kilowatt set was provided and last June two 17.5-kilowatt equipments were installed on the heavier through trains.

Each of these three latest machines is operated through two five-inch Morse Silent Chain drives, one of which runs horizontally from a sprocket on the forward car axle to a jack shaft supported by the steel structure holding the generator. The other chain runs vertically from the jack-shaft sprocket to the generator shaft, as shown at the right in Fig. 1. These chains can be readily inspected. One set of chains ran for 140,000 miles before it was necessary to remove it for repinning, after which it was practically as good as new. The generator-supporting structure consists of a cast-steel base bolted to the front end and center sills of the truck; on top of this is a cast-steel pedestal which serves as a platform on which the generator is bolted. As shown in Fig. 1, this platform stands over a foot above the floor of the baggage car. The open space shown between the platform and floor is usually closed by a flexible canvas gasket to exclude cold air, dust and water. The generator is inclosed by a hinged steel casing. The jack shaft has roller bearings and the generator shaft ball bearings. Considering the rigid mounting of the generator on the truck, it runs surprisingly well and quite free from noise and vibration even at high speed and load. The generator is of Ridgway make and is a six-pole, compound, commutating-pole machine. It operates on the train circuit between the limits of 300 and 2,100 revolutions per minute (corresponding to train speeds over 12 miles per hour), being connected thereto by an automatic switch when the voltage reaches 66 volts.

The electrical control and regulating system at first sight seems to be somewhat complicated, but in general principles is quite simple. When the train is not in motion and the generator is therefore idle, current for lighting or other load is supplied from three lead storage batteries of 32 cells each, located under the baggage or dynamo car, under the middle car, and under the rear car of the train; occasionally the middle battery is omitted. The generator control includes an automatic switch for connecting in the machine properly after its voltage has increased to be above that of the battery; there is also a generator current and voltage regulator to keep the maximum current output below a certain adjustable value and to keep the voltage slightly above the increasing voltage of the batteries as they are charged until a maximum of about 83 volts is reached. This provides a gradually tapering or decreasing current as the point of full charge is reached and protects the batteries from excessive overcharge.

For connecting the dynamo car to the other cars of the train a three-wire train line is used. This consists really of two two-wire circuits with a common return wire. The dynamo and the two or three storage batteries are connected across one circuit, while the lamps or other load are connected across the other circuit. Each circuit can therefore be regulated independently. Regulation of the generator

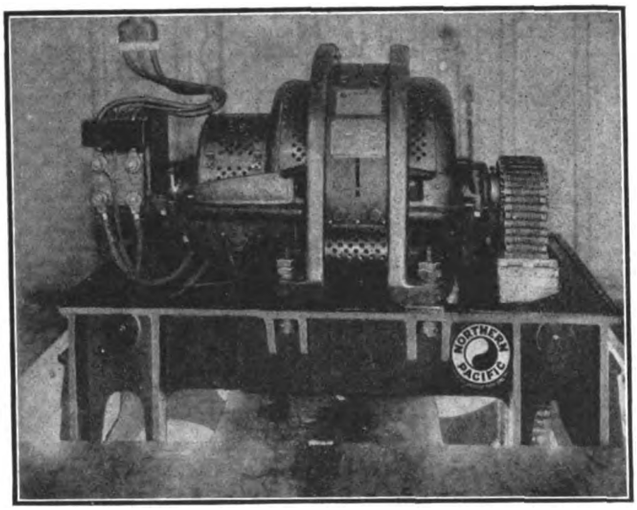


Fig. 1.—Mounting of Axle-Driven Generator Above and Free From Floor.

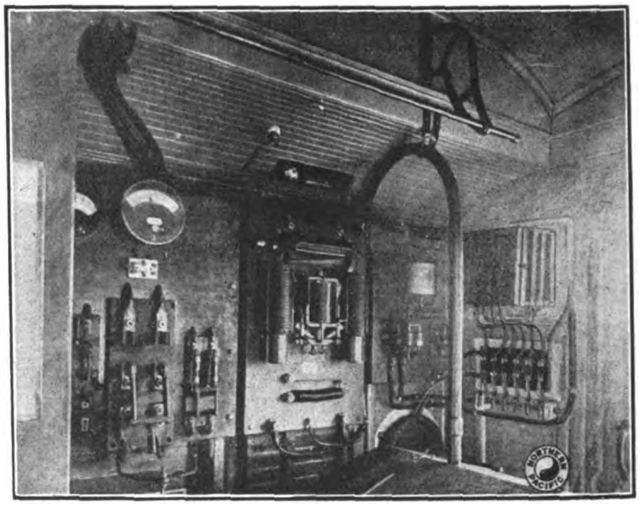


Fig. 2.—Instrument, Switch and Regulator Panels in Baggage Car Near Covered Generator.

Digitized by Google

charging circuit has already been referred to. The lamp regulator, which is really in two parts, is used to keep the voltage of the lamp circuit very close to 66 volts. Thus while the batteries are being charged it must absorb the difference between the generator voltage, which may be as high as 83 volts, and the proper lamp voltage of 66.

Without going into the details of the regulation and control equipment, it may be said that it operates very satisfactorily. Fig. 2 shows this part of the apparatus. As installed in the latest sets the arrangement is somewhat different. Included in this regulating equipment are one or more resistances to compensate for the different positions of the batteries. This resistance protects the forward battery from getting higher charging voltage and from discharging at a higher rate than the rear battery and thus overcomes the drop in potential in the train line against which the rear battery has to contend.

So far as the general public is particularly concerned, the special advantages of this system of train lighting are the availability of the current at all times and the consequent stable and uniform lighting of the cars whether standing still or in motion. As for the railway companies, the economy and efficiency of operation appeals strongly to them in addition to the preceding reasons.

New Diehl Polyphase Squirrel-Cage Motors.

The Diehl Manufacturing Company, Elizabeth, N. J., has just completed and placed on the market an entirely new line of polyphase induction motors of the squirrel-cage type. These, it is claimed, have structural, electrical and patented ventilating features which make this line highly desirable.

The yoke itself, as shown in Fig. 1, is of the "skeleton" type and cast from gray iron. It is carefully proportioned to provide advantageously for the ventilating plan which will be mentioned later. Due consideration is given to strength and rigidity of construction. The end bonnets are of the same material as the yoke and designed with equal care for ample ventilation, strength and rigidity. It will be noted that they are of mill-type construction, thus protecting the stator windings and precluding casual injury from external sources. The end bonnets are interchangeable and are so drilled in relation to the yoke as to permit of rotation, thus providing for wall, ceiling and floor mounting.

Bearings are comparatively large in proportion, purposely so designed to give a minimum bearing pressure. They are interchangeable end for end, and are in every case provided with ring oilers of large diameter, thus insuring a low rotative speed of the ring and preventing churning and throwing of the oil. The oil well is so made as to give ample space for the rotation of the oil ring which is held in place in a manner precluding the possibility of its failure to rotate. The bearings are dustproof by virtue of carefully designed oil-hole covers, oil-vent covers and a medallion cap provided on the front bearing housing. The usual drain

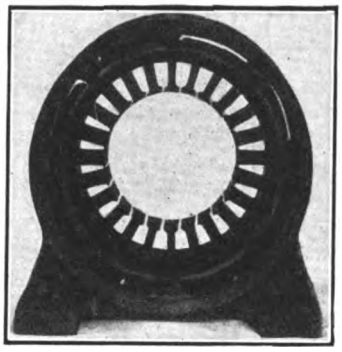


Fig. 1.—Yoke and Stator Core of Motor.

plug is provided at the bottom of the oil wells.

The stator and rotor cores are built up of annealed laminations of a special grade of electrical sheet steel purposely selected as having the desired characteristics to insure minimum iron losses. The assembly of the laminations is secured by heavy cast iron for the stator, or steel for the rotor end plates, all parts being carefully keyed to the yoke housing and shaft, respectively.

All shafts are made from a special grade of mild steel carefully ground to gauge size at the bearing surfaces and rotor punching seat. There is provided on each end a liberal oil sling turned integral with the shaft. The shafts are universally interchangeable between motors of the same frame sizes.

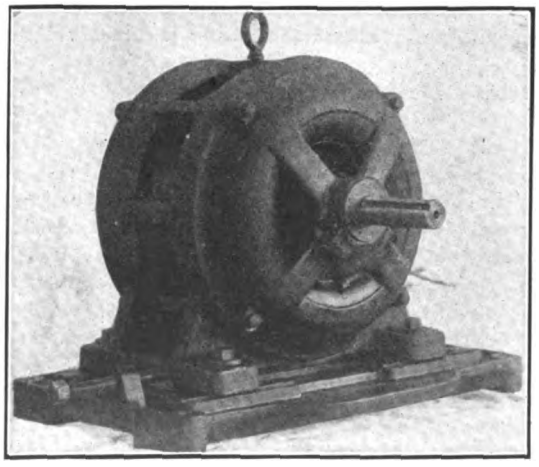


Fig. 2.—New Polyphase Squirrel-Cage Induction Motor.

The stator windings are first partially formed and shaped and then inserted into the heavy insulated semi-inclosed stator slots. This applies to all motors up to 20 horsepower, inclusive. For sizes above 20 horsepower open slots have been adopted, permitting the use of a coil completely formed, insulated and impregnated prior to placing in the slots. Slots are provided with the best grade of insulation and submitted to a standard high-voltage test which in every case is equal to or exceeds the standardization requirements of the American Institute of Electrical Engineers. The finished stator is finally subject to two dippings and bakings in an insulating compound of proper grade to insure a thorough impregnation and sealing of the windings.

The rotor winding is of the regular squirrel-cage type. That portion of the winding which goes into the rotor's partially closed slots consists of round copper bars. These rotor bars are provided with a shoulder on the projecting end, the tip being carefully turned to size so that a close fit is insured in the end rings. These are pressed onto the projecting tips of the rotor bars. The tips are then headed over, forming a regular rivet head. Thus, during the operation of heading over the tips the body of the tip expands, insuring an absolutely tight fit and perfect electrical connection to the end rings. After this riveting process is completed the entire mass is dipped into hot solder of a very high melting point which penetrates all recesses, completely covering the end rings and ends of the rotor bars, preserving the electrical contacts from any possibility of corrosion.

Riveted to each end of the rotor core are ventilating blades which maintain a continuous flow of air drawn in through the end-bonnet openings, passing first over the lower, then over the upper sides of the coils, and finally over the exposed portions of the stator core, being ejected through the openings in the yoke. The ventilating scheme is a patented feature and the manufacturer claims that positive directive ventilation is the result.

Each three-phase motor is provided with six leads and each two-phase motor with four leads, each of which is brought out through a heavy pressed-steel terminal box. Soft-rubber insulating bushings are provided for each lead. The standard tray provided is suitable for floor, wall or ceiling mounting and when used for floor mounting has the oil-drip tray feature.

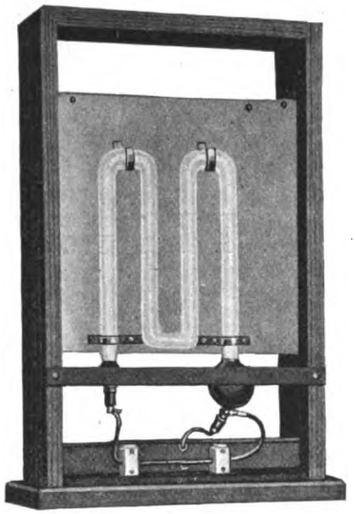
Digitized by Google

Mercury-Vapor M-Shaped Photographic Enlarging Outfit.

Photography, like every other industry or trade, has made tremendous advances in recent years due to the demand for high-grade work. Especially has this been the case with enlargement of photographic negatives which require special lighting facilities for producing the best results. What is required is a steady light without flicker or variation and one that could be used without condensing lenses or other diffusing media. An illuminant was also required that had a long life and did not require constant care and attention.

For enlarging purposes the illuminant must bring out the roundness and the atmosphere of the negative without accentuating any of the retouching or coarseness that would detract from the finished picture.

This ideal has been practically realized for some time past with the use of one



M-Shaped Photographic Enlarging Lamp.

or more twenty-inch mercury-vapor tubes. This arrangement gave the desired quality and quantity of light, but it was found that the efficiency would be very materially increased if it could be arranged to concentrate the maximum amount of light directly behind the negative.

Realizing this fact, the Cooper Hewitt Electric Company, Hoboken, N. J., has brought out the M-shaped outfit illustrated herewith, which accomplishes the desired object in a very simple manner. So called from its similarity in shape to the letter M, this outfit consists of a 50-inch tube bent at six points as shown. The tube in this shape gives a strong even field with two sheets of ground glass which can be placed within 3.5 inches of the tube and within one-half inch of the negative. The outfit can be furnished for either direct-current or alternating-current circuits, and may be mounted on a stand, as one of the illustrations shows.

A number of these devices are in use by photographers who claim that they are able to obtain excellent enlargements in considerably less time than with other light sources. Among the particular advantages claimed by those using this outfit are that it affords an even distribution and a steady glow of purple rays, whereas the arc lamp has to be adjusted at frequent intervals, and that there is an absence of glare often observed from a single incandescent source.

Test on Pole Guy Anchors at Cleveland.

The Faultless Anchor Company, Fostoria, O., recently made a test of its anchors in Cleveland, O. The test was witnessed by a large number of representative electrical men, including Messrs. McCarty, superintendent of construction, and Spangler, inspector of pole-line construction, Cleveland Bell Telephone Company; Messrs. Sharp,

Photographic Lamp on Stand.

superintendent of construction, and Richardson, pole-line supervisor, Western Union Telegraph Company; Mr. Burgess, superintendent of overhead construction, Cleveland Illuminating Company, and Mr. Pearson, foreman of construction, Ohio State Telephone Company. The object of the test was to obtain data bearing upon the holding strain of mechanical anchors, and, second, to determine the ultimate or necessary strain required to break or pull the anchor from the ground.

The load was applied to the anchors by connecting them through a dynamometer, with a double set of large blocks and a heavy-duty chain fall to a heavily guyed pole of normal height. A substantial initial strain was first applied and a mark made on the anchor rod to indicate its initial position. The creeping of the rod was measured from this initial mark. The load was added in increments of from 500 to 1,500 pounds. Measurements for creep were made between each loading. An interval of five minutes without pull was allowed between each load.

The results on the "Faultless" anchors were as follows:

Test 1.—One-half-inch rod, two-blade, 16-inch-spread anchor. Held without creep at 5,500 pounds. This anchor made a very remarkable showing in that the next load added pulled its rod apart at 6,600 pounds.

Test 2.—Five-eighth-inch rod, two-blade, 18-inch-spread anchor. Held without creep at 4,800 pounds, when one blade broke, due to a flaw in casting. The capacity of this anchor is said to be about 9,000 pounds.

Test 3.—Three-quarter-inch rod, three-blade, 18-inch-spread anchor. Held without creep at 12,800 pounds. The blades of this anchor bent down at 13,200 pounds.

Test 4.—One-inch rod, four-blade, 24-inch-spread anchor. Blades bent down at 15,200 pounds without creep. This anchor is a late addition to the line, intended to hold without creep at 16,000 pounds, for dead-end and cable-strain service. This is said to be the first test of this very large anchor, and proved quite conclusively that more metal is required in the fins. This change is being made.

The basic principle of this new anchor is considerably different from that of other anchors on the market. It depends primarily upon virgin or undisturbed earth to hold it in the ground. The very large holding surface which it presents to undisturbed soil eliminates tendency to creep. This anchor may be installed in virgin soil in a very short time.

New Portland Quarters for Western Electric Company.

Expansive business growth has caused the Western Electric Company to give up its old local quarters at Portland, Ore. Since 1910 the company has been located on Fifth Street, but has now moved into a new two-story brick and concrete building, which has been made ready for it at East Ash and Union Streets. The building has efficiently designed shipping, receiving and warehousing facilities, and is one of the most modern of its kind in the Northwest. It has been planned to facilitate the quick handling of large stocks, which will insure first-class service.

A royal decree of May 20, 1915, institutes a municipal tax for the city of Tripoli in Africa of $0.0077 a kilowatt-hour on electric energy consumed for lighting, heating, or ventilation. This is 5.7 per cent on the present cost of $0.135 a kilowatt-hour. Power used for motors is exempt.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

AUTOMATIC PHOTOGRAPHING MACHINE.—United Vending Machine Company, 840 East Ninety-third Street, Cleveland, O., submittor. Manufactured by General Electric Company, Pittsfield, Mass.

Device is a coin-operated machine, contained in a steel cabinet equipped with an arc lamp for automatically making small tintypes. In operation of device a coin-switch is used to complete circuit of small operating motor, which runs for one minute actuating mechanism, and which controls knife switch in arc-lamp circuit. 125 volts, alternating current or direct current, 15 amperes.

Standard when connected by standard fittings to wiring circuits of suitable capacity for current required, but not for connection to ordinary lighting circuits, nor to ordinary lamp sockets or receptacles.

Listed August 11, 1915.

CABINETS.—Aurora Steel Products Company, Aurora, Ill.

Cabinets shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed August 7, 1915.

COIN-OPERATED MUSICAL INSTRUMENTS.—Almy Manufacturing Company, 60 West Kinzie Street, Chicago, Ill.

Automatic cashier and discount machine, consisting of a coin-operated automatic musical instrument with mechanism for displaying photographs, all inclosed in a wood and glass case. An automatic inclosed switching mechanism controls the circuits of a number of incandescent lamps which illuminate interior of instrument while operating.

Listed August 19, 1915.

FIXTURES.—Trenaman Electric Dental Manufacturing Company, Incorporated, 220 Fifth Avenue, New York, N. Y.

Adjustable electric light fixture for dentists' offices, consisting of a fixture supported by a special cable passing over pulleys on a frame, with counterweight, junction box, switch and supply cord. The special cable consists of two National Electrical Code flexible conductors, a steel runner and tie cord for support of fixture, an outer padding of cotton threads and two braids.

Listed August 18, 1915.

OUTLET BUSHINGS.—S. R. Manufacturing Company, 327 Dean Street, Providence, R. I.

A brass plate, with drilled hole for soldered connection of ground wire, threads on end of rigid conduit and supports a porcelain cap with three outlets for conductors.

S. R. grounding cap, one-half to one and one-fourth inch sizes.

Listed August 19, 1915.

PANELBOARDS.—The Mountain Electric Company, 1619-23 Glenarm Street, Denver, Colo.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed August 11, 1915.

PICTURE MACHINES AND APPLIANCES.—Atlas Educational Film Company, 5 South Wabash Avenue, Chicago, Ill.

Arc-lamp attachment. This device, for use with the Atlas special portable hand-operated picture machine, consists of an arc lamp, resistance units and lamp house mounted on a metal bracket and provided with a portable cord and plug for connecting lamp to supply circuit; 6 amperes, 110 volts.

Standard for use with slow-burning films only.

Listed August 16, 1915.

PICTURE MACHINES AND APPLIANCES.—Electric Products Company, 1069 East 152nd Street, Cleveland, O.

Watton-Rexolux, consisting of a vertical motor-generator and a panel with switches and cutouts.

Types M, MA, MM, MMA, for one, two and three-phase circuits, 35, 50 and 70 amperes direct current.

Listed August 19, 1915.

RECEPTACLES, for Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant and Perkins flush type.

25 amperes, 250 volts, catalog Nos. 446, 447, 448.

Listed August 10, 1915.

RECEPTACLES, Standard.—Best Electric Company, Pittsburgh, Pa.

"Best" composition-shell receptacles.

Keyless, 660 watts, 250 volts, sign type, catalog No. 2500.

Listed August 12, 1915.

RHEOSTATS.—Western Electric Company, 463 West Street, New York City.

Motor starters, types CR-1000, 1001, 1002, 1007, 1022, 1025, 1027, 2301, 2303; and (panels) CR-1100, 1102, 2201-2206 inclusive, 2320.

Speed controllers, types CR-1200, 1220, 1221, 1224, 1225, 1240-1245 inclusive, 1314; (panels) CR-1300, 1303, 1310, 1311, 1315, 1320, 1321, 1324, 1325 and (for printing presses) 6010, 6011, 6032, 6033, 6050, 6052, 6103, 6106, 6220.

Field rheostats, types CR-1226, 1227, 1228, 8000, 8001, 8100, 8132, 8192, 8322, 8390.

Theater dimmers, types CR-9301, 9302, 9303, 9304, 9311, 9312, 9313, 9314, 9321, 9322, 9323, 9324, 9331, 9332, 9333, 9334.

Battery-charging rheostats, types CR-9200, 9202, 9204.

Resistance units, types CR-9000, 9010, 9142, 9143, 9144, 9145.

Drum controllers (for industrial service), types CR-3100, 3105, 3110, 3133, 3134, 3136, 3202; (without primary oil-switch attachment) 3204, 3900; also type K (for non-grounded circuits).

Motor starters and speed controllers, types CR-1000, 1001, 1100, 1200, 1220, 1221, 1225, 1240-1245 inclusive, are standard only when circuit-breakers or fuses are installed in connection with them. (See National Electrical Code. Rule 78*g*.)

Drum controllers are standard when properly installed in connection with resistance elements.

Listed August 2, 1915.

SOCKETS, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. porcelain-shell sockets.

Keyless, 1,500 watts, 600 volts, catalog Nos. 528, 529 and 530, with special metal inclosing bodies and attached eight-inch shade holders.

When used with with gas-filled lamps, these devices must not be used in show windows or in other locations where inflammable material is liable to come in contact with lamp equipment, and must, if within buildings, be connected to circuit with conductors of standard slow-burning or asbestos covering.

Listed August 11, 1915.

TRANSFORMERS.—The States Company, 19 New Park Avenue, Hartford, Conn.

Air-cooled autotransformer for indoor use.

275 volt-amperes. Primary voltage 110, secondary voltage 55. Catalog No. 14,001.

550 volt-amperes. Primary voltage 220, secondary voltage 55 and 110. Catalog No. 14,011.

Standard only when installed and wired in both primary and secondary circuits in accordance with rules for Class C wiring of National Electrical Code.

Listed August 20, 1915.

WIRES, Weatherproof.—Monarch Electric & Wire Company, 624 West Adams Street, Chicago, Ill.

Standard.

Listed August 2, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

GOWANDA, N. Y.—The Gowanda Light and Power Company has purchased the Keyes Electric Company, and has begun active work in improving the lighting system at Gowanda. Plans for a new power house to be constructed are now being made.

SOUTH BETHLEHEM, PA.—The L. P. Lipshutz Cigar Company, of Philadelphia, will erect a large four-story cigar factory here in the near future. It is reported that electricity will be used for the motive power throughout the plant.

CARBONDALE, PA. — The Board of Education is having plans prepared for a new brick, stone and concrete high school building to cost $100,000. E. H. Davis, of Scranton, Pa., is the architect.

TARENTUM, PA. — The expenditure of $21,000 has been authorized for improvements to the municipal electric plant. Sidney B. Martin, of Pittsburgh, Pa., will have charge of the work.

AYDEN, N. C.—A $15,000 electric light plant will be installed. Address the town clerk.

GEER, S. C.—The council plans to expend $10,000 to extend the lighting system. Address the mayor.

NORTH CENTRAL STATES.

CINCINNATI, O.—The Court Street Welfare Association, an organization of business men, intends to use its influence in securing the extension to that street of a boulevard lighting system to replace the present old-style street lights. L. M. Sims is the president. L.

DAYTON, O.—Part of the equipment of the new Miami Hotel, for which contracts are being let, will be a large electric sign on the roof, bearing the name of the hotel in letters nine feet high, visible for some miles. W. Hall is furnishing the electrical equipment for the hotel, and can give information regarding the sign. L.

DAYTON, O.—The Dayton Power & Light Company has secured franchises and street-lighting contracts in the villages of Spring Valley and Bellbrook, and expects to furnish service to these villages some time previous to the end of the present year.

MASSILLON, O. — H. Whitford Jones, of Cleveland, has prepared plans for a new street-lighting system to be installed by the Massillon Electric & Gas Company, which has been tentatively approved by members of the council's light committee. The plans provide for an ornamental lighting system for the business district, and for a total of 1,121 street lights for the city. T. O. Kennedy, general manager of the light company, has charge of the matter for the company. L.

OSTRANDER, O.—J. C. Maugans, who recently completed the construction of a large garage and repair shop, intends extending electric service from the generating plant used in connection with the shop to the whole village, and is planning a distributing system for that purpose. Street lights will probably be installed. L.

SPRINGFIELD, ILL.—The sum of $15,000 will be expended for improving the light system. Address secretary of Local Board of Improvements.

LAKEFIELD, MINN.—The sum of $27,000 will be expended in rebuilding the light and water systems.

MINNESOTA FALLS, MINN. — The Minnesota Valley Power Company will make some extensive improvements on its plant at Minnesota Falls. A new and larger plant will be installed. Estimated cost of improvements is $20,000.

STRANDQUIST, MINN. — G. P. Janson is interested in the installing of new electric lighting system.

PERRY, IOWA.—The Iowa Railway & Light Company will make extensive improvements in the way of a modern power plant to be located in Perry and to supply current for surrounding towns. Work will probably be commenced on the new plant in a short time. Address Colonel Dows, of Cedar Rapids, president and general manager.

SPRINGFIELD, MO. — The present contract for city lighting is not satisfactory. A municipal plant may be established. Address J. H. Rathbone, chairman of lighting committee.

ATTICA, KANS.—Bonds amounting to $30,000 have been voted to install a new water works and electric light plant. Address the city clerk.

SOUTH CENTRAL STATES.

HAWESVILLE, KY.—The Water & Light Company has been incorporated with $12,000 capital stock by W. H. Williams, Nellie L. Williams and Charles C. Williams.

PROVIDENCE, KY. — This city will vote in November on a bond issue for the purpose of building an electric light plant. The amount of the proposed issue is $20,000. The Providence Electric Light Company, which is now operating, has no franchise, and has offered to sell its plant to the city for $5,000.

COPPERHILL, TENN. — M. C. King and others are planning the establishment of an electric light plant at Madisonville, Tenn. A franchise has already been granted at Madisonville.

HENDERSON, TENN.—This city which recently voted a bond issue of $13,000 for the purpose of building an electric light plant, will ask bids on the construction work shortly. J. L. Galbraith is mayor.

WHITE CASTLE, LA.—A special election on a $25,000 debt for the purpose of erecting a new water works system and electric light plant, carried. Work is to begin at once on the new project.

GROVE, OKLA. — Extensions will be made to the electric light plant in this city. Address W. H. Davis, city clerk.

HIGHLAND PARK, TEX.—Bonds amounting to $10,000 have been voted for the installation of an ornamental lighting system. Address the mayor.

KYLE, TEX.—The Excello Storage Battery Company, of San Marcos, is arranging to install an electric light plant in this city. Address W. W. Giesen, secretary of the company.

WESTERN STATES.

BOZEMAN, MONT.—Reported that City Council has rejected all bids submitted for the installation of an ornamental lighting system and that same will be installed by the city, work to be handled by the city engineering department. C. A. Speith is the city clerk. O.

BUTTE, MONT. — Park, Main, Broadway, Dakota, Montana, Arizona and Wyoming Streets are included in a lighting district recently created, which will be improved by the installation of an ornamental lighting system. Reported that city clerk will shortly issue a call for bids for materials and installation. O.

GREAT FALLS, MONT.—A lighting district comprising Second Avenue, North, from Park Drive to Nineteenth Street, wherein an up-to-date ornamental lighting system will be installed, has been created by the City Council. Bids for materials and installation of same, according to reports, will be called for shortly. O.

TERRY, MONT.—The Town Council has granted a franchise to L. H. Gaffney, local, to construct, operate and maintain an electric light plant and distributing lines in this city. Mr. Gaffney purposes expending several thousands of dollars in making the improvement. O.

KENDRICK, IDAHO. — The City Council at a recent meeting granted an electric light franchise to A. V. Dunkle, of Plummer, Idaho, who plans the construction of a plant and distributing system, the plant alone to cost $10,000. Reported active construction will begin at once and that the plant will be ready for operation within two months. O.

EUREKA, CAL. — Announcement has been made here that the Western States Gas & Electric Company will expend in the Eureka Division, $12,000 of the $266,000 bond issue recently authorized by the State Railroad Commission, to carry on necessary improvement work during the ensuing year.

ESCALON, CAL.—The people of Escalon have voted in favor of creating a highway lighting district.

GLASGOW, MONT. — The council

Digitized by Google

is planning the installation of an electric lighting plant to cost $18,000. Address H. R. Palmer, city clerk.

SANTA ANA, CAL.—Bids are being received for lighting the Buena Park lighting district.

ASHLAND, ORE.—The proposition of issuing bonds in the sum of $25,000, the money to be used in purchasing the electrical equipment and distributing lines in this city of the California-Oregon Power Company, was defeated by a large majority at a recent election. Two utilities viz., the California-Oregon Power Company and the Ashland Municipal Plant occupy this territory. The former has offered to vacate Ashland, providing the local plant would take over its property within the city limits, and purchase necessary current from the California-Oregon Company. The municipal plant, owing to inadequate facilities is unable to care for increasing business. O.

EUGENE, ORE. — Petitions have been presented to the City Council asking for the installation of an ornamental lighting system to be installed on Ninth Avenue, between Olive and Pearl Streets. O.

COLFAX, WASH.—Reported a site located at the northeast corner of Mill and Spring Streets, this city, has been purchased by the Washington Water Power Company, of Spokane, and that the corporation will shortly begin the construction of a two-story fireproof structure to be used as a substation and office.

GOLDENDALE, WASH. — The Klickitat County Commissioners have been petitioned by the Pacific Power & Light Company for a franchise to construct, operate and maintain telephone, light and power transmission lines through the county. This company serves practically every town of any importance in eastern and central Washington. O.

SEATTLE, WASH.—In a recent communication to the City Council, Superintendent of Lighting J. D. Ross urged that immediate steps to be taken looking towards the purchase and development of a power site as an adjunct to the present municipal plant, whose facilities are inadequate to supply the growing demand for municipal light and power. In his communication Superintendent Ross discusses at length the various offers made to the City of Seattle to furnish electric current. Speaking of the offers made by the Schwager-Nettleton Mill Company and the Stimson Mill Company, he said that neither proposition could be seriously considered, as the city can generate current cheaper than either of the companies, and that neither offer can in any way solve the problem which confronts the municipal lighting plant. Mr. Ross states that he will shortly make a definite recommendation looking toward the securing of additional power to the City Council. The Mountain Development Company, through P. H. Hebb, president, has again submitted an offer to the City Council to sell to the city the White River power site for $1,000,000, under the same terms and conditions made in the former offer. Mr. Hebb, as an alternative proposition, agrees to furnish the city with 20,000 continuous horsepower for a period of 20 years, at a rate of one-third cent per kilowatt-hour, and upon one year's notice will furnish any continuous amount in excess of 20,000 horsepower, up to 50,000 horsepower, in the aggregate rate of one-fourth cent per kilowatt-hour for such additional power. The company agrees to commence furnishing current as soon as the plant can be installed, conditional, however, that deliveries shall begin as to the first 20,000 continuous horsepower within 18 months from the signing of a contract by the City of Seattle. Several years ago voters of the City of Seattle voted bonds to purchase the White River plant owned by Mr. Hebb, and the money has never been utilized.

SEATTLE, WASH.—The largest light and power franchise ever asked in King county was recently granted by the County Commissioners to the Puget Sound Traction, Light & Power Company, which serves the largest towns in the Puget Sound District, viz.: Bellingham, Everett, Seattle and Tacoma, and maintains head offices in Seattle. The franchise extends over the entire southern portion of King County, being bounded on the north by the southern limits of Seattle, extending eastward to the summit of the Cascade Mountains, following the Kittitas County line on the east, the Pierce County line on the south and Puget Sound on the west. Practically every small town in this section of King County will be served by the proposed improvement and the power company plans the expenditure of thousands of dollars in making the extensions and connecting up the service, not only with the small towns and villages, but the ranches and dairy farms as well. The insertion of a common-user clause in the grant was asked by the City of Seattle, through its corporation counsel, and the Commissioners granted the request. The City of Seattle for several years has seriously considered extending the lines of the municipal plant into this territory, but inadequate facilities have kept the city from making the extensions. According to Superintendent of Lighting J. D. Ross, when the municipally owned plant can be increased to care adequately for the business which can be gotten in Seattle and has current to spare, extensions will be made into the outlying territory which is included in the franchise recently granted to the Puget Sound Company. O.

TACOMA, WASH.—An ornamental lighting system will immediately be installed on E Street, from Tacoma Avenue to Jefferson Avenue, according to Superintendent of Lighting Collins. Reported that City Clerk Nickeus will shortly issue a call for bids for materials, iron standards, wire, lamps, etc., also for installation of same.

PROPOSALS.

TELEPHONES.—Sealed proposals will be received at the office of the Chief Signal Officer, War Department, Washington, D. C., until September 20, 1915, for furnishing 500 camp-type telephones for the Signal Corps. Additional information may be secured by addressing the above-named office.

ELECTRICAL SUPPLIES.—Sealed proposals will be received by the general purchasing officer, the Panama Canal, Washington, D. C., until September 13, 1915, for furnishing, by steamer, free of all charges, on dock either at Colon or Cristobal (Atlantic ports) or port of Ancon (Balboa, Canal Zone, Pacific port), capstans, switchboards, cables and other electrical supplies. For further particulars address the above-named office.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on September 21, 1915, for the following material, delivery to be made at the navy yards mentioned; bidders should send to the Bureau for copies of the schedules desired: One industrial type electric locomotive, Washington, schedule No. 8744; 9,200 solid and cored arc-lamp carbons, Brooklyn, schedule No. 8752; 2,500 sets carbons, to burn white, for Adams-Bagnall arc lamps, Norfolk schedule No. 8750; 3,000 feet interior communication cable, 100,000 feet telephone cord, 27,000 feet twin-conductor wire, Brooklyn, schedule No. 8751; 100 storage-battery testing outfits, 2 range, deflector and cutout switchboards, Brooklyn, schedule No. 8757.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,147. CARBONS.—An American consular officer in the United Kingdom reports that he has had a request for quotations on arc-light carbons. He states that a similar request was recently published, which brought unduly high quotations. The inquirer desires to act as an agent.

NO. 18,149. ELECTRICAL SUPPLIES.—An agency in Italy writes an American consular officer that it wishes to receive printed matter, price lists, etc., from American manufacturers of electrical household appliances, such as flatirons, grills, water heaters, fans, etc. It is stated that the firm has large show windows for display purposes.

NO. 18,152. ELECTRICAL EQUIPMENT.—The commercial agent of the bureau in Chicago is in receipt of a letter from a firm in that city stating that it has an inquiry from a business man in Argentina who is interested in electrical equipment. The inquirer states that he is in a position to sell large quantities of lamps, lamp cord, electrical appliances, etc.

NO. 18,168. ELECTRIC MOTORS.—A firm in Spain writes an American consular officer that it wishes to secure catalogs and full information relative to electric motors. Correspondence should be in Spanish. Bank reference is given.

NEW INCORPORATIONS.

SUPERIOR, WIS.—The Ross Electric Company has been incorporated with a capital of $10,000, by Leslie G. Ross and others.

HAWESVILLE, KY.—The Hawesville Water and Light Company has been incorporated with a capital of $12,000 by W. H. Williams and others.

BATTLE CREEK, MICH. — The Tekonsha Electric Light Company has been incorporated with a capital of $10,000 by W. F. Warner, Davenport, Iowa, and others.

NEW YORK, N. Y.—The Electric Changeable Sign and Illuminating Company, Incorporated (Manhattan), has been organized with a capital of $50,000, to do electrical contracting, sign and illuminating work, etc. The in-

Digitized by Google

corporators are: M. Freixas, S. Weinstein and P. Weinstein.

LAMONI, IOWA. — The Lamoni Electric Company has been incorporated with a capital of $40,000. The officers are: Albert Carmichael, president; Joseph Roberts, vice-president; H. C. Burgess, secretary, and F. B. Blair, treasurer.

CHICAGO, ILL.—The Cayer Signal Company has been incorporated with a capital stock of $250,000, to manufacture and deal in electrical and mechanical attachments. The incorporators are J. L. Cayer, Frank McDonald and John W. Eskholme. Z.

MARINE, ILL.—The Marine Electric Service Company has been incorporated with a capital stock of $2,500. The company is to supply light, heat and power and accessories and equipment. The incorporators are H. F. Neale, Gertrude Neale and R. S. Sease.

RAMSEY, ILL.—The Wright Brothers Light & Power Company has been incorporated with a capital stock of $8,000. The company is to manufacture and sell light, heat and power. The incorporators are Alva B. Wright, Raymond C. Wright and J. J. Wright. Z.

PERSONAL MENTION.

MR. W. A. EDSON, deputy smoke inspector, has been appointed smoke inspector for the state of Massachussetts, by the Board of Gas and Electric Light Commissioners, at a salary of $2,800. Mr. Edson succeeds the late William H. Gerrish.

MR. CHARLES H. GUCKEL, formerly general manager for the Springfield (Mo.) Gas & Electric Company is opening an electrical engineering office in Springfield. He has also secured the agency for electrical devices and supplies.

MR. A. L. MARTIN, local manager of the Oregon Power Company, at Dallas, has been appointed a member of a Commercial Club committee to arrange for the participation of Polk County in the Manufacturers and Land Products show at Portland, Ore.

DR. WILLIAM H. TOLMAN, director of the American Museum of Safety, New York City, has been made an honorary member of the Statistical Society of Paris, France. The honor is a recognition of the valuable services rendered by him in promoting the health and safety of workers in the various industries. The Statistical Society was organized in 1860 with the object of popularizing statistical information.

MR. H. O. SWOBODA has been retained as consulting engineer for the Spengler-Loomis Manufacturing Company, Chicago, Ill. The company will take up the manufacture of electrical heating appliances and it is expected that some devices will be ready for the market in about two months. Mr. Swoboda has had an extended experience not only as a consulting engineer, but as an expert in the design and manufacture of electrical heating apparatus.

MR. W. H. FLANDREAU, recently re-elected president of the International Association of Municipal Electricians, by a unanimous vote, has been a resident of Mt. Vernon, N. Y., for the past 21 years and city electrician for 20 years of that time. He is a native of Westchester County, New York, and for years has been prominently identified with electrical and fire department circles of that section. For 10 years he was one of the directors and president for two terms of the Hudson County Volunteer Firemen's Association of New York, and is also a member of the New York State Chiefs' Association. He formerly was connected with the Postal and Western Union Telegraph Companies and with independent telephone companies of that section.

W. H. Flandreau.

MR. CLARENCE R. GEORGE, of Houston, Texas, who was re-elected secretary of the International Association of Municipal Electricians, as reported in our last issue. has already served four years in that capacity. During the time he has served the Association in that position he has been regarded as one of its most conscientious and painstaking officials, and is exceedingly popular, not only with the entire membership, but in electrical circles generally throughout the country. Mr. George has served as city electrician in Houston, his home town, for nearly 17 years, through various city administrations, and is prominently identified with electrical interests throughout the Southwest. He is one of the early members of the Jovian Order, which had its inception in Austin, Tex., and is prominent in its councils.

Clarence R. George.

OBITUARY.

MR. EDWARD B. MOORE, who for years was Commissioner of Patents and therefore in charge of the United States Patent Office, died on September 7 at his home in Washington, D. C. Mr. Moore was 63 years of age. For about 30 years he was connected with the Patent Office, occupying various positions and receiving steady promotion, until he was appointed Commissioner of Patents in 1907. He held this position until August, 1913. He took a prominent part in the negotiation of many treaties relating to patents during his administration and represented the United States at several international congresses. He was born at North Anderson, Me.

NEW PUBLICATIONS.

UNITED STATES MINING STATUTES.—The United States Bureau of Mines has just issued Bulletin 94, "United States Mining Statutes Annotated," in two volumes of 1,772 pages, which is now being sold by the Superintendent of Documents, Government Printing Office, Washington, D. C., at $2.50 a set. This bulletin is a compilation of all sections of the United States Revised Statutes and of all acts of Congress relating to mines, mining, mineral lands and the mining industry on the public lands. It is intended for persons engaged in mining enterprises that come within the scope of Federal mining laws and as a guide as to the determination of mining rights and duties. It shows the status of every Federal mining law, both laws relating to metal mining and those relating to coal, oil and phosphate and to mining on public, Indian and railroad lands. The bulletin relates only to the United States mining laws and does not include any of the laws of the different states in regard to mining. Another bulletin which the Bureau of Mines hopes to print in the future will contain the state laws.

STANDARDS FOR RUBBER-COVERED WIRES.—Underwriters' Laboratories, Incorporated, has issued in book form the standards for rubbered-covered wires and cables. This book is in six parts, of which the first deals with the general nature of the Label Service of the Underwriters' Laboratories. Section 2 describes the work of inspections at wire factories and the use of labels on rubber-covered wires. Section 3 gives the National Electrical Code specifications for the construction and test of rubber-covered wires and cables. Section 4 gives the Laboratories' standards for methods and machines in testing rubber compounds used for insulating wires and cords; both chemical and physical test methods are described. Section 5 describes the field follow-up system in the method of testing market samples. Section 6 explains the system of monthly summaries and demerit schedules.

DATES AHEAD.

Electrical Supply Jobbers' Association. Quarterly meeting, Clifton Hotel, Niagara Falls, Ont., September 14-16. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Annual convention, Mt. Kineo House, Kineo, Me., September 14-17. Secretary, O. A. Bursiel, 149 Tremont Street, Boston, Mass.

American Institute of Electrical Engineers. Panama-Pacific convention, Native Sons of the Golden West Building, San Francisco, Cal., September 16-18. Secretary, F. L. Hutchinson, 33

Digitized by Google

West Thirty-ninth Street, New York, N. Y.

American Electrochemical Society. Twenty-eighth general meeting. Clift Hotel, San Francisco, Cal., September 16-18. Secretary, Joseph W. Richards, South Bethlehem, Pa.

International Engineering Congress, Civic Auditorium, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention, San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electric Railway Association and its affiliated associations. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention. Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

Hughes Electric Heating Company, Chicago, has been awarded a gold medal for its ranges and bakers' ovens displayed at the Panama-Pacific International Exposition, at San Francisco.

National Metal Molding Company, Pittsburgh, Pa., is sending out leaflets calling attention to the merits of its Flextube double compounded seamless interwoven flexible conduit.

Wagner Electric Manufacturing Company, St. Louis, Mo., has had reprinted from the *Proceedings* of the American Institute of Electrical Engineers for last May the paper prepared by its consulting engineer, Val A. Fynn, entitled "Classification of Alternating-Current Motors." This is one of the papers presented before the thirty-second annual convention of the American Institute held at Deer Park, Md., at the end of last June.

Electric Fuseguard Company, 391 Mulberry Street, Newark, N. J., has issued catalog No. 1 covering its line of safety inclosed fuses, electrical protective equipment and supplies for railway, signal, light and power, telegraph and telephone circuits. This line of products includes not only inclosed fuses of standard construction but a great assortment of fuse boxes, cutout blocks, service switches and hoods and other supplies of this type for a great variety of circuits.

Edwards Lighting Fixture Company, 605 East Lake Street, Chicago, Ill., has issued its catalog E 2 of electric fixtures which it has ready for immediate shipment. This is a very attractive catalog of 78 pages containing fine illustrations and data on a large variety of ornate fixtures of the most modern type. The designs include very simple as well as more elaborate patterns in the way of pendents, shower fixtures, indirect and semi-indirect fixtures, brackets, etc.

Hotpoint Electric Heating Company, Ontario, Cal., recently had as special guest at a luncheon of its executives at the Casa Blanca Hotel, Ontario, the head of the Research Department of the Curtis Publishing Company, Charles Coolidge Parlin, who delivered a very interesting address in which he outlined the methods of his company to determine for its advertisers the manner in which they can get the very best results in sales campaigns. The meeting was attended by the officers of the company and the executive heads of its various departments.

Delta-Star Electric Company, Chicago, Ill., has purchased a tract of land at the corner of Fulton Street and Artesian Avenue with good railroad shipping facilities. The company is preparing to build a new manufacturing plant on these premises. The plans have been completed for the first building, which will cover an area of 99 by 110 feet. It will be a brick structure with sawtooth roof. Additional buildings will be erected later. The new plant will be thoroughly modern and of highest type of construction and will greatly increase the facilities of the company, which is now located at 631 West Jackson Boulevard.

Record of Electrical Patents

Issued by the United States Patent Office, August 31, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,151,555. Process and Apparatus for Drying Pots. W. E. Barnes, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. Electric heating element below and in the pot.

1,151,563. Machine for Manufacturing Insulating Boards from Fibrous Material. A. G. Brown, assignor to Union Fibre Co., Winona, Minn. For making insulating boards from material carrying an excess of water.

1,151,605. Heater. T. C. Morgan, Chicago, Ill. Includes electric heating element.

1,151,649. Inhaler. D. M. Barr, Philadelphia, Pa. Air is electrically heated and inhaled through tube having impregnating device.

1,151,683. Telephone System. H. L. Harris, assignor to Garford Mfg. Co., Elyria, O. Arrangement of cord circuits, signals, etc., for connection of common-battery and magneto substation lines at main station.

1,151,706. Electric Welding Machine. F. Müller, assignor to Pratt & Whitney Co., Hartford, Conn. Structure and mounting of connection and work holders in resistance type machine.

1,151,707. Electric Relay or Repeater. T. A. Nathans, New York, N. Y. Voice currents relayed in telephone system by converting them into heat which acts on magnetite in derived circuit to vary its conductivity.

1,151,720. Electric Railway Signal System. J. J. Ruddick, assignor to United States Electric Signal Co., West Newton, Mass. Block system for electric roads deriving signaling current from power circuit.

1,151,726. Horn-Gap Lightning Arrester. E. O. Schweitzer, and N. J. Conrad, assignors to Schweitzer & Conrad, Incorporated, Chicago, Ill. One horn is in sections connected by high resistance and connected with terminal by high resistance [illegible] fuse. (See cut on next page.)

1,151,739. Circuit-Breaker. C. A. Tucker, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Operating mechanism for laminated-brush, carbon-break circuit-breaker.

1,151,741. Electric Motor Wheel. W. D. Valentine, assignor to National Rapid Transit Co., New York, N. Y. Structure of wheel having motor incorporated therein for monorail system.

1,151,756. Carriage-Return Mechanism for Type-Writing Machines. O. Bennett, Placerville, Cal. Electromagnetically operated.

1,151,757. Type-Writing Machine. O. Bennett. Has adjustable type rack and electrically operated hammer mechanism for striking the type.

1,151,761. Electrical Measuring Instrument. J. L. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Thermometer shows variations of temperature of liquid of known specific thermal capacity in vacuum receptacle containing known resistor.

1,151,783. Protective Apparatus for Alternating-Current Distribution Systems. G. Harlow and K. M. Faye-Hansen, assignors

Digitized by Google

to Westinghouse Electric & Mfg. Co. Section to be protected has circuit-breaker at each end and includes series transformers whose secondaries are in circuit with resistances and trip coils connected between equi-potential points, balance being destroyed on development of fault.

1,151,796. Relay. A. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. For telephone circuits; special arrangement of contacts.

1,151,799. Casing for Lamp Sockets, Pendent Switches and the Like. C. J. Klein, Milwaukee, Wis. Manner of locking cap and shell together.

1,151,800. Lamp Socket. C. J. Keith. Has longitudinally divided, two-part, insulating casing.

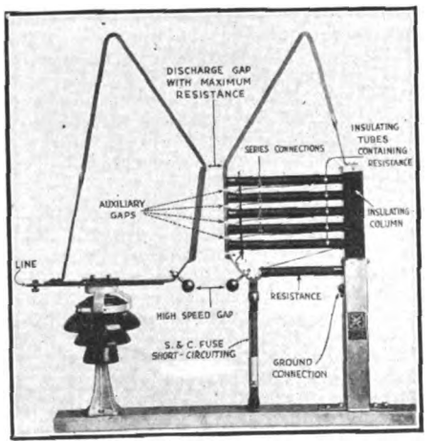
1,151,804. Electric Motor. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Commutator motor for operation on direct or alternating current having greater number of poles of less strength for alternating than for direct-current operation.

1,151,824. Electric Condenser. G. Reuthe, assignor to Gesellschaft für Drahtlose Telegraphie M. B. H. Berlin, Germany. Pack of sheet-metal electrode plates and dielectric plates immersed in liquid dielectric.

1,151,828. Circuit Closer. F. E. Schinke, Chicago, Ill. Has pair of contact plates which may be rocked in several directions and spring normally holds them inoperative.

1,151,841. Electric Arc Lamp. W. C. H. Wefel, assignor of 49 per cent to S. R. Whitaker, H. D. Bartlett and A. S. Whitaker, Denver, Colo. Mechanism for operating lamp having convergent electrodes and bridge for starting arc.

1,151,848. Automatic Time Switch. M. H. Avram, assignor to Slocum, Avram & Slocum, New York, N. Y. Contacts operated by plunger driven through air cushion between pistons in cylinder.



No. 1,151,726.—Horn-Gap Arrester.

1,151,860. Dynamo-Electric Machine. A. J. Brown, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Commutator structure maintaining true surface under expansion and contraction of bars.

1,151,867. Wireless Controlled Steering Mechanism. K. Dougan, Minneapolis, Minn. For torpedoes, etc.; electromagnet controls gearing of constantly running motor with rudder, and has its circuit controlled by wireless.

1,151,946. Ignition System. C. Hartmann, assignor to Gould Coupler Co., Depew, N. Y. For gas engines; has provision for alternately using direct and alternating current and either of two interrupters may be used.

1,151,953. Traffic Signal for Automobiles. C. M. Keenan, Detroit, Mich. Outer casing having display openings has interior rotatable translucent casing containing lamp and bearing appropriate words of direction changeably visible through display openings.

1,151,954. Automatic Photographic Printing Machine. T. C. Korsmo and T. C. Olson, Madison, Wis. Electric motor for manipulating sensitized paper with relation to negative and electric light for printing are automatically controlled.

1,151,981. Trolley-Operated Contact. C. W. Ward, East St. Louis, Ill. Switch on pole connected with hanger by lever and operated by upward pressure of passing trolley wheel.

1,151,991. Reversing Mechanism for Electrically Driven Washing Machines. F. Balzer, assignor to Troy Laundry Machinery Co., Chicago, Ill. Electric motor continuously drives commutator for individually reversing the machine motors at regular intervals.

1,152,005. Coupling Connector for Submarine Cables. L. R. Clark, Englewood, N. J. Special terminal heads for use with wire-armored cables.

1,152,007. Headlight. C. W. Dake, assignor to Pyle National Electric Headlight Co., Chicago, Ill. In reflector arrangement, lamp is located at point whereat coincide foci of front and rear parabolic reflectors and center of intermediate reflector which is section of sphere.

1,152,008. Warning Signal Device. W. W. Dean, assignor to Garford Mfg. Co. Electromagnetically operated automobile horn permits draft through it to remove dust, etc., as vehicle moves forward.

1,152,018. Telegraph Circuit. J. J. Ghegan, Newark, N. J. For code signaling; has divided battery and means for rendering one battery section ineffective when the other is ineffective.

1,152,027. Temperature Regulator. F. T. Kitchen, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Thermostat in apartment controls electromagnet which controls heater circuit.

1,152,059. Type-Printing Electric Telegraph System. W. S. Steljes, South Tottenham, London, England. Receiving instrument has electromagnetically operated type wheel and paper roll moved by electromagnet against type wheel.

1,152,062. Automobile Lock Switch. C. G. Terfler, Chicago, Ill. Cover of casing can be removed only when switch is in certain position.

1,152,082. Electric Flashlight Lamp or Lantern. A. L. Edwards, assignor to Wheeling Stamping Co., Wheeling, W. Va. Lamp, switch, etc., mounted on plate adapted to be secured to top of dry cell.

1,152,085. Sparker for Explosive Engines. W. H. Ferguson, Columbus, O. Has a pair of contacts, one of which is moved into sparking position by rotary member and other contact is moved into such position by the rotary member through tension device.

1,152,088. Relay. L. A. Hawkins, assignor to Union Switch & Signal Co., Swissvale, Pa. Frequency-selective relay energized by split-phase coils from a single-phase circuit arranged to neutralize the magnetomotive forces at a given frequency, the resultant operating the movable element at another frequency.

1,152,092. Method of Advertising and Apparatus Therefor. F. T. Hopkins, assignor to Thos. Cusack Co., Chicago, Ill. Manner of arranging subject matter, etc., in a flashed sign.

1,152,094. Railway Car Signal. J. E. Johnson, Anderson, Ind. Signal lamp switches operated by track device and interlocked to open previously closed switches when one is closed.

1,152,096. Braking Apparatus for Electrically Propelled Vehicles. P. N. Jones, Pittsburgh, Pa. Motors controlled electromagnetically by master controller may be thrown into a dynamic-braking circuit by manually operated means independent of master controller.

1,152,116. Lock for Boxes. W. G. Magoveny, assignor to Crouse-Hinds Co., Syracuse, N. Y. Details of outlet box. (See cut.)

1,152,139. Station Indicator. W. Beck, Rochester, N. Y., assignor of one-fourth each to C. D. Coker, A. J. Aldridge and J. Lewis. Trip-controlled electromagnetic mechanism feeds belt to successively display a series of station names thereon.

1,152,146. Sign. A. F. Conner and G. L. Willett, assignors to Thos. Cusack Co. Hollow open front sign letter has inside lamps and different colored lamps adjacent the outer side surfaces to represent shading.

1,152,147, 1,152,148 and 1,152,149. Electric Fuse. C. W. Davis, assignor to Standard Underground Cable Co., Pittsburgh, Pa. First patent: Structure for mounting between cable terminals in junction box having fuse in casing with expulsion opening and immersed in oil. Second patent: Similar purpose; fuse has high and low fusing portions with tension device acting on high-fusion portion to widen gap on blowing of low-fusion portion. Third patent: Junction box for oil fuses with fuse secured to cover and means for preventing expulsion of oil from casing while cover is being placed in position.

1,152,155. Electric Flashlamp or Lantern. A. L. Edwards, assignor to Wheeling Stamping Co. Casing for dry cell carries lamp, switch and connectors adapted to engage with cell terminals.

1,152,170. Attachment Plug. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport Conn. Particular structure including a switch.

1,152,177. Priming Spark Plug. I. R. Hicks, Hallsville, Mo. Details of device having means for introducing gasoline for priming.

1,152,211. Secondary Rack. C. L. Peirce Jr., Pittsburgh, Pa. Jib cranes joined for supporting insulator rod.

1,152,219. Automobile Headlight. C. Reinker, Lakewood, O. Reflector has unshaded lamp in center and pair of shielded lamps, one colored, at edge.

1,152,246. Battery Cell. W. L. Walker, Groton, Conn. Has inner and outer acid-resisting jars, the inner being non-conducting.

1,152,247. Battery Jar. W. L. Walker, New London, Conn. Inner and outer jars have ventilating air passages between them.

1,152,269. Trolley Retriever. E. Benson, Hartford, Conn. Details of clutch and resetting mechanism.

1,152,272. Electric Spark Gap. H. Boas, Berlin, Germany. For producing quickly quenched vibrations; has electrodes of tungsten.

1,152,283. Train Stop. J. G. Brinson, assignor of one-half to A. V. Scott, Idaho Falls, Idaho. Track obstacle mechanism electromagnetically operated at will from a distance.

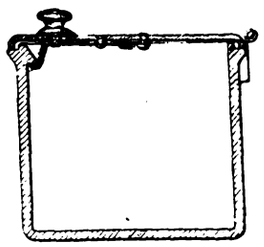
1,152,287. Telegraph Transmitting Instrument. G. T. Buchanan, Highland Park, Mich. Depression of one of key levers, each representing a letter or character, operates Morse key to send corresponding letter or character.

1,152,336. Telephone Switch. F. S. Meyers, Dewitt, Iowa, assignor of one-half to T. Foley. Details of receiver-hook switch.

1,152,344. Insulated Rail Joint. E. F. Schermerhorn, assignor to Rail Joint Co., New York, N. Y. Joint bar insulated from rail and metal chafing guard between bar and insulation at head of rail.

1,152,362. Electric Protective System. E. G. Waters, Forest Row, England. Relates to arrangement for discriminately cutting out cable sections by fault current.

1,152,370. Slotted Signal Lever. J. L. D. Langdon, assignor to General Railway Signal Co., Gates, N. Y. Interlocking machine for operating railway signals comprises electromagnetically operated mechanism.



No. 1,152,116.—Outlet-Box Lock.

1,152,376. Motor Control System. J. H. Albrecht, assignor to Westinghouse Electric & Mfg. Co. In dynamic braking, resistors in field and armature circuits are controlled by braking current.

1,152,385. System of Supervision for the Apparatus of a Telephone or Other System. A. E. Keith, assignor to First Trust & Savings Bank, Chicago, Ill. Particular arrangement of heat-coils and signals in telephone exchange for locating abnormal heat-coil.

Patents Expired.

The following United States electrical patents expired on September 6, 1915:

610,190. Secondary Battery. G. J. Miller, Kenton, O.

610,197. Controlling Device for Electric Elevators. N. P. Otis and R. C. Smith, Yonkers, N. Y.

610,229. Electric Clock Train. C. M. Crook, Elgin, Ill.

610,274. Telautograph. L. O. McPherson, Highland Park, Ill.

610,278. Telegram Transmitter. E. Porter, Sydney, New South Wales, Australia.

610,339. Telegraph Tape. F. Atherton, Paterson, N. J.

610,347. Telephone. W. A. Drysdale, Philadelphia, Pa.

610,393. Telephone. S. S. Fisher, San Francisco, Cal.

610,402. Electric Switch. R. L. L. Hundhausen, Wilmersdorf, Germany.

610,406. Resistance and Contact Apparatus for Electric Currents. H. Lyon, Glasgow, Scotland.

610,413. Direct-Current Regulator. F. E. Ramsey, Walsenburg, Colo.

610,445. Electric Railroad. J. C. Henry, Denver, Colo.

610,509. Means for Controlling Voltage and Volume of Electrical Currents. H. Williams, Cleveland, O.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII. No. 12. CHICAGO, SATURDAY, SEPTEMBER 18, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
District Heating 499
The Electric Furnace.....500
Importance of Measuring Demand.....500
Electric Cooking in the West.....501
The Convention of the Northwest Electric Light and Power Association 501

DEPARTMENTS:
Commercial Practice.....507
Electrical Construction.....512
National Association of Electrical Inspectors.....517
Public Service Commissions.....519
New Electrical and Mechanical Appliances.....538
Current Electrical News.....541
Record of Electrical Patents.....545

LEADING ARTICLES:
Electricity in a Wholesale Grocery Establishment.....503
Lightning-Arrester Installation.—By Terrell Croft.....512
Association of Iron and Steel Electrical Engineers.....521
Pennsylvania Electric Association.....524
Northwest Electric Light and Power Association.....528
Indiana Electric Light Association.....534

MISCELLANEOUS:
Prominent Electrical Men on Naval Advisory Board.....502
Chicago Utility Companies to Send Employees to Military Camp 506
Electrical Features of New Office Building of New Bedford Central Station.....507
Sign Legislation in Clarksville.....508
Galva Company Extends Lines.....509
Boston Edison Company's Steady Growth.....509
Effective Sign for Newspaper.....509
Public Service and Rates Discussed by Association of Edison Illuminating Companies.....510
Samuel M. Kennedy.....510
Stimulating Friendly Relations by Sale of Baby Bonds....510
New Cotton Mill to Use Central-Station Power.....511
Production Meter to Check Building Operation.....520
Electric Club-Jovian League of Chicago Resumes Weekly Meetings 528
Trade Papers Adopt Standards of Practice.....537
Telephone Pioneers Journey to San Francisco.....537

Copyright, 1915, by Electrical Review Publishing Company, Inc.

DISTRICT HEATING.

One of the important aspects of district heating is the bearing it has on the power business of the central station. In many industries heat or hot water is necessary in the performance of the manufacturing operations and it is usually in such class of establishments that the central-station company encounters the greatest competition when soliciting the adoption of purchased power by the manufacturer. Even for heating alone, in climates where the heating season is long, severe competition is encountered, many manufacturers claiming that as large quantities of exhaust steam are necessary the engine performs the functions of a cheap and effective reducing valve, generating at very low cost all the energy required for manufacturing.

Aside from the value of these contentions from an engineering standpoint, the fact remains that in almost every community there are a number of plants that come under this category and all efforts of the central station to secure the business are of no avail. The natural and logical solution of this problem, where conditions permit, is for the utility company itself to supply heating as well as power to such factories. Where the building lies within reasonable distance from the electric station this step is entirely feasible for the central station and is an activity which is a part of the natural development in the complete centralization of power generation.

It has been the experience of a large number of companies engaged in district heating that the business can be secured at rates equivalent to the cost to the customer operating his own plant. Possibly slightly higher rates can be charged, because of the convenience of the service. Residences and small business places, which pay higher prices for coal, can be charged more than larger buildings where an engineer is employed and where the coal cost approximates that of the heating company.

Many heating companies are not directly profitable but in most cases this can be traced to the lack of an equitable basis for charging. Steam costs, like electric costs, can be divided into service costs, capacity costs and output costs. As heating load-factors are substantially the same for all customers, it is fair to ignore the capacity costs and to consider costs as made up of service costs and output costs. Rates should be made up of a service charge and a charge for steam used.

To be successful steam-heating systems must be

Digitized by Google

treated with the same careful commercial management and technical analysis that is brought to bear upon the electrical side of the business. Due consideration must be given to the efficiency of the underground distribution system; to the nature of the business available; to the form of contract for service, and what is most important, the business must be solicited intsead of waiting for it to come forward of its own initiative.

These points were forcibly brought out in a paper presented by Mr. J. Grant De Remer before the convention of the Pennsylvania Electric Association last week, as reported on other pages of this issue. Certainly, at this time, when efforts must be made to secure business otherwise neglected for more easily secured contracts, serious consideration should be given the subject of district heating.

In addition to all other advantages of such service, the supply of heat makes the customer doubly dependent upon the central station and increases the value of the service to the community.

THE ELECTRIC FURNACE.

One of the interesting papers presented at the recent convention of the Association of Iron and Steel Electrical Engineers last week was that by Dr. Karl G. Frank dealing with "Progress in Iron and Steel Industry and the Electric Furnace." It is pointed out in regard to the latter that the increasing demands for very high quality and special alloy steels has necessitated the development of the electric steel furnace, and today without exception it is the best means to produce high quality steel. The principal advantages of the electric furnace are that it produces the highest temperature obtainable; it produces that temperature without contamination of the charge and it offers a ready and easy means to control that temperature. In view of these qualifications, it seems strange that the author should hold that the electric furnace is essentially a refining process and that actual melting will always be done otherwise. In fact, the important position held by the electric furnace in the industrial world at the present time may possibly be best realized by a statement of the fact that the present development requires over one million horsepower of electrical energy. It is true, however, that in the United States at the present time the electric steel-making capacity is under 100,000 tons per year, while the total production of steel from all kinds of fuel furnaces is more than 30,000,000 tons. Developments have proven, however, that electric steel furnaces can produce steel at any tonnage rate at a cost lower than any other fuel furnaces, and it is uniformally true that the quality of the product is much superior. The future of electric furnace development, therefore, depends largely upon the attitude taken and the policies adopted by the central-station companies.

The exploitation of this branch of the business is one of the most important matters now receiving the attention of the central-station industry. The many inherent advantages of the electric furnace, such as the ability to produce high-grade steel from comparatively low-grade ore, together with the general trend toward decreasing fuel, makes the outlook indeed very promising. The adaptability of the electric furnace to do the work more efficiently and better than that now done by other sources of heat is a great argument in its favor. Other reasons for the adoption of the electric furnace are that it can be obtained in sizes, capacities and temperature ranges to almost exactly fit the work contemplated; this in conjunction with the fact that the electric furnace requires no flues of other vents and can, therefore, be placed anywhere in the manufacturing plant, also because the source of heat is much closer to the material treated than any other method of heating, results in the higher efficiency of the electric furnace even after transmission, conversion and other losses are considered.

Considered from the standpoint of the utility company, the electric furnace load is extremely desirable. From actual experience electric furnaces show an annual load-factor on 12-hour service of about 40 per cent and about 70 per cent with 24-hour service. In most cases also it is possible to operate the furnace during off-peak periods even in plants operating 24 hours per day.

From the consideration being given this subject by utility companies in various localities, it is evident that a comprehensive movement is under way to add this desirable load to the central-station lines.

IMPORTANCE OF MEASURING DEMAND.

As the business of supplying electrical energy from central stations has developed, increasing attention has been given from year to year to the measurement of output, and consumption upon customers' premises. Meter accuracy and its maintenance have been increasingly recognized as important elements in the conduct of the business, and the expense involved in maintaining meter departments has been generally seen to be worth while from the standpoint of conserving revenue. Meters notoriously run slower with age and the neglect of recalibration may make serious inroads upon the legitimate revenue.

Corresponding attention has been given by but few companies to the measurement of the demand made by customers upon the power station, regardless of the fact that this is an important element in the cost of service, and indeed in hydroelectric systems may be by far the most important. This is probably because, after the customary scale of charges was put into effect, the revenue from most customers is not dependent upon a precise knowledge of their actual demand. Nevertheless, demand is an important element in framing a schedule of rates, so far as it is concerned with classes of customers. In specific cases, too, it is a direct element in determining the bill of the individual customer. It should be measured accurately not only in the latter case but in determining the characteristics of typical groups of customers.

Digitized by Google

Instruments for the measurement of maximum demand have long been available, but it is only within recent years that types have been placed upon the market which come sufficiently near to meeting requirements to be considered generally satisfactory. Recently, however, instruments of this kind have received much attention from manufacturers and have undergone rapid development. They deserve a wider use by operating companies. When placing them in service it should be realized that different types of instruments will probably prove the most suitable for different classes of service. A study of the different types, and trial installations on the premises of typical customers, should do much to increase the central-station official's knowledge of the loads which he is supplying, and put him in a position to more intelligently meet the future problems which he will be called upon to solve.

ELECTRIC COOKING IN THE WEST.

The report of the Electric Range Committee at the Northwest convention was in a way epoch-making. It is probably the most comprehensive effort which has yet been made in this country to compile data and information, as well as central-station experience, dealing with this subject. The report is largely due to the activities of the chairman of the committee, Mr. W. R. Putnam, of Salt Lake City. As might be expected in regard to a subject of this kind, there are many opinions, but a lack of quantitative data concerning the operating characteristics which are affected by this form of load. Where diversity-factors have been observed they are found to be rather favorable, so that the station peak is not much increased by a load of this kind. Much more information is needed, however, applicable to different local conditions, before reliable conclusions can be formulated on this subject.

Many portions of the West present conditions which are unique in respect to this matter. Fuel of all kinds is often scarce, with corresponding high prices, and in many communities gas is not available. Such conditions are especially favorable for securing an electric heating load, and where the problem has been energetically attacked, as at Billings, Mont., results can be depended upon to follow. A very considerable revenue awaits the central station in this field and, especially in the case of hydro-electric plants, but little additional investment upon the part of the operating company is involved.

Water heating for domestic use is an unavoidable side problem which must be met. A flat rate for this service seems to be generally favored, as the load can be easily arranged to give a high load-factor.

In introducing electric cooking, it seems desirable to use personal solicitation through thoroughly competent salesmen who can present the advantages of electric cooking in a convincing way and refrain from all claims which cannot be subsequently made good in practice. The manufacturers are ready to co-operate in advertising and demonstrations, and the latter are especially desirable, since education is usually necessary to get the best service from the electric range. Payment for equipment in installments is usually recognized to be necessary and means should be taken to finance this requirement.

THE CONVENTION OF THE NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

On other pages of this issue will be found the report of the convention of the Northwest Electric Light and Power Association held last week at Portland, Ore. This convention was successful in every way and was replete with interest from start to finish. Like so many of the other local associations, the Northwest Association has affiliated with the National Electric Light Association, although in the past there has not been entire sympathy on the Pacific Coast with the work of the national association. The holding of the annual convention of the latter association at San Francisco this year, with the consequent intimate commingling of the representatives of eastern and western companies, has done much to formulate a better understanding. President E. W. Lloyd of the National Association was present at the Northwest convention and his remarks upon that occasion could leave no doubt in the minds of the northwestern members that the chief executive of the National Association will do everything in his power to see that the interests of this section of the country are properly recognized.

Two causes of friction have been the specifications for overhead line work and the activities of the Committee on Accident Prevention. Representation from the Pacific states in the membership of these committees, as well as in the other activities of the association, should do much to remove all misunderstandings. There is already an appreciation of the difference in conditions in overhead line construction in the East and West, and no doubt the future work of the Overhead Line Committee will give full recognition to these differences.

The rules of the California Railroad Commission regarding inductive interference between power and telephone lines, and the proposed National Electrical Safety Code which is being formulated by the Bureau of Standards at Washington, are subjects of deep interest in the Northwest states. It is realized that regulations of this kind, if made mandatory, will put restrictions upon the freedom of operation of utility companies which may seriously embarrass them in certain instances. The subject of water power, and federal legislation in connection therewith, is another topic of deep concern and the companies operating in this territory are awaiting with much concern the enactment of federal legislation which will permit them to proceed with water-power developments.

Digitized by Google

Prominent Electrical Men on Naval Advisory Board.

The personnel of the Naval Advisory Board, announced by Secretary of the Navy Daniels on September 12, included several men conspicuous for their achievement in the development of electrical inventions and in the conduct of important business enterprises related to the electrical industry. Except for Thomas A. Edison, who was appointed chairman of the Board by Secretary Daniels, the members were chosen by 11 scientific societies, each selecting two representatives.

The membership is as follows:

Thomas A. Edison, chairman.

Dr. W. R. Whitney and Dr. L. H. Baekeland, of the American Chemical Society.

Frank Julian Sprague and B. G. Lamme, of the American Institute of Electrical Engineers.

Dr. Robert Simpson Woodward and Dr. Arthur Gordon Webster, of the American Mathematical Society.

Andrew Murray Hunt and Alfred Craven, of the American Society of Civil Engineers.

Matthew Bacon Sellers and Hudson Maxim, of the American Aeronautical Society.

Dr. Peter Cooper Hewitt and Thomas Robins, of the Inventors' Guild.

Howard E. Coffin and Andrew L. Riker, of the American Society of Automobile Engineers.

William Lawrence Saunders and Benjamin Bowditch Thayer, of the American Institute of Mining Engineers (metal).

Dr. Joseph William Richards and Lawrence Addicks, of the American Electrochemical Society.

William Le Roy Emmet and Spencer Miller, of the American Society of Mechanical Engineers.

Henry Alexander Wise Wood and Elmer Ambrose Sperry, of the American Society of Aeronautic Engineers.

The first meeting has been called for October 6, at the office of the Secretary of the Navy, Washington, D. C. Formal organization of the board will be made. Secretary Daniels will make an address outlining his ideas in forming the board, and the work will be subdivided so as to facilitate passing upon problems presented to the Board. These will have to do largely with inventions submitted to the Navy Department. It is also thought by the Secretary that the Board will be able to originate appliances and suggest modifications in the present equipment of the Navy which may have a far-reaching effect upon the science of naval warfare.

Thomas A. Edison, chairman of the board, is one of the most prolific inventors the world has known. His invention of the Edison incandescent lamp, the Edison system of distribution, the many fundamental inventions dealing with simple and multiplex telegraphy, the telephone, the Edison storage battery, his contribution to the development of the kinetoscope and the moving-picture field and other innumerable inventions place him in the forefront of the world of science and invention.

Brief biographical sketches of other members of the board, familiar to the electrical industry, follow:

American Chemical Society.

Dr. W. R. Whitney is director of the Research Laboratory of the General Electrical Company, Schenectady, N. Y. His successes there include the process which insured the commercial practicability of the photographic film; the "metalized" filament, or "Gem" lamp; the mechanically working tungsten; the gas-filled or half-watt lamp; the magnetic electrode arc lamp, and the X-Ray tube.

Dr. L. H. Baekeland, Yonkers, N. Y., a Belgian by birth, who invented Velox and other photographic papers, the Townsend electrolytic cell and photographic films and dry plates and "Bakelite," an insulating material of remarkable qualities entering into a wide range of electrical apparatus. He has been awarded medals by four American societies, was United States delegate to the International Congress of Chemistry in London, 1909, has been president of five American scientific societies and vice-president of two others, and holds degrees from Belgian, German and American universities, being at one time laureate of the four Belgian universities.

American Institute of Electrical Engineers.

Frank Julian Sprague, Milford, Conn., a graduate of the United States Naval Academy and later associated with Thomas A. Edison, who equipped the first electrically trained gun in the American navy; built the first electric trolley railways in the United States, Italy and Germany; introduced the electric elevator; invented the multiple-unit system of electric train control now used on all elevated and subway roads here and abroad; invented a system of control for automatic braking of trains and is developing high angle fire shrapnel. Mr. Sprague won gold medals at the Paris and St. Louis expositions.

B. G. Lamme, Springfield, Ohio, whose 140 inventions include practically all type of polyphase alternating-current apparatus and railway generators and motors. Mr. Lamme, who is chief engineer of the Westinghouse Electric & Manufacturing Company, has been an acknowledged leader in the last twenty-five years in the electrical engineering work of America and Europe.

Inventors' Guild.

Dr. Peter Cooper Hewitt, New York City, who is best known as the inventor of the Cooper Hewitt electric lamp, used for illuminating factories and for photographic work. He is also the inventor of the telephone relay and electric wave amplifiers, wireless telephone and telegraph apparatus, hydroplane, aeroplane and dirigible balloon apparatus and light transformers, changing the color of light rays.

Thomas Robins, Stamford, Conn., who is the inventor of numerous mechanical devices, including the belt conveyor for carrying ore and coal, for which he was awarded a gold medal at the Paris Exposition. He is enrolled in the American Legion, and last winter visited the front in France to study military conditions.

American Society of Automobile Engineers.

Andrew L. Riker, Detroit, who was the first president of the Society of Automobile Engineers and whose work resulted in placing the American automobile on a meritorious world-wide basis. He produced the first toothed armature and among the first electric vehicles, electric trucks, marine lighting plants and racing automobiles. In 1900 he was awarded a medal by the French government for meritorious automobile design.

American Society of Mechanical Engineers.

William Le Roy Emmet a graduate of the United States Naval Academy, who has achieved fame as an electrical engineer and inventor. His most important work has been in the development of alternating currents and of the steam turbine. He designed the machinery for the first ships driven by electric motors and invented the oil switch and the varnished cambric cable. Mr. Emmet is consulting engineer of the General Electric Company and is in direct charge of the great work now going on in the electric-propulsion and ordnance equipment of the United States superdreadnaught *California.*

American Society of Aeronautic Engineers.

Elmer A. Sperry, who perfected one of the first arc lights in America before he was 20 years old and who today is one of the world's foremost inventors of electrical appliances. He was one of the first to produce electrical mining machinery, electrical street railway cars, electric motor vehicles and gasoline automobiles; he perfected the gyroscopic compass and was the first to produce entirely practical apparatus for the stabilization of ships and aeroplanes.

Digitized by Google

Electricity in a Wholesale Grocery Establishment.

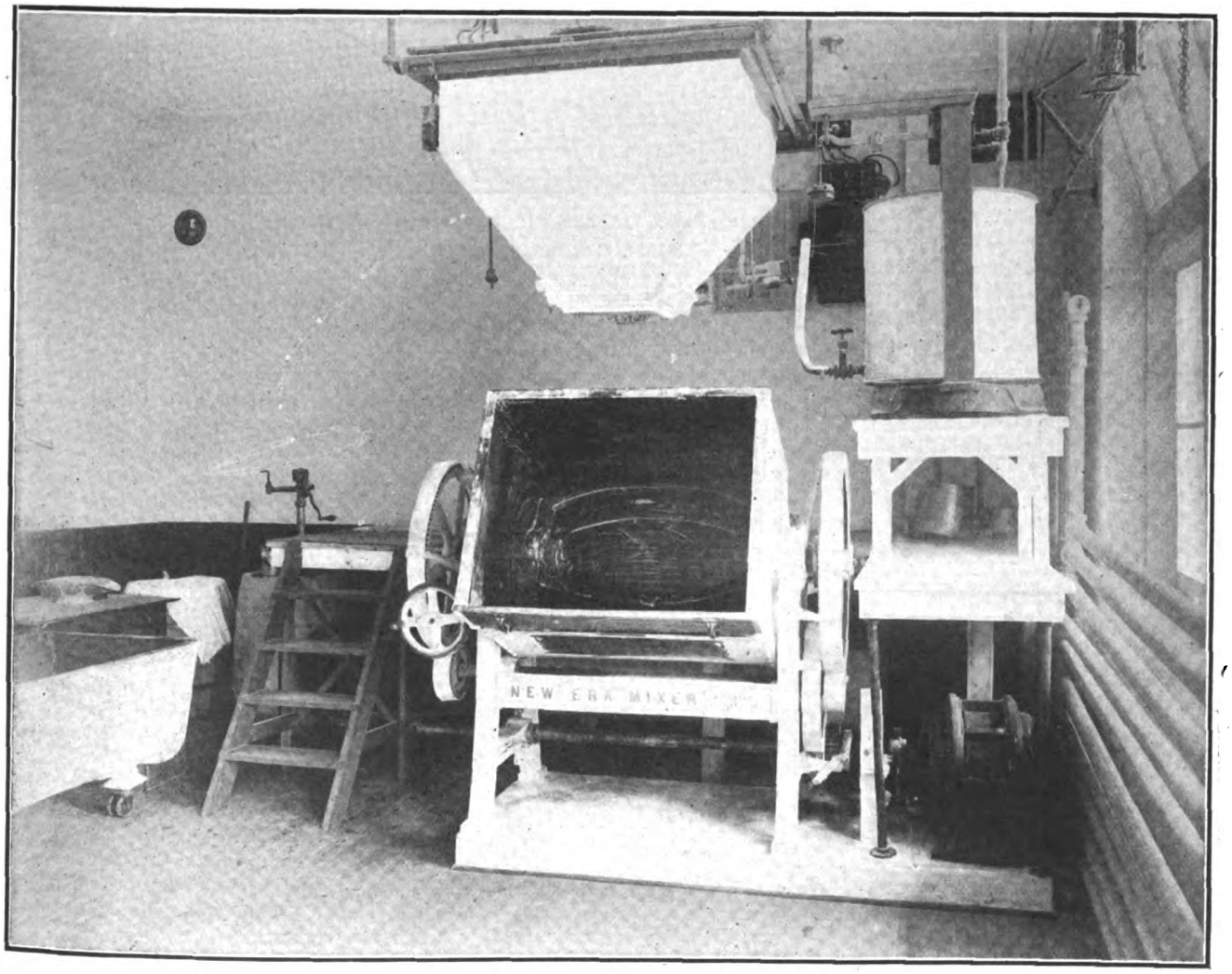
This article treats of the advantages of central-station service for a wholesale grocery establishment which maintains its own bakery and cold-storage facilities for a chain of stores. Details are given as to the electrical equipment in the several individual plants.

What can be done in the way of electrical development in the mercantile business of small cities, when properly pushed by the central station, is well illustrated by the Meaker Food Stores in Auburn, N. Y. The corporation owning the stores operates two main groceries and markets, the Auburn Grocery Company and the Sun Grocery Company, besides five branch stores in various parts of the city. In addition there is a large wholesale grocery, auto-delivery service, and the Sun Baking Company, which has a daily capacity of 10,000 loaves of bread and 2,000 cakes, besides pies, doughnuts and cookies.

The product of the baking company is principally sold by the Food Stores although some wholesaling is done. In all of the establishments the most modern electrical equipments have been installed for light and power, including refrigeration, meat grinders, coffee mills, cash carriers, elevators, call systems, etc. In the bakery the oven temperatures are controlled by electrically-operated thermostats.

The two main stores and the bakery have complete motor-driven refrigerating plants for cooling produce of all kinds. The lighting systems in all departments have received careful attention and are not only artistic, but scientifically effective. Current is supplied by the Empire Gas & Electric Company from its three-phase, 60-cycle system and all motors used by the Meaker corporation are three-phase, 60-cycle, 230-volt machines. It will, therefore, be unnecessary to mention the motor characteristics in the course of this article, which will be devoted principally to the refrigerating systems and the bakery equipment installed.

Before taking up the details of the equipments it may be well to consider some of the advantages offered by electrical devices in this kind of business, using central-station service. Electric lighting has become so generally used in places of business that it is scarcely necessary to enumerate the advantages gained by its use. It is, however, the only lighting that can be used to advantage where low or cool temperatures are maintained, and in refrigeration systems this is important. The illumination of show cases is possible where low temperatures are maintained, as is the case in markets. In bakeries electric light and power has solved the heat question that was formerly so troublesome and has added materially to the hygienic conditions. The "Safety First" question is always to be considered and in bakeries and markets it plays just as important a part as in other lines of business. Electric illumination and electric drive have done much for the safety and comfort of employees as well as greatly



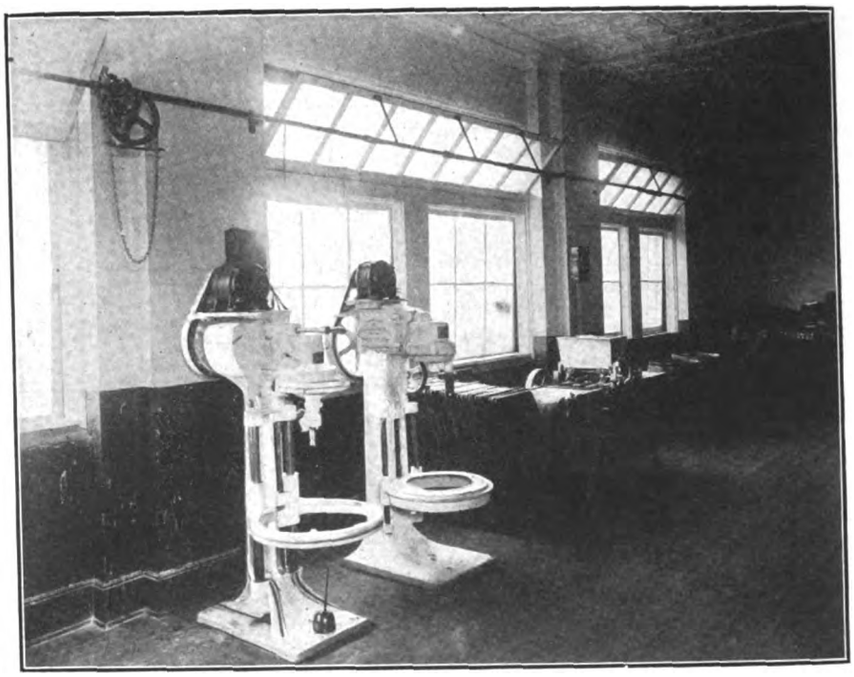
New Era Dough Mixer Driven by 10-Horsepower Motor.

Digitized by Google

improving the quality of the product. In fact, much of the success of a bakery establishment depends upon uniformity of product which is only possible with electric drive.

Something may be aptly said in regard to the use of private plants in baking establishments. The first cost of motors is considerably less than that of a plant or a steam engine with long lines of shafting, and cumbersome belts which are always liable to dislodge dirt and throw oil that may contaminate the baked goods. The cost of motor maintenance is exceedingly small compared with that of a plant. The capacity of a plant is fixed but where central-station service is used motors may be added at any time and placed where convenience dictates. The reliability of an isolated plant frequently depends upon a single boiler and generating unit and failure of any one part means a shut down. With central-station service this phase of the question need not be considered.

With mechanical drive, to keep down excessive losses in shafting, belting, and gearing the machines must be located to simplify the drive. With electric drive the machines can be placed to facilitate the logical sequence of operations. The entire absence of smoke, noxious gases, and dust makes electric power particularly adapted to all places where food stuffs are sold or made.



Motor-Driven Mixers.

Sun Baking Company.

For the accommodation of the Sun Baking Company a three-story brick and concrete building has recently been erected. This building also includes the offices and the garage. Natural light, sanitation, and ventilation have received careful attention and every machine employing power is individually driven by an electric motor. The top floor is used for the storage of flour which is elevated by one of three electric elevators. On this floor is located a Read Machine Company flour sifter with a capacity of over 10,000 loaves of bread daily. It is driven by a five-horsepower motor with gear connections.

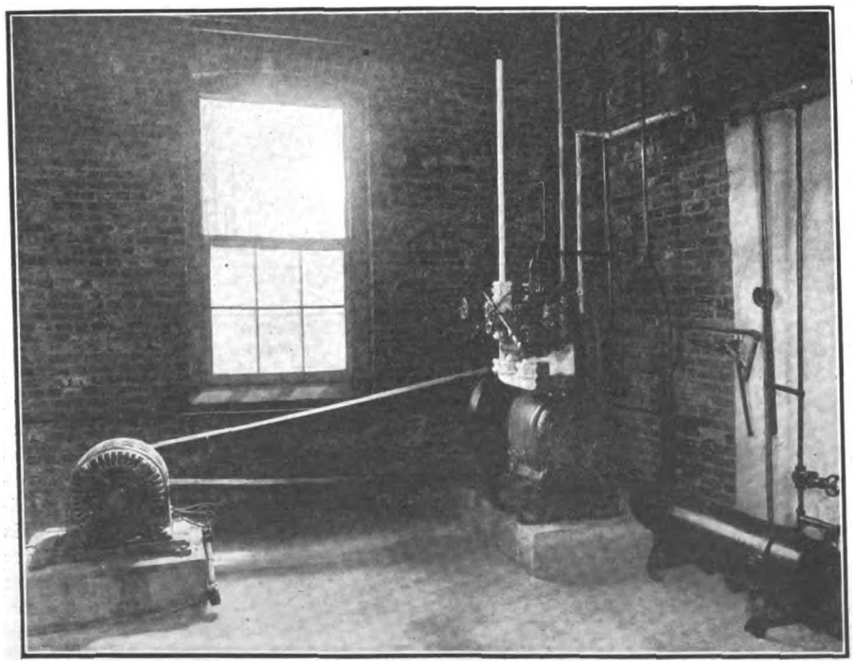
From the sifter the flour descends to the floor below into a New Era dough mixer shown in one of the accompanying illustrations. This mixer, as will be seen from the illustration, consists of a sheet metal container which can be tilted, within which are a series of paddles or stirrers. The mixer is driven by a 10-horsepower motor through gearing. From the dough mixer the dough is transferred to a Werner& Pfleinder divider and rounder shown in another of the illustrations, which is driven by a 2.5-horsepower motor. Here the dough is automatically divided into the size of the loaves and formed on the rounder.

Supplementary to this machine there is a Thompson loaf moulder driven by a two-horsepower motor. For mixing the cake dough there is a Read three-speed mixer shown herewith. The illustration shows two such machines but the larger machine has been substituted for the smaller one. The dough container is placed on the machine and the stirrer attached to the vertical shaft. The machine is driven by a one-horsepower motor.

For the preparation of cookies there is a Triumph cooky machine having a capacity of 400-dozen cookies an hour. This machine rolls the dough to the proper thickness, cuts out the cookies and drops them into pans ready for baking. A one-horsepower motor drives this machine by means of gearing.

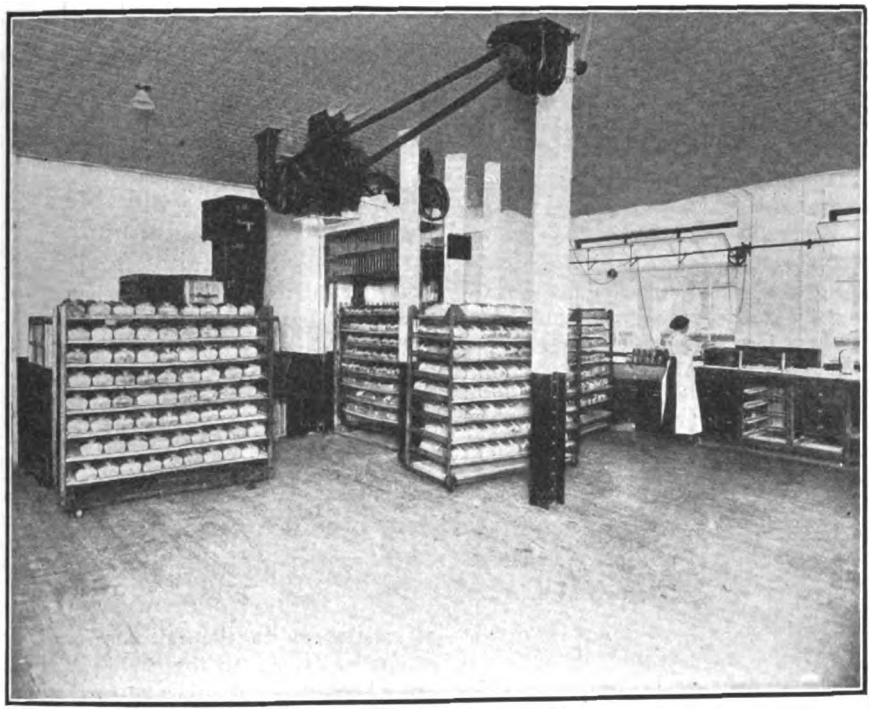
There is a complete refrigerating plant installed for cooling the perishable ingredients used in the various products of the bakery, which will be described in connection with the other refrigerating plants. This plant is similar to that of the Auburn Grocery Company and the illustration will serve for both outfits.

All of the ovens in the bakery have while-tile fronts and are governed by electrically-operated thermostats. The entire absence of shafts and belting is



Motor-Driven Compressor.

Digitized by Google



Motor-Driven Elevator.

noticeable to any observer as well as the extreme cleanliness, good lighting, perfect ventilation, the absence of heat and other conditions that tend to make insanitary and unhygienic conditions.

Refrigerating Plants.

To make the description of the refrigerating equipments more comprehensive it may be well to state some of the requirements of refrigerating plants for markets, groceries and bakeries. The dry direct-expansion system is used in all three plants here described. This system, where the ammonia leaves the expansion coil slightly superheated, requires about 33.33 per cent more pipe than a wet compression system in which the ammonia leaves the coils containing enough entrained liquid to maintain a wet compression condition in the compressor. It is, however, more simple than the wet system and is better adapted to small plants.

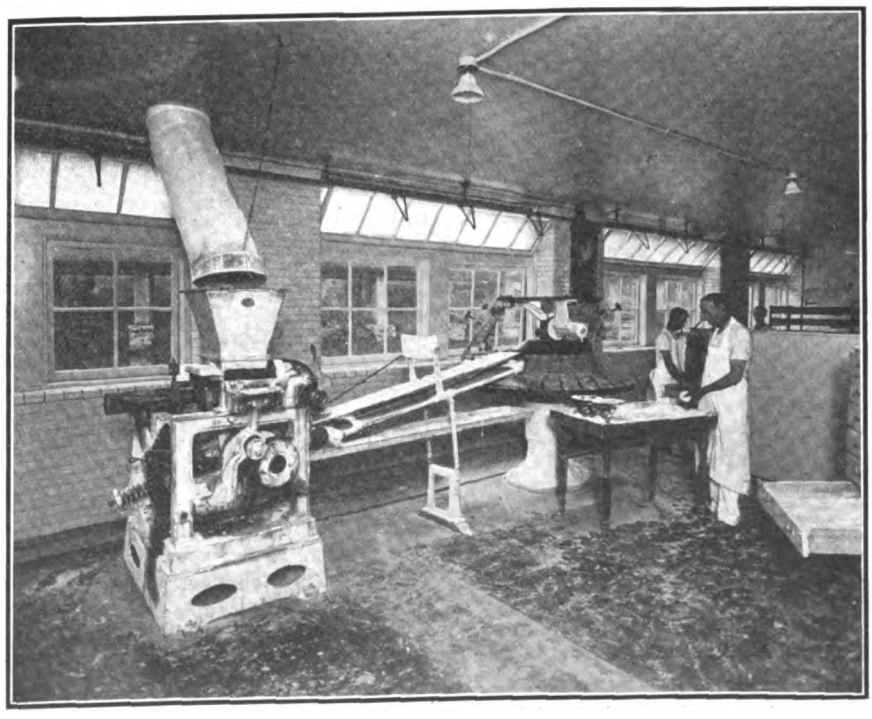
Ammonia is evaporated in the direct-expansion coils from which it returns to the compressor which increases the pressure of the gasified ammonia. An expansion valve controls the liquefied ammonia under condenser pressure as it flows from the receiver to the expansion coil in which a materially lower pressure is maintained in order that the refrigerating medium may boil at a sufficiently low temperature to absorb heat and consequently refrigerate the surrounding air. In the older systems of refrigeration, the condenser used required the external application of water sprays and a circulation of air for cooling. In modern plants the condenser consists of concentrically-arranged pipes, one within the other. The ammonia circulates through the inner pipe and the water between the outer surface of this pipe and the outer pipe casing. With this construction the condenser can be placed in any convenient place and readily adapts itself to electrically operated refrigeration plants.

Cold-storage boxes have various shapes and the consideration of how much refrigeration is necessary depends upon the construction of the boxes or rooms, the heat admitted from opening the doors, from illumination, heat emitted by the goods stored, etc. The insulation of the walls of cold storage rooms is one of the most important items. A good form of construction comprises two strips of wood seven-eighths inch thick, one-inch air space, another seven-eighths wood strip, six inches of granulated cork and finally two wood strips separated by building paper. With such construction the heat transmission in B.t.u.'s is about 0.46 per square foot of surface per degree difference between the inside and the outside temperature. Different commodities require different temperatures and it is necessary to provide means for regulating the temperature. One arrangement consists of two or more direct expansion coils, each controlled by an expansion valve. With this arrangement one coil may be shut off or the circulation of the ammonia controlled in any coil.

The following excerpts are taken from Matthew's "Mechanical Refrigeration" and will serve as a guide to laying out refrigeration plants and to illustrate the reason for adopting the equipments described:

"The total amount of heat that the refrigerating machine must remove from the cold-storage compartment, is made up as follows: Latent and sometimes specific heat of the products stored; heat evolved by lights; heat given off by workmen; heat absorbed in the precipitation and freezing of moisture; heat of air entering through open doors; heat entering through the storage-room insulation.

"The amount of refrigeration required to cool a given amount of food product through a given range in temperature is a practically fixed quantity for a given product, but varies widely with different products. When cooling is not to be carried below the freezing



Divider and Rounder, Motor Driven.

Digitized by Google

point the amount of refrigeration required may be found by multiplying the specific heat of the product by the number of degrees through which it is to be cooled. If the product is also to be frozen, this amount of refrigeration must be increased by the amount of the latent heat of fusion, and if cooling is to be continued below the freezing point, the refrigeration must be further increased by the specific heat of the product below 32 degrees multiplied by the number of degrees through which it is cooled below the freezing point. The specific and latent heat of a number of products commonly preserved in cold storage are given in Table I.

TABLE I.
Properties of Food Products (Matthews).

Product.	Specific heat above 32 deg. F.	Latent heat of freezing.	Specific heat below 32 deg. F.
Beef, lean...	0.77	102	0.41
Beef, fat....	0.60	72	0.34
Butter	0.64	...	0.84
Cream	0.68	84	0.38
Eggs	0.76	100	0.40
Fish	0.82	111	0.43
Milk	0.90	124	0.47
Mutton	0.67	...	0.84
Oysters	0.84	114	0.44
Poultry	0.80	105	0.42
Pork-fat	0.51	55	0.30

"Example.—It is required to cool 10,000 pounds of freshly cooled poultry through 68 degrees Fahrenheit. The specific heat as given in the table is 0.80. The number of British thermal units to be removed will be 0.80 times 10,000 times 68 which equals 544,000. Dividing this result by 144 (number of British thermal units per pound of refrigeration), the amount of cooling duty is found to be 3,777.7 pounds. If the poultry is frozen, the additional refrigeration required will be 10,000 times 105, which equals 1,050,000 British thermal units or 7,292 pounds, and if additional cooling to zero degrees Fahrenheit is required, the additional cold will be 10,000 times 0.42 times 32 which equals 134,000 British thermal units or 933.3 pounds. The total refrigeration duty to cool the products through 68 degrees Fahrenheit, freeze it at 32 degrees Fahrenheit and then chill it to zero degrees Fahrenheit, would be 3,777.7 plus 7,292 plus 933.3, which equals 12,003 pounds, or dividing by 2,000 (pounds per ton), six tons."

Table II is used for estimating the amount of refrigeration required to chill beef, pork, and sausage, through 64 degrees Fahrenheit or from 104 degrees Fahrenheit to 40 degrees Fahrenheit.

The refrigeration plant in the Sun Baking Company's building comprises a Brunswick five-ton, Type CC4 vertical two-cylinder ammonia compressor belted to a 10-horsepower motor. This supplies refrigeration to three store rooms 18 by 12 by 8 feet, for butter, lard, flour, eggs, etc., and a smaller cooler for cream. The average temperature maintained in all of the coolers is 40 degrees Fahrenheit. The refrigerating plant of the Auburn Grocery Company so far as the motor and compressor are concerned are duplicates. The arrangement for cooling the display counters for perishable goods is novel and possesses numerous advantages. The meat and fish counters are 80 feet long and 3 feet wide, the cheese and perishable goods counter 28 feet long and 3 feet wide. At the back of the counters there is a four-pipe ammonia coil extending the full length. The front above the counter level is glass about two feet high with glass extending about two-thirds the distance to the rear side. The temperature maintained around the goods is about 40 degrees Fahrenheit.

TABLE II.
Refrigeration to Cool Meats (Matthews).

Products.	Poultry.	Beef, fat.	Beef, medium.	Beef, lean.	Pork, fat.	Sausage, 15 % water.
Specific heat.....	0.80	0.60	0.68	0.77	0.51	0.65
B. t. u. to cool 1,000 lbs. 1 deg. F.....	800	600	680	770	510	650
B. t. u. to cool 1,000 lbs. 64 deg. F.....51,200		38,400	43,520	49,280	32,640	41,600
Pounds refrigeration per 1,000 lbs. (64 deg. F.).....355.55		266.66	302.22	333.66	226.66	288.88
Pounds of meat cooled 64 deg. per ton of refrigeration..... 5,625		7,500	6.615	5,844	8,765	6,923
Average weight, carcass.....		750 lbs.	750 lbs.	750 lbs.	250 lbs.	...
Carcasses cooled per ton.....		10	8.82	7.78	35.3	...

The meat cooler is 14 feet square and 8 feet high and is maintained at 32 degrees Fahrenheit. The vegetable cooler is 6 by 15 by 8 feet and is maintained at 34 degrees Fahrenheit. The butter cooler is 5 by 10 by 8 feet and is maintained at a temperature of 40 degrees Fahrenheit. The initial ammonia pressure is kept at approximately 120 pounds with a back pressure of eight pounds.

The refrigerating equipment of the Sun Grocery Company is larger, consisting of a 10-ton York two-cylinder ammonia compressor belted to a 20-horsepower motor. There are seven coolers for meat and groceries in which the temperatures are maintained at from 12 to 33 degrees Fahrenheit. The proportion of the refrigeration capacity to the cubical contents is approximately the same as that of the Auburn Grocery Company's plant. The construction, however, differs somewhat. There are several brine tanks in each storage room through which part of the ammonia expansion coils pass. This lowers the temperature of the brine to that of the room and it is possible to shut down the compressor for several hours at a time with but a slight rise in room temperature.

A tabulated list of motors in the various establishments described is given in Table III.

TABLE III.
Motor Data—Sun Baking Company, Auburn Grocery Company, Sun Grocery Company—3-phase, 230-volt, 60 cycles.

No.	Horse-power	Kind of Drive	Application
			SUN BAKING COMPANY.
1	5	Gears	Read Machine Company's cone flour sifter, 10,000 loaves bread daily.
1	10	Gears	New Era dough mixer, 10,000 loaves bread daily.
1	2.5	Gears	Werner & Pfleiderer divider and rounder.
1	2	Gears	Thomson loaf moulder.
1	1	Gears	Read three-speed dough mixer for cake.
1	1	Gears	Triumph cooky machine, cuts out 100 dozen in 15 minutes.
1	10	Belt	Brunswick five-ton ammonia compressor.
			SUN GROCERY COMPANY.
1	20	Belt	York 20-ton ammonia compressor.
			AUBURN GROCERY COMPANY.
1	10	Belt	Brunswick five-ton ammonia compressor.

NOTE—These data do not include electric elevators and small motor applications such as coffee mills, meat grinders, etc.

Chicago Utilities Send Men to Army Training Camp.

The Commonwealth Edison Company, Public Service Company, of Northern Illinois and the Chicago Telephone Company will each send a quota of employees to the military training camp which is to be held at Fort Sheridan, Ill., September 20 to October 17. In each case the salary and expenses of the men will be paid by the utility.

The Commonwealth Edison Company will send 10 men, who have been selected by a committee of executives of the company, namely, W. A. Fox, vice-president; J. H. Gulick, vice-president; Peter Junkersfeld, assistant to the first vice-president and W. L. Abbott, chief operating engineer. The employees who will attend at the company's expense are: George H. Jones, power engineer; John T. Mountain, operating department; F. N. Savage, operating department; A. P. Thoms, operating department; D. F. Backen, substation department; A. H. Sweetnam, engineering department; B. F. McGuire, statistical department; W. W. Parker, testing department; H. E. Wulfing, street department; and C. W. Bontemps, distribution engineering department.

The Edison Company will also pay half salary and allow time off to any other employees who desire to attend. About 55 employees of the company are members of the Illinois National Guard, and these men are always permitted to attend the annual encampments on full pay without sacrificing their vacations.

Digitized by Google

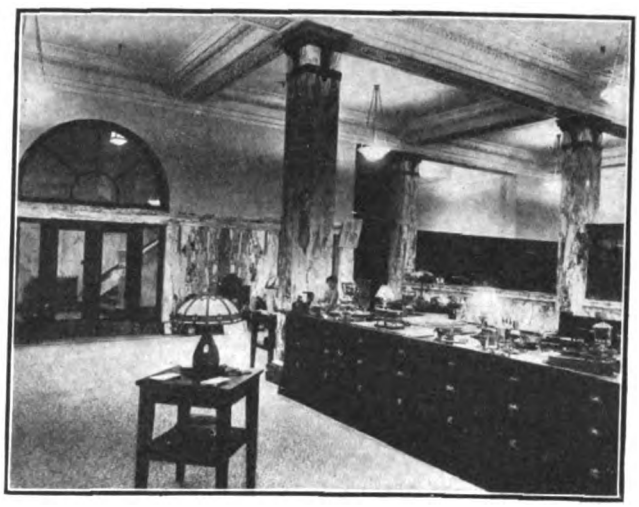
Commercial Practice
Management, Rates, New Business

Electrical Features of New Office Building of New Bedford Central Station.

The New Bedford (Mass.) Gas & Edison Light Company has recently occupied its new building, located on the principal business street of the city, near partment stores, banks and public buildings. The structure is of limestone, consists of four stories and basement 80 by 100 feet, with a garage adjoining 70 by 100 feet, and is devoted entirely to the purposes of the business. The cost was about $300,000.

On the first floor are the business offices, the front half being a lobby and show room for domestic appliances. The interior facing is of handsome variegated Italian marble, the baseboards and column bases and heads being of black Egyptian marble. The cashier's cage is of bronze. The floor is four bays wide and five bays deep, with massive columns, and semi-indirect alabaster bowls, each containing four 100-watt Mazda lamps, are centrally located in each bay.

Lamp and Fixture Display Room.



Section of General Office.

Displays of domestic appliances are contained in all-glass cases and consist of a full line of Universal household devices, Simplex and Rogers percolators, and flatirons, water-boilers, toasters, samovars, etc., of various manufactures. Electric ranges of Simplex, Hotpoint, Hughes and Westinghouse manufacture, and Eureka, Eclipse, Brilliant, Western Electric and Frantz-Premier portable vacuum cleaners, and Arco Wand stationary cleaner are on sale. Standard fireless cookers, Hughes portable ovens, General Electric fans and other devices are offered, the large area given to the display being favorable to an adequate showing of the apparatus.

On the second floor, reached by electric passenger elevator or marble stairway, are the manager's and superintendent's offices and a large show room for lamps and fixtures. Electric drop lamps and chandeliers are arranged in ten lines, the units being suspended on wire hooked rods about 2.5 feet long from lines of pipe installed near the ceiling, these inclosing feed wires with connections by flexible cords from two-light Benjamin receptacles, two lights being connected from each outlet. There are 26 lights or chandeliers in each line, with 13 outlets. Switches for their control are located in an oak-framed cabinet located conveniently near, to enable a salesman to switch on the lights desired for exhibition purposes. Lighting of the showroom is by means of the units on exhibition.

The third floor of the building contains an assembly hall with seating capacity of about 275. This room is about 50 by 60 feet, and is lighted by means of nine 300-watt nitrogen-filled lamps in acorn-shaped alabaster bowls. A well equipped kitchen adjoins the hall, for use in preparing suppers and to enable the women employees to prepare their noon lunches.

The hall is used for monthly lectures on technical subjects and for frequent entertainments of the Stetson Club of employees. This club is also provided with a room furnished with billiard tables and other games and magazines, and is open daily for 8 to 11 p. m. Each member pays one dollar a year to meet the janitors expense; the company provides the room and lighting free.

Other rooms on this floor are a ladies' rest rooms and a directors' room, both handsomely finished in mahogany.

The whole fourth floor is the stock room. A three-ton F. S. Payne Company freight elevator with platform 9 by 15 feet, operates between the basement and this floor, with a door leading from the electric garage directly onto its platform. Wagons that carry supplies are run onto the elevator and taken up to the fourth floor, where they are loaded, this method saving one handling. The drum and elevator motors, of 20 horsepower, are located on an iron floor just below the roof. Elevators are run on the company's 550-volt three-phase service.

The electric meter-testing room is provided with two separate boards consisting of three slate panels each. Wires come from the switchboard in the basement through 0.75-inch iron conduit to junction boxes, and the resistance tubes are supported on a framework, above the board, constructed of angle irons on brackets eight inches from the wall. Direct, single-phase and three-phase alternating current are available, from 0.25 to 80 amperes in volume, for testing all meters, and compressed air is provided for blowing out mechanisms and drying paint.

The board was constructed on plans of the lighting company's meter department by the Taunton & New Bedford Copper Company. Three 25-watt Mazda lamps

Digitized by Google

in close Holophane metal shades light the bench, and a 12-inch fan installed on the angle-iron supports furnishes ventilation.

The electric garage of the New Bedford company is one of the most thoroughly equipped in New England. There are charging stations for 27 vehicles at once, and a repair room with three-eighths-horsepower motored double grinder, an ignition battery of from 0.5 to 30 amperes, in 0.5-ampere steps; an electric vulcanizer, which permits of the repair of tire shoes without removal from the automobile, and a gas stove for heating tallow for lubricating driving chains.

A feature of the garage is a working pit in the floor, 4 by 12 feet and 5 feet deep, with nine 40-watt Mazda lamps, each in a round recess in the walls about one foot below floor level and so located as to shine on the under mechanism of an automobile run over the pit. The bottom is of concrete and the walls are lined with white tiles.

The New Bedford company is a leader in electric vehicle operation and promotion. It has nine cars of its own, of the following makes, with uses appended: A Bailey runabout, for the special use of D. W. Beaman, general superintendent; a Baker runabout, equipped for use in trimming arc street lamps; a 1,000-pound Baker, for carting pipe for the gas department; a 2.5-ton Baker, for hauling poles; a 1,000-pound Detroit, used in installing electric meters; a 1,000-pound General Vehicle truck, for transporting gas stoves; a one-ton G. V., used in installing electric services; a 3.5-ton G. V., to haul coke, and a 1,000-pound Studebaker, used in installing gas meters. In addition, three trucks and nine pleasure cars are charged for private parties, and one of the trucks is garaged here. There are about 45 electric vehicles in the city.

A room containing the board, and office equipment for the vehicle department, is located at the front of the building near the doors, and here is installed a three-phase 550-volt motor-generator set, which provides 15 volts direct current as a booster on the 110-volt central-station circuit. The switchboard for the control of incoming circuits and the charging panels is of Taunton & New Bedford Copper Company manufacture, and the grids are of Cutler-Hammer make.

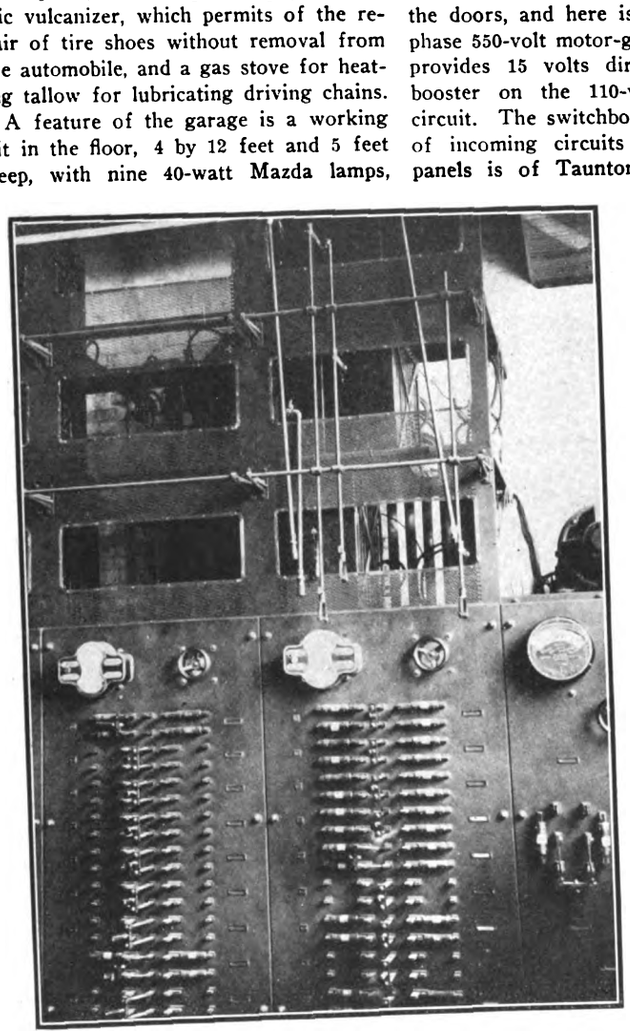
A stock room on a half-floor above is reached by a spiral iron staircase.

The main switchboard for the buildings is located, as noted, in the basement, and consists of four large slate panels, for direct current, single-phase and three-phase alternating circuits. Conduits carrying leads to the upper floors rise from the back of the board, which stands four feet from the wall, and run open along the ceiling, there being six 1.5-inch conduits.

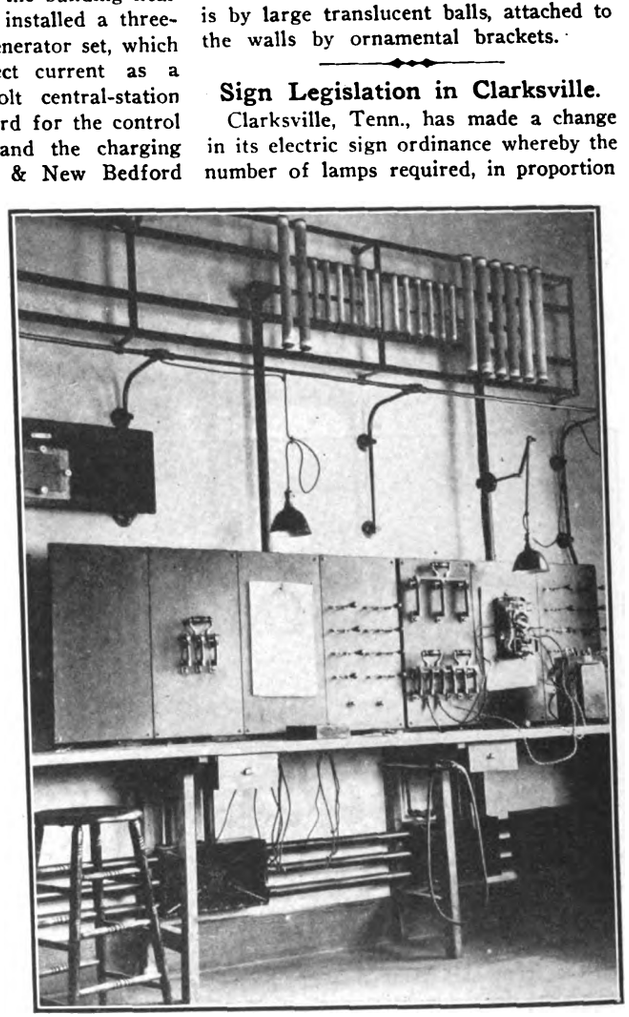
A horizontal angle iron at the back of the board, about five feet above the floor, bonds the conduit and secures alignment. The total capacity of the board, which supplies both the main building and the garage, is about 1,600 amperes.

In the basement is located an Arco Wand vacuum cleaner operated by a two-horsepower motor on 220-volt single-phase service and controlled from each floor by a push-button switch. The air compressor for tire inflation and other purposes is driven by a 2.5-horsepower three-phase motor and is provided with automatic control which keeps the tank at required pressure.

The external lighting of the building is by large translucent balls, attached to the walls by ornamental brackets.



Charging Board in New Bedford Company's Garage.



Meter-Testing Outfit, New Bedford Gas & Electric Company.

Sign Legislation in Clarksville.

Clarksville, Tenn., has made a change in its electric sign ordinance whereby the number of lamps required, in proportion to the surface of the sign, is not specified, as in the old ordinance. The amended measure now states: "And for the purpose of this ordinance an electric sign is hereby declared to be a sign in which all the letters are illuminated on each side of said sign by incandescent lamps of such power as to illuminate thoroughly all the letters on each side of said sign."

Electric Truck for Advertising Cigars.

The C. C. Bickel Company, cigar manufacturers of Louisville, Ky., has been advertising its leading brands by means of a motor truck carrying a number of electric signs. The truck has been in Lexington and other towns in the state.

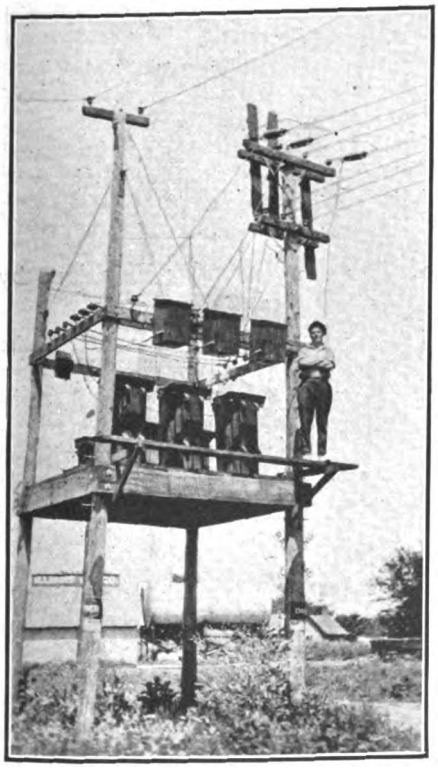
Digitized by Google

Galva Company Extends Lines.

The Galva (Ill.) Electric Light Company has purchased the electric property at Wataga, Ill., and it will be operated from the central power station at Galva when connected by transmission lines now building. This company, organized two years ago, has bought and dismantled seven electric plants and now supplies nine towns and cities in Henry, Knox and Stark counties.

The power plant at Galva is new, substantial, highly efficient, and amply designed for continuous service for its population of ten thousand. About 700 horsepower in motors are connected.

The accompanying illustration shows the step-down apparatus at Cambridge, having a capacity of 150 kilovolt-amperes, three-phase, four wire. This



Transformer Installation on Galva Line.

station is 18 miles from Galva. E. L. Brown is president, E. O. Brown manager and H. C. Pollitz secretary of the corporation.

Boston Edison Company's Steady Growth.

Figures which show the condition of the Edison Electric Illuminating Company of Boston on June 30, 1915, have been issued by the company, in anticipation of the annual return soon to be filed with the Massachusetts Gas and Electric Light Commission, as required by law.

High records have been established in the number of lamps connected, the horsepower of motors, the gross earnings and the net earnings.

Lamps and motors connected, compared with previous years, were as follows:

	1915	1914	1913	1912
Incandescent lamps	2,508,059	2,245,547	1,972,872	1,766,618
Arc lamps	11,010	12,297	12,039	11,652
Motors, horsepower	116,913	106,205	93,175	78,733
Connected load, in 50-watt equivalents	4,382,856	3,973,881	3,502,925	3,075,782

Energy sold to other companies and municipalities was as follows, in kilowatt-hours:

	1914-15	1913-14	1912-13
Cambridge Electric	8,137	8,115	8,166
Charlestown Electric	2,374,453	2,033,126	1,927,957
Town of Norwood	1,484,000	1,516,000	1,597,600
Town of Wellesley	796,750	639,410	573,970
Town of Wakefield	342,240	....	....

For the first time in the company's history the net earnings exceeded $4,000,000, the exact figures for 1914-15 being $4,002,292, compared with $3,855,016 the year before, or a gain of 3 per cent.

Earnings were equivalent to 14 per cent on the $20,480,000 stock outstanding June 30, compared with the same rate on $20,472,900 the preceding year.

Earnings for the past four fiscal years compare as follows:

	1915	1914	1913	1912
Gross	$7,429,124	$7,008,288	$6,365,874	$5,787,344
Expenses	3,426,832	3,153,271	2,724,198	2,371,563
Net ..	4,002,292	3,855,016	3,641,675	3,415,780
Misc. profits	118,909	57,134	103,956	74,969
Total net ...	4,121,201	3,912,150	3,745,631	3,490,750
Taxes	843,450	785,713	797,617	780,000
Balance..	3,277,751	3,126,437	2,948,014	2,710,750
Interest...	371,474	399,615	390,065	242,859
Dividends	2,457,174	2,252,319	1,950,333	1,872,444
Bal. for deprec. and misc. charges	449,102	474,503	607,616	595,446

The total number of customers is now 72,902, and the population of territory served is over 1,000,000.

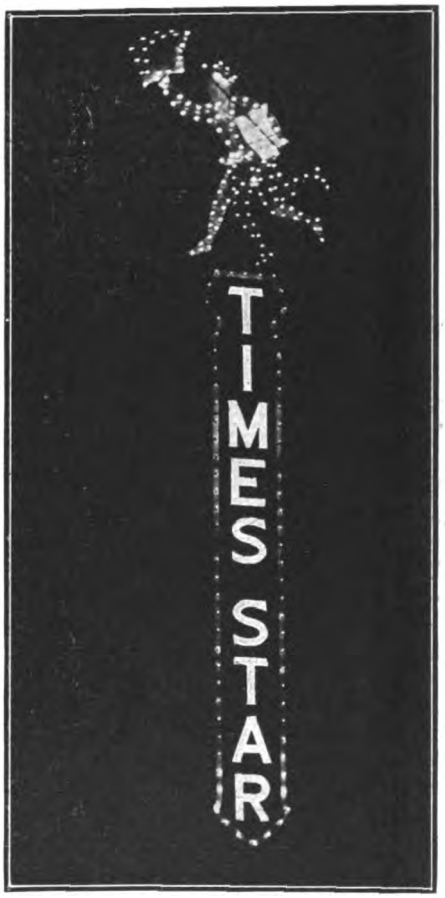
Effective Sign for Newspaper.

Keen appreciation of the value of good advertising is the most natural thing in the world for a newspaper, which itself lives by advertising; and there is therefore nothing surprising in the fact that the Cincinnati *Times-Star*, a leading afternoon daily in that city, has installed one of the most striking electric signs in Cincinnati, for the purpose of making the location of its building conspicuous and getting what publicity there may be in the possession of such a sign.

Something a little out of the ordinary was desired, as a matter of course, in order to serve the purpose desired. The Federal Sign System, (Electric), which was called upon to do the work, considered the job from this angle, and evolved a sign which is eminently characteristic, and which nobody need fail to recognize as one designating a newspaper office. Anybody who can read can see the name, *Times-Star*, outlined at night in letters of fire two feet high, while even those who cannot can hardly overlook the gigantic running newsboy who surmounts the sign, waving a sheet from his bundle of papers.

The sign is placed at the corner of the *Times-Star*, seven-story building at Sixth and Walnut Streets, projecting so as to be visible from all directions; and inasmuch as it is 40 feet high from top to bottom, it can readily be understood that it can be seen from a considerable distance.

On account of presenting both sides to the public view, it is a double-face



New Electric Sign in Cincinnati.

sign; the two faces being identical. The letters are white-enameled porcelain steel, raised from the black background, and standing out plainly in daylight, while the lights in which they are outlined at night make them even more conspicuous. Around the border, which is also painted white, a high-speed waving effect is produced at night by means of flashing lamps.

The figure of the boy on top of the sign is eight feet high, and a motor-driven Reco flasher operates the contacts which produce the running effect, making this sign one of the most striking in Cincinnati. Betts & Betts color-caps are used around the border, to give contrast. There are 1,000 10-watt Mazda lamps in the sign.

Digitized by Google

Public Service and Rates Discussed by Association of Edison Illuminating Companies.

The report of the Committee on Reporting Decisions of Public Service Commissions, E. W. Burdett, chairman, and the report of the Committee on Residential Service, Alex Dow, chairman, together with a general open discussion on central-station rate-making, engaged the serious attention of the thirty-sixth convention of the Association of Edison Illuminating Companies which was held at Spring Lake Beach, N. J., September 13 to 16, inclusive. While other localities on the Atlantic seaboard were suffering from an extreme heat wave, the weather at Spring Lake was ideal for the holding of the convention. A much enjoyed feature was the presence of Thomas A. Edison and his family.

A paper entitled "Electricity for Everybody, a Complete Canvass of the Boston Edison Territory," by Leavitt L. Edgar, presented some remarkable suggestions with regard to the possibilities of universal electrical service. Reports of the following committees were presented: Meters, O. J. Bushnell, chairman; Electric Plant, R. F. Schuchardt, chairman; Steam Plant, J. W. Porter, chairman; Standards, William C. L. Eglin, chairman; Street Lighting, J. W. Cowles, chairman; Incandescent Lamps, J. W. Lieb, chairman.

The convention, which was presided over by Walter F. Wells, of the Edison Illuminating Company, Brooklyn, N. Y., was the largest held in the history of the Association. The business sessions were conducted in a large tent on the lawn. On Tuesday evening a shore dinner, attended by over 400, was given in the tent and greatly enjoyed. On Wednesday evening addresses were made by Frank A. Vanderlip, president of the National City Bank, of New York, and by Thomas N. McCarter, president of the Public Service Electric Company, Newark, N. J. These addresses dealt with questions relating to administrative, executive and financial topics. Samuel Insull, president of the Commonwealth Edison Company, was to have spoken on this subject, but had to leave.

There were many ladies in attendance, for whom there was a special entertainment provided. The leading manufacturing interests were well represented, President E. W. Rice and a large staff from the General Electric Company, and President E. M. Herr and many others from the Westinghouse Electric & Manufacturing Company being present.

The convention concluded on Thursday evening with a dinner to the past presidents, each of whom was presented with a gold badge. The full proceedings of the convention will be given out by the Press Committee.

SUCCESSFUL COMMERCIAL MANAGERS.

Samuel M. Kennedy.

One of the best known men in the electrical industry on the Pacific Coast is Samuel Macaw Kennedy, general agent of the Southern California Edison Company. No greater tribute can be paid Mr. Kennedy as a central-station executive than a reference to the astonishing commercial growth of the company since his connection with it. Since 1903, when he was placed in charge of the commercial activities of the company, the business has increased over 600 per cent and the annual load-factor has been raised from 30 per cent to over 61 per cent.

S. M. Kennedy,
General Agent, Southern California Edison Company.

Mr. Kennedy was born in Toronto, Can., and was educated in the Model School, Collegiate Institute and Upper Canada College, in that city. After leaving college he entered his father's business, and began studying the problems of the wholesale importer of foreign products. In due course he was appointed one of the firm's foreign buyers, and for ten years made frequent trips to and from Europe, crossing the Atlantic forty-two times before he had completed his thirtieth year. During the latter portion of this period he had entire charge of the European end of the business, and made regular visits to the manufacturing centers of Great Britain, France, Switzerland, Germany and Austria. Primarily, as the result of a sunstroke, his health broke down, and for five years he traveled in search of a congenial climate, eventually going to California, where he regained his strength.

In 1901 he became identified with the electrical business, as assistant to the president of the United Electric Gas & Power Company, which company was absorbed in 1903 by the Southern California Edison Company. Since that date Mr. Kennedy has acted as general agent of the Edison Company, and has guided the commercial end of the corporation's growing business. During this period he has seen the volume of his company's business increase 600 per cent and by scientific load building has helped the annual load-factor to climb from approximately 30 per cent to over 61 per cent. Mr. Kennedy has given special attention to the question of "Rates for Service," "Public Relations," and "Business Development," and has contributed a number of valuable articles on these subjects to technical periodicals.

Mr. Kennedy is also a director of Santa Barbara Gas & Electric Company, the Long Beach Consolidated Gas Company and the Santa Barbara & Suburban Railway.

Stimulating Friendly Relations by Sale of Baby Bonds.

A net income of five per cent is the inducement offered by the Oklahoma Gas & Electric Company for the purchase of all baby bonds in denomination of $5.00 and this opportunity to its patrons is being accepted as an easy way for wage earners and persons of moderate means to invest in securities.

This baby-bond specialty was inaugurated by Henry Willmering, chief accountant, Oklahoma Gas & Electric Company, whose keen insight forecasted the plan of popularizing the company by teaching its patrons how to invest their money safely in bonds that are free from income tax and at the same time protect the company against loss through failure of patrons to pay their bills.

These baby bonds, with interest-bearing coupons attached, have revolutionized the system of interest paying heretofore in vogue and likely will be adopted throughout the country by public utilities whose patrons enjoy a return upon their meter deposits.

The process, in its present simplified form, may be stated briefly as follows: The certificates are issued in denomination of $5.00 with attached coupons covering a period of nine years from date of issuance which is indicated by stamp both on face of certificate and upon the back of the first coupon.

Digitized by Google

On July 1 of each year, or during the month, these coupons, properly indorsed, are presented at the cashier's window and are redeemed by paying the consumer either the cash or by applying the interest upon current bills. The date upon the back of the first coupon indicates whether it is good for a year or fractional part thereof, all chance of error having been eliminated. After payment is made, the value of the coupon is written plainly across the face of the coupon and the date of payment is stamped upon the back.

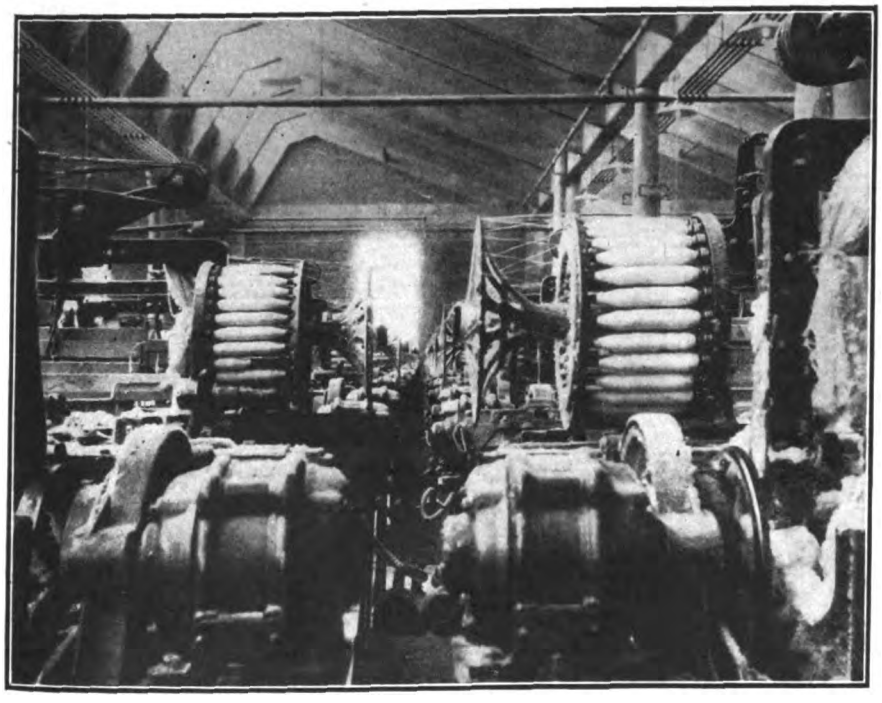
The coupons redeemed each day are sent to the deposit certificate clerk, who duly records the serial number and amount of coupon opposite the corresponding certificate, thereby eliminating all chance of paying the interest twice. After passing through the proper channels, the coupons are filed numerically and reference can be had in a moment's notice.

The willingness with which consumers accept this baby bond and the continually favorable comment on the five-per-cent feature, naturally lead one to the belief that a very troublesome problem has been solved. Before the advent of the coupon bond, thousands of post cards had to be made up annually, showing amount and number of deposit and interest due, then checked against the deposit records and consumers' ledgers and finally mailed to the patron.

This process involved weeks of night work and great confusion attended and much strife resulted from big rushes at the office where much delay naturally followed when all could not be served promptly. The old certificate called for a payment annually of five per cent but the consumer evidently did not read the certificate or consider the interest item.

All utility men are aware how vital is the subject of public relations and this baby-bond feature has proved to be a wonderful factor in producing a broad wholesome smile as the consumer walks up to the cashier and receives a bonus from the gas and electric company.

Patrons walk away from the contract department, examining and reading this new document that represents their bond holdings with the company and they are interested. It is an innovation—it smacks of progress—forward movement. And the public is impressed.



Motor-Driven Looms In Cotton Mill.

New Cotton Mill to Use Central-Station Power.

The extensive plant of the Naunkeag Steam Cotton Company, now in process of construction at Salem, Mass., will be equipped throughout with electrically operated machinery, operated with power obtained from the Salem Electric Lighting Company. The former mills of the company, with the single exception of a concrete storehouse, were entirely destroyed in the conflagration of June 25, 1914.

Already the weave shed, a one-story saw-tooth roofed structure, covering about seven acres, is finished and about 1,200 looms are being operated. The total capacity of the shed is 2,600 looms, and these will be all installed this year. Each of the looms is individually motored, those weaving pillow-case tubing being driven by one-half horsepower motors, and those weaving sheeting by three-quarter horsepower units. All the motors thus far installed are of the induction type, and operate on 220 volts alternating current, the tubing loom motors at 1,200 revolutions per minute and those driving the sheeting looms at 1,800 revolutions per minute.

Each motor is geared to its loom, and the looms are arranged in double lines with the motors on both groups of looms adjacent to each other as shown in the accompanying illustration.

Energy is received from the central station at 2,300 volts, 60 cycles, three-phase, through 1,500 feet of underground conduit. Two transformer vaults are located in the basement of the weave shed, and here are installed three 200-kilovolt-ampere and two 100-kilovolt-ampere transformers rated 2,300/220 volts and three 30-kilowatt 110-volt lighting transformers.

From the transformer rooms the power leads pass to distributing panels, in a corridor outside, which are strongly inclosed in grating. Thence the circuits are carried through the concrete floor, connecting with the switch boxes above through porcelain fittings and J. C. Phelps caplets.

In the basement of the weave shed is located a 125-horsepower motor operating an Ingersoll-Rand double compressor connected with an air tank receiver rated at 100-pounds pressure, which operates humidifiers in the mill.

The weave shed is lighted by 150-watt Mazda lamps installed in 18-inch Wheeler enameled reflectors in 24-foot bays, 14 feet on centers.

New buildings under construction are a four-story carding and ring spinning mill and a five-story cotton storehouse, the latter to be equipped with motor-driven elevators and blowers. Electricity used in these buildings will be three-phase, 60-cycle energy at 550 volts pressure.

A transformer station having a concrete floor and roof and grated sides is under construction in front of the spinning mill. This station will contain four transformers.

Opening of Commonwealth Edison New Quarters.

During the week of September 20, the Commonwealth Edison Company, Chicago, will hold an opening of its new service headquarters and electric shop, located in the new Edison Building. Invitations have been sent to all of the company's customers, and arrangements are being made to accommodate a large number of visitors. Music, motion-pictures and many other special features will be provided.

Digitized by Google

Electrical Construction

LIGHTNING-ARRESTER INSTALLATION.

By Terrell Croft.

A lightning arrester is a device which offers a path to ground of little opposition to lightning-discharge or other static-disturbance currents, but which at the same time prevents the flow of currents impelled by the normal voltage of the circuit to which it is connected. It should be understood that a lightning arrester does not necessarily "arrest" lightning. The protection afforded is not infallible, but does, with standard makes of lightning arresters, greatly decrease the risk of lightning damage. The installation of lightning arresters is then, in a sense, a species of insurance.

The principle of the lightning arrester is that it constitutes a "short-circuit" route from the line wires to ground for the static-disturbance current. It also affords a course to ground of great opposition to the currents normally circulating in the line. Usually lightning arresters comprise air gaps, or films of chemical compounds connected between the line and ground across which the very-high-voltage, very-high-frequency, lightning discharge currents jump or arc with comparative ease. In some kinds of lightning arresters there is a tendency for the arc, which may be formed when the discharge current jumps across the gap, to continue, due to the normal electromotive force of the generator serving the line. Where this condition is liable to occur, provisions, which would require more extended description than can be given here, must be made to prevent it.

A lightning arrester should be placed on every wire entering a station, because it is impossible to predict with accuracy just where the lightning may "strike." It may strike a long line and not affect a short one, and *vice versa*. It is apparent then that if maximum insurance is to be provided, there should be an arrester on each line near its entrance into the building.

In locating station lightning arresters it is obvious that they should be placed as close as possible to where the wires protected enter the building, so that the danger to the wiring in the building not provided with lightning protection will be minimum. There is frequently formed, particularly with arresters of certain types, a destructive and vicious arc when a lightning current passes to ground through an arrester, and it is for this reason that inflammable materials should not be permitted to remain near an arrester. Fig. 1 shows diagrammatically a typical lightning-arrester installation. Only one wire of the circuit is indicated, but all of the wires of the circuit should be protected as shown.

The lead connecting a lightning arrester between the line and ground should be as straight as possible, because curves, bends or twists may introduce exceedingly great reactance to the lightning-discharge currents in the circuit. For example, the lead *AC*, Fig. 1, to ground is shown as straight as it is possible to make it. Obviously, therefore, lightning arresters should not be mounted on switchboards, but should be independent thereof, and, as suggested in a preceding paragraph, located as close as possible to the point where the conductors enter the building.

The importance of effective ground connections for lightning arresters can scarcely be overestimated, because experience has shown that the condition of the ground or earth connection may largely determine the effectiveness of a lightning-protection equipment.

The ground lead, that is, the conductor or wire, for example, *AC* or *ACD*, Fig. 1, in which the arrester is connected between the line and ground, may from a theoretical standpoint be of practically any reasonable cross-section, or of practically any material. However, since all other metals are either too expensive or corrode too readily, copper is the only material that should be used for ground wires in central stations. Galvanized-iron wire has been used in some cases for ground wires on pole lines, but it has the disadvantage that it is liable to rust asunder at the surface of the ground. Theoretically, the greater the exposed surface of a conductor for a given cross-section, the better carrier it should be for lightning-discharge currents. It follows, therefore, that metal straps or

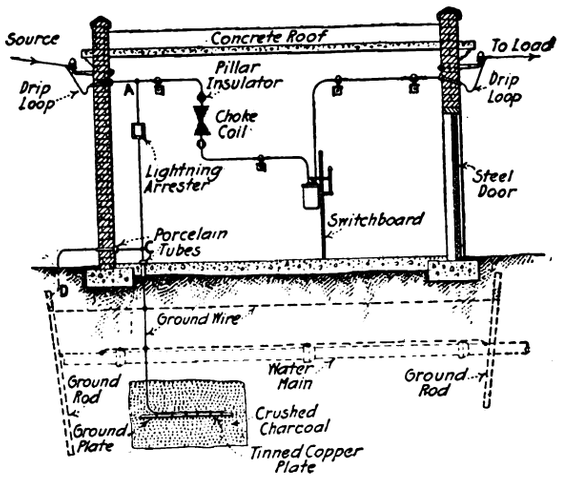


Fig. 1.—Switching Station With Well Arranged Arrester Installation.

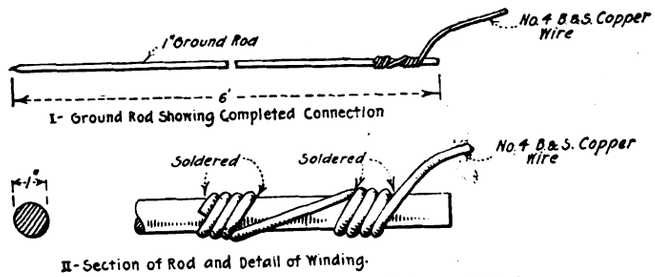


Fig. 2.—Details of Typical Ground Rod.

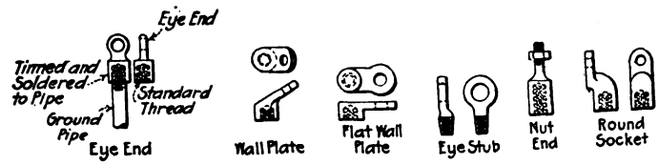


Fig. 3.—Galvanized Fittings for Ground Connections.

Digitized by Google

tubing (see following paragraph) are better, theoretically, than round wire for this purpose. However, experience has shown that round copper wire, provided it is not too small, will usually answer all requirements. A copper wire smaller than No. 6 should never be used, because this size provides the minimum mechanical strength and conductivity advisable. It is better to use larger ground wires, particularly in important installations. In many cases a ground lead of No. 0 wire is used. This would be equivalent to a copper strap one-eighth by twenty-one thirty-seconds inch (approximately). Ground leads of drawn copper tubing are used to a considerable extent in important installations. Since skin effect is very pronounced in a conductor carrying a high-frequency lightning-discharge current, the metal at or near the center of a solid cylindrical conductor is ineffective in conveying the current. It follows that instead of using solid conductors, it is better for this purpose to use tubular conductors so that the maximum amount of metal in the conductor will be effective. Furthermore, the tubular conductor has the advantage of being stiffer with a given weight of metal than a solid one.

Earth connections or connections to ground are usually made by connecting the ground lead to (1) a water pipe, Fig. 4, (2) a pipe driven into the ground, Fig. 5, (3) a round metal rod or stake driven into the ground, Fig. 2, or (4) a copper plate buried in permanently damp earth, or in a prepared bed, Fig. 6. Frequently effective ground connections can be made by joining the ground lead to flumes, penstocks, or the steel rails of a railroad system.

To make a ground connection on a water pipe, a special brass plug, Fig. 7, is screwed, as illustrated in Fig. 4, into a fitting in the water pipe, as shown at *A*, or into a hole drilled and tapped into the water pipe itself, as at *B*. It is obviously desirable to make the connection in the water main as at *B*, where possible, but where this is not feasible it may be made in a service pipe which leads directly to the water main, as shown at *A*. The connection should always be made on the street side of the water meter. This provides probably the best and most effective ground connection where an extensive pipe system is available. In important installations, such as the ground connection for a central station, the ground lead should be connected to the piping system at several different points.

The pipe earth connection (Fig. 5) is made by driving a piece of wrought-iron pipe into the ground to such a depth that its lower portion will lie in permanently moist soil. The pipe connection offers the cheapest method of making a ground, where it is not possible to connect to a water-piping system. At the same time, experience has shown that pipe ground connections are very effective if properly installed. Galvanized wrought-iron conduit can be used instead of pipe for making grounds of this character.

The methods of connecting the ground lead to the ground pipe are shown in Figs. 8 to 11. The simplest method of effecting a connection is shown in Fig. 8, wherein the copper ground lead is twisted around the ground pipe and soldered thereto. The portion of the pipe where the lead connects, and the lead itself, must be thoroughly tinned prior to the soldering to prevent any possibility of electrolytic action. Sal ammoniac can be used for a flux for tinning the iron pipe, which should be filed clean and bright before the solder is applied.

The method of connecting a ground strap to a ground pipe is shown in Fig. 9. The strap is wedged within the pipe by a metal plug driven in the orifice. Then the plug, pipe and strap are soldered together.

The ground lead can be connected to a pipe by means of a plate clamped between a couple of locknuts on the threaded end of a pipe as shown in the of Figs. 10 and 11. Where the space is restricted it may be necessary to bend down the connecting plate as shown in Fig. 10, but under ordinary conditions it may be permitted to extend, as shown in Fig. 11. The terminal lug placed on the end of the ground lead provides an effective method of connection between the ground lead and the plate and permits the disconnection of the lead if such may be necessary for testing. All metallic parts that are thus in contact at the top of a ground pipe should be tinned to prevent electrolytic action.

Galvanized awning fittings may be used in making ground connections. Some of these standard fittings are shown in Fig. 3. They can be readily procured of galvanized iron and in special cases provide convenient attachment lugs.

The distance to which to drive a ground pipe is determined to some extent by local conditions. The pipe should always go down far enough that its greater portion will always lie in permanently moist earth. As a general rule, a ground rod should be

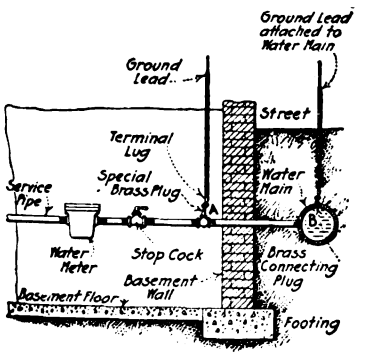


Fig. 4.—Ground Connection to Water Pipes.

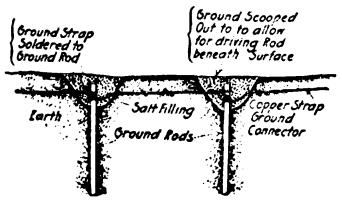

Ground Strap Soldered to Ground Rod
Ground Scooped Out to to allow for driving Rod beneath Surface
Earth
Salt filling
Ground Rods
Copper Strap Ground Connector

Fig. 5.—Multiple-Pipe Ground.

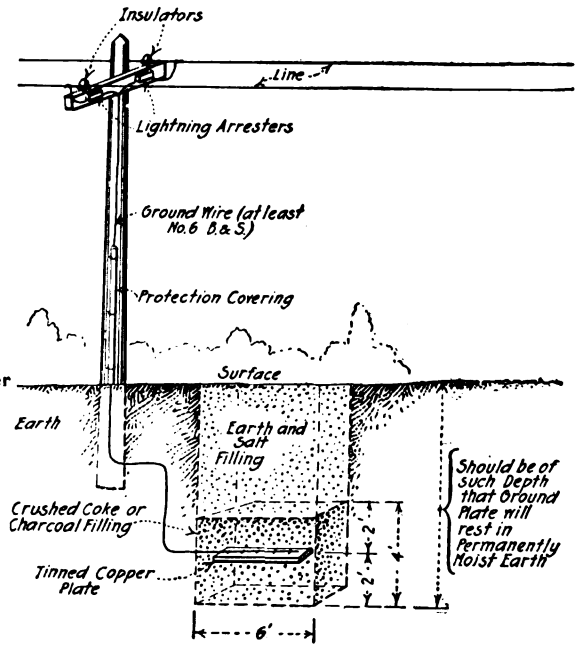


Fig. 6.—Pole-Line Arrester Installation.

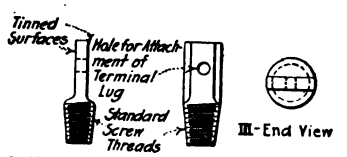


Fig. 7.—Brass Plug for Ground.

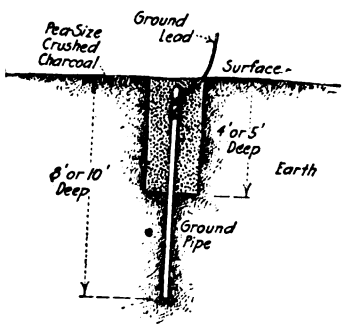


Fig. 8.—Ground Rod With Carbon Packing.

Digitized by Google

driven at least 6 or 8 feet into the earth and a greater depth is often desirable.

A ground rod or pipe should not be permitted to vibrate while it is being driven. If it does vibrate, it forces away the earth that surrounds it, leaving an air space between the metal and the surrounding soil, as shown in Fig. 12, greatly increasing the resistance of the ground contact offered by the rod or pipe. This difficulty is most likely to occur where the soil is moist.

The earth around a ground rod should always be tamped after a rod has been driven, to correct for the vibration difficulties described above and to make the surrounding soil contact closely with the rod. That tamping will materially decrease the resistance of a ground is evident from tests. The resistance of the earth connection afforded by a ground rod may be 20 to 40 times more before tamping than after.

The methods of improving the conductivity of pipe or rod earth connections are illustrated in Figs. 8 and 10. In Fig. 8 is shown a method described in The Factory Mutual Fire Insurance Rules in rule 5*c*, which consists in digging a hole 4 or 5 feet deep around the ground rod, and filling it with crushed coke or charcoal about pea size. This is said to compensate in a measure for the lack of moisture that may sometimes be encountered. In Fig. 10 salt is packed around the upper end of the ground rod and water is poured on the salt. The salt solution percolates down through the soil around the rod, increasing the conductivity of the adjacent soil. This has the effect of increasing the contact area of the ground rod with the soil and decreases the resistance of the earth connection. The salt should never be permitted to come high enough that it will attack the point of connection between the ground lead and the pipe. Tests have shown that the resistances of pipe earth connections can be very materially lowered by the application of a salt-and-water solution as above described.

A multiple or distributive pipe ground connection is installed where it is desired to obtain an earth connection of minimum resistance. It consists of a number of individual pipe grounds connected in multiple. Obviously the resistance of two pipe earth connections in multiple is less than the resistance of one connection and it follows that the greater the number of pipes connected in multiple, within reasonable limits, the less will be their combined resistance.

Fig. 13 shows an example of a multiple connection where 12 pipes driven into the ground around a station are all connected in multiple by a lead wire, encircling the building under the surface. The connections between the various pipe units may be made by using special connectors like those of Figs. 3 or 11, or a ground wire may be soldered to the tops of the different pipes as shown in Fig. 5. The portions of the pipes adjacent to the copper ground lead should be thoroughly tinned, as should the ground lead itself, to prevent electrolytic action between dissimilar metals.

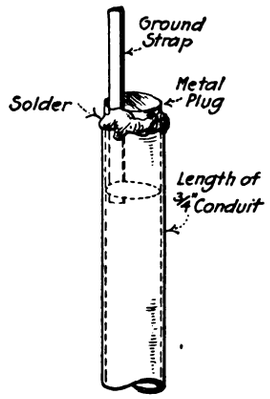


Fig. 9.—Method of Connecting Ground Strap to Ground Pipe.

The resistance of a pipe earth connection varies about inversely as the depth of the pipe in the conducting stratum. Practically all of the resistance of the connection is in the immediate vicinity of the pipe. When preparing multiple-pipe grounds no two pipes of the system should be located closer together than 6 feet. Where the pipes are thus spaced the combined resistance of a multiple-pipe ground will vary inversely as the number of pipes composing it, that is, a two-pipe earth connection will have one-half the resistance of a one-pipe connection, and eight pipes will have one-eighth the resistance of one pipe. The diameter of the pipe has, within reasonable limits, little effect. A good earth connection made by driving one pipe into the ground should have a resistance of less than 20 ohms.

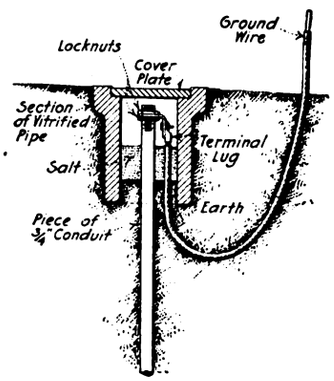


Fig. 10.—Wrought-Iron Pipe Ground With Salting Pocket.

The size of pipe or rod to use for making grounds is a quantity that admits of no absolute determination. The rod or pipe must always be large enough to insure ample mechanical strength and so that it will not vibrate excessively while it is being driven. A one-inch wrought-iron pipe is usually satisfactory. In important installations, two-inch pipe may be used.

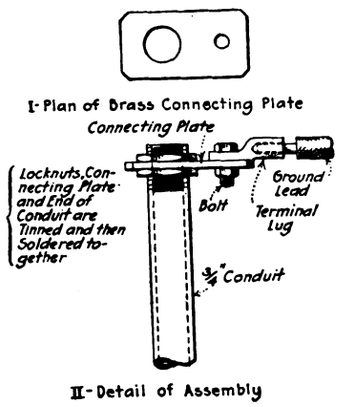


Fig. 11.—Connecting to Ground Pipe Where Lead Taps Off Horizontally.

Ground rods, Fig. 2, are sometimes used instead of ground pipes. They find their principal application for grounds for telephone and other small lightning arresters. These ground rods are usually about 6 feet long and 0.5 inch in diameter and therefore are not sufficiently heavy for ordinary electric light or power work. The conditions affecting their installation are essentially the same as those described in connection with the ground pipes as outlined in the preceding paragraph. It is obvious that a ground pipe will, for a given amount of material, be longer and stronger than a solid rod. This is the reason why pipes are used more frequently than solid rods.

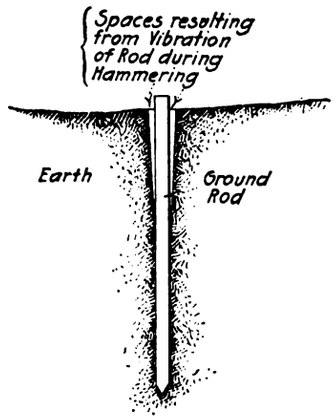


Fig. 12.—Showing Decrease in Contact Area Due to Vibration of Rod.

The ground-plate method of connection is now probably the most infrequently applied of all, it having been superseded to a large extent by the ground-pipe method. Typical ground-

Digitized by Google

plate installations are shown in Figs. 1 and 6. Detailed instructions for making the ground-plate grounds are given in rule 15g in the National Electrical Code. The ground plate should always, if possible, be buried in permanently moist soil. Where it is possible to install it in the earth under the bank of a stream that never runs dry, the ideal condition will be attained. Merely sinking a metallic plate in the bed of a stream, particularly if it has a rocky bottom and if the water in the stream is pure, will not necessarily make a good ground connection. Pure water, contrary to the general belief, has a very high resistance. However, if this water is combined with metallic salts that usually are in solution in the earth the conductivity of the combination is good. While a metallic ground plate buried in crushed coke or charcoal, Fig. 6, may have a better conductivity than the ground afforded by a single pipe driven into the earth, it is probable that a multiple-pipe connection, Fig. 13, affords a better ground than one ground plate.

A charcoal or coke bed for a ground plate has the effect of increasing the area of the plate in contact with the earth because the carbon is a good conductor and the granulated carbon also acts somewhat like a sponge, in that it retains moisture and tends to keep the adjacent earth in a damp condition, thereby rendering its conductivity a maximum.

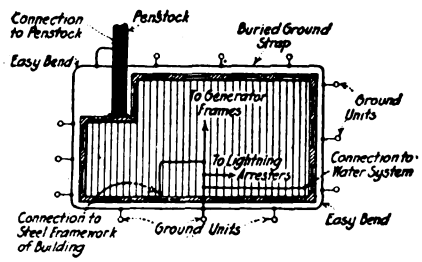


Fig. 13.—Multiple-Pipe Ground Installation.

The method of making a plate ground is shown in Fig. 6. A hole is excavated as near as possible to the location where the ground connection is to be made. Ordinarily the excavation should be about 6 feet long, 4 feet wide, and deep enough to insure to a reasonable certainty that its bottom will always lie in a permanently moist strata. Usually such holes should be 8 or 10 feet deep. The bottom of the hole is filled with a two-foot layer of crushed charcoal, or pea coke well tamped. The ground plate is then placed on this filler and covered with another two-foot layer of the granulated carbon. This layer should also be tamped. The excavation is backfilled to the surface with earth. If common salt (sodium chloride) is mixed with the back filling, the conductivity of the earth will be increased. However, the salt will in time dissolve and soak away into the earth. If the conductivity of the soil at the location where the ground is made is poor, provision should be made somewhat as suggested in Fig. 10, whereby the salt can be replenished and the high conductivity of the soil continuously maintained.

Ground plates are shown in Figs. 6 and 16. The plates are usually made of No. 14 or 16 gauge sheet copper. Ribbed cast-iron plates are, however, quite satisfactory. (See note following rule 15g of the National Electrical Code.) Sheet-iron plates should be avoided because the ordinary commer-

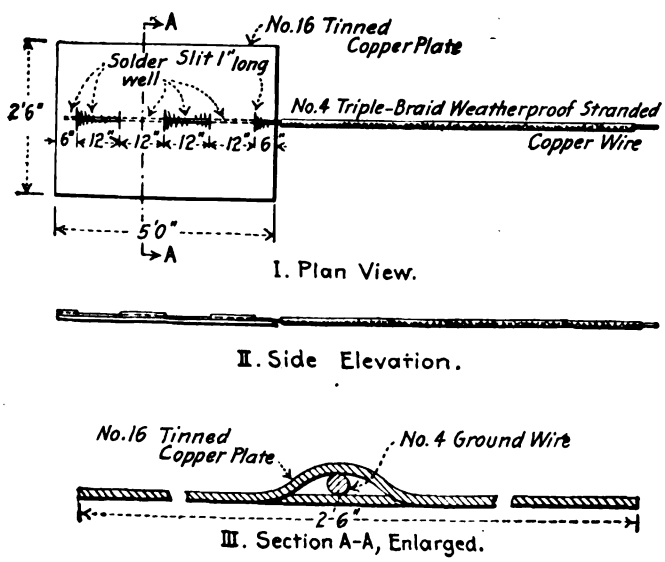


Fig. 14.—Best Method of Connecting Ground Wire to Ground Plate.

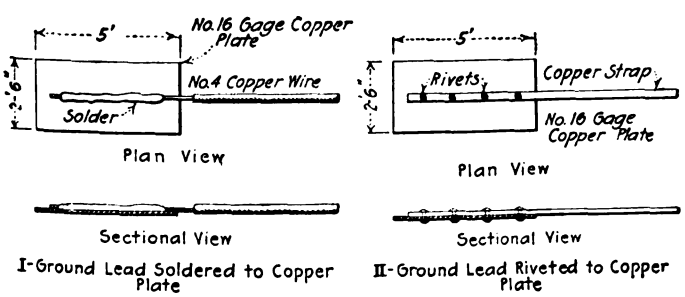


Fig. 15.—Method of Connecting Ground Lead to Ground Plate.

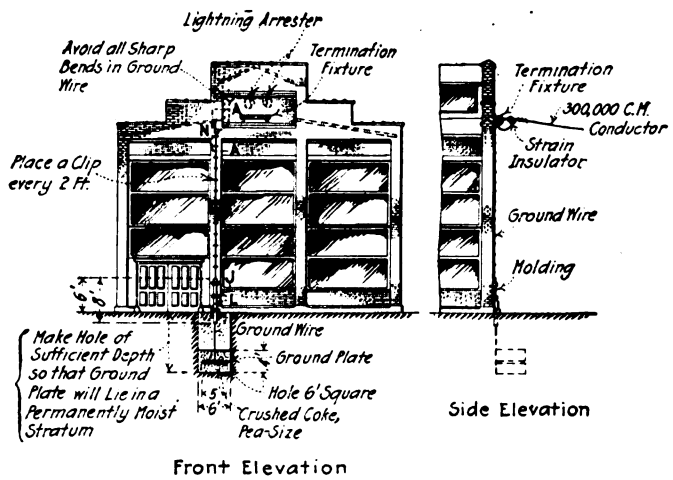


Fig. 17.—Assembly of Lightning-Arrester Installation.

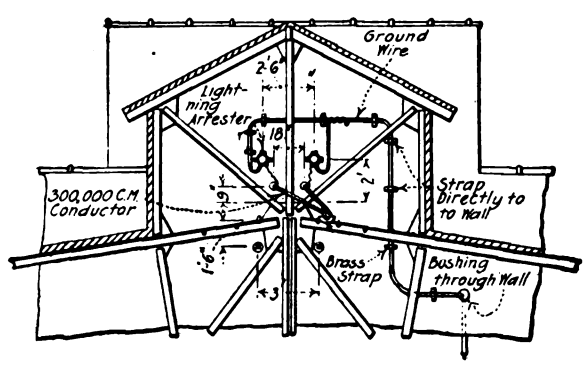


Fig. 18.—Arrangement of Arresters Inside Building.

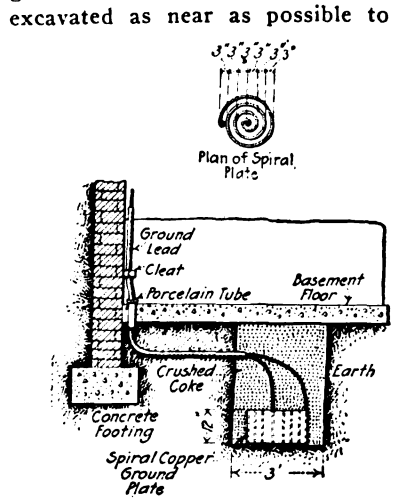


Fig. 16.—Spiral Ground Plate Under Basement Floor.

Digitized by Google

cial "sheet iron" is usually sheet steel and will corrode rapidly and waste away entirely. A ground plate should have an area on each surface of about 10 or 12 square feet, that is, a total superficial area of about 20 to 24 square feet.

The methods of connecting the ground leads to ground plates are shown in Figs. 14 and 15. In Fig. 14 slots about one inch long are punched through the plate across its center line. The end of the ground wire where it has been previously stripped of its insulation and tinned is threaded through the slots as shown and is then soldered to the plate. Both surfaces of the plate should be well tinned. The method just described is probably the best one for connecting a lead to a ground plate. The lead can be soldered to the upper face of the ground plate as shown in Fig. 15, I. Where a copper strap is used for a ground lead. it can be riveted to the plate and then soldered as shown in Fig. 15, II.

A spiral sheet copper ground plate is shown in Fig. 16. Ground plates of

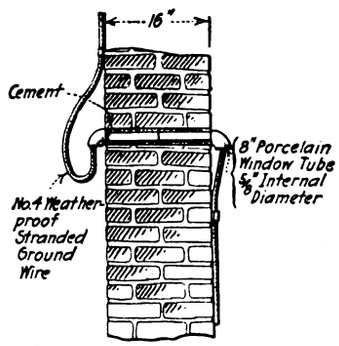


Fig. 20.—Porcelain Tubes Used to Protect Ground Wires.

this type have been employed to a certain extent by the telephone companies in the East, where it was desired to secure large superficial contact area within a small space. These spiral plates are usually bedded in crushed coke or charcoal, unless the earth in which they are installed is very damp.

A complete lightning-arrester system and ground connection for a 250-volt industrial plant is shown in Fig. 17. The ground wire connecting the two arresters is carried down inside of the building, Fig. 18, to a point *N*, Fig. 17, where it is brought through the wall and led down the outside of the building to the ground plate. The ground wire is clamped to its supporting surface by brass clips spaced two feet between centers down to a point within six feet from the sidewalk level. From this point it is carried to a point two feet below the sidewalk level in wooden molding, Fig. 19. The function of the molding is to prevent the accidental contact of pedestrians with the ground wire, which may, under certain conditions, become charged and thereby endanger life. Fig. 20 details the method whereby the ground lead was carried through the wall at the point *N*. Insulation of the ground lead from the wall is, of course, not necessary at this point, but the porcelain tubes were used to prevent moisture from entering around the lead, and to give the wire an "official" appearance to prevent interference from unauthorized persons.

Lightning arresters on pole lines should, on low-potential lines, be installed about as shown in Fig. 6. In localities subject to lightning disturbances it pays to locate arresters not only at the station but at numerous points along the line. The function of these line lightning arresters is to protect the transformers, if there are such, and the service wires to the buildings and to discharge the line. It is considered good practice to place the arresters at intervals along the line of from 1,500 to 2,000 feet, more or less. Where an overhead line joins an underground cable, an arrester should be located at the junction. It is desirable to place line arresters at points where several overhead lines join, because then a discharge intercepted by any one of the lines may reach ground through the arrester.

It is claimed by some that effective protection of distributing transformers against lightning and static disturbances can be attained only through the installation of a suitable lightning arrester on each wire of the transformer primary circuit, on the pole on which the transformer hangs. It is claimed that if a lightning arrester is located even one pole away, the difference of potential on the transformer due to lightning disturbances may be double that which would obtain were the arrester on the same pole with the transformer.

Ground wires should not be connected to gas pipes because there is always the possibility of a spark or arc between lengths of a gas pipe so connected, due to a faulty coupling or a rusty joint. Such an arc might ignite the gas and cause a fire. Furthermore, the discharge might, instead of following around the metal work of a meter, jump directly across portions of it and produce an explosion.

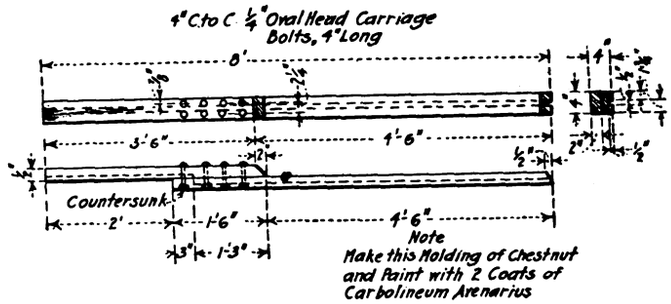


Fig. 19.—Wooden Molding for Ground Wire.

Ground wires should not be run inside of iron pipes unless the ground wire is electrically connected to the pipe at the point where it enters it. If the electrical connection is omitted, the iron pipe incasing the wire will greatly increase the reactance of the ground lead, thereby causing it to present immense opposition to the high-frequency lightning-discharge currents.

The function of the choke coil is to provide a certain amount of reactance in a circuit between the outside line and the apparatus which the lightning arrester is to protect. Reactance offers great opposition to lightning-discharge currents and hence tends to force them to take a path through the lightning arrester to ground rather than through the apparatus in the station to ground.

Choke coils must be thoroughly insulated. The insulation may, for a low-voltage choke coil, be provided by the base on which the coil is mounted. High-tension choke coils are supported on insulating pillars, as shown in Fig. 21, II. The choke coil is always. as shown in Fig. 1, connected directly in the line and hence is at line potential whenever the circuit is alive.

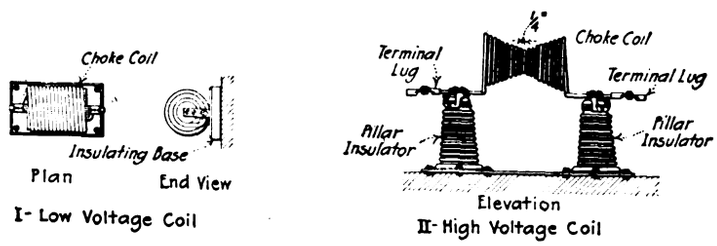


Fig. 21.—Choke Coils for Low and High-Tension Service.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The vacation season is practically over and the secretary is beginning to receive information as to the fall activities of the sections. For his own part, he is at home again and is to be addressed, as usual, at Concord, Mass.

R. Weaver, electrical inspector for the Missouri Inspection Bureau, St. Louis, Mo., and Ernest E. Choate, municipal electrical inspector for the town of Milton, Mass., have become members of the Association.

It is the custom in a number of places for the chiefs of inspection departments to hold at intervals conferences, to which contractors, wire men, etc., as well as inspectors are invited and at which questions on the Code, wiring and correlated subjects are discussed. The two questions presented this week are two which arose under these circumstances and were presented to me by one of the most valued and energetic of our Executive Committee members with the hint that a number of inspectors found it difficult to answer wiremen's questions of similar nature. Several of our members felt that they were not strictly Code questions, yet they seemed to me so closely connected therewith (Rule 1 containing some very condensed and technical matter) that they were suitable for our column, and I asked one of our members to reply rather at length (which accounts for the length of one reply to No. 311), especially as three of our members stated they did not grasp the meaning of autotransformers in connection with direct-current generators.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Protection of Two-Wire Direct-Current Generators.

Question 310.—There is a difference of opinion as to just where the fuse protection referred to in paragraph two, Rule 1d should be placed. Some inspectors insist it should not be placed in the line with the series field or connected thereto. Why so?

Answer 1(E). Our experience has been to require the placing of the fuse in the lead which is not connected to the series winding. I think an earlier edition of the Code had a similar wording in its rule on this subject. In a shunt-wound generator, however, the fuse may be placed in either lead. This would be true, also if a single compound-wound generator is used.

Answer 2 (T). For a single two-wire direct-current generator either shunt or compound wound it would make no difference in which lead the single-pole protection as mentioned under Rule 1, section *d*, second paragraph, be placed. For compound direct-current generators operating in parallel single-pole protection should not be placed in lead connected to series field; owing to the effect of current flowing through equilizer a fuse placed in this lead would not provide proper protection for the armature.

Answer 3(P)*. I consider the question to be incomplete. In the case of a series-wound generator the placing of the fuse anywhere in the line at the machine will satisfy the rule. If the machine is compound wound, however, care must be taken to see that the fuse is so located that when it blows it will open the shunt-field circuit as well as the series field.

Answer 4(F and G). The rule in question only requires single-pole protection. It is very evident that the closer we can place this protection to the armature (which is the source of supply) the better protection we get. If the fuse is placed in the main connected to the series field, then the protection is removed just that much further away. Also, if the series-field insulation broke down with the opposite polarity grounded, a fuse placed in the lead not connected to the series coil would receive all of the current returning to the armature and would protect the machine.

Answer 5(S)*. If the person who sent this question will consult a drawing, of two compound dynamos in parallel, he will find that serious troubles might arise if the single-pole protection was placed in the line with the series field. If the series side of the line should be opened this dynamo would become a motor and run as such by current from the other dynamo. If the question is for a single machine, the protective device might be placed on either side of the line and same would be approved.

Answer 6(M). The Code does not state that the fuse protection should be placed in the line with series field. Where a machine is operating as a single unit I can see no objection to the protection referred to. Where compound-wound generators are operating in parallel, if the fuse in the series lead were open, the current would still have a path to the armature through the equalizer connection, which may be the objection raised by the inspector in question.

Answer 7(D). In answer to this

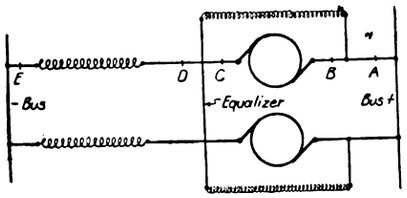
Digitized by Google

question, would state that I do not know why some inspectors prohibit the fusing in the line with the series field or connected thereto. Perhaps those who are objecting could give us some information.

Answer 8 (O). Except for a generator on a two-wire grounded system where the safety device must be placed in the grounded lead, the Code does not specify which side of the circuit is to contain the safety device. It is doubtless true that the opening of the main circuit of a compound-wound machine at a point near the series field would, owing to the inductive "kick" from the series winding, be less desirable than opening the other side of the circuit. The inspector may properly recommend that the fuse or circuit-breaker be not placed in the side containing the series field, but he has no right under the Code to demand it.

Answer 9(R)*. The Code requests this protection to be placed in the lead not connected to the series field. I presume a fuse so located is not subjected to so large an inductive effect from the field discharge, in case of a heavy short-circuit under load, in view of the fact that the armature is in series with it and the field.

Answer 10(N)*. When a series or compound generator is operated singly it makes no difference in which lead the single-pole protection is placed, except the strict wording requires that it be



No. 310.—Location of Fuses for Two Direct-Current Generators.

placed between the armature and shunt-field connection.

When, however, these two types are operated in parallel with other machines the presence of the equalizer introduces a pronounced change of possibilities. The single-pole protection may be placed at either of the five points *A, B, C, D,* or *E*. If it be placed at *A* and it opens, it leaves the shunt field excited and entire machine alive up to the machine end of the fuse. If at *B,* the armature is opened, but shunt field excited from the bus. If at *C,* the armature is opened but shunt field excited from bus as before. If at *D,* the outside circuit of machine is open, but machine may drive as a shunt motor from the other machine under certain conditions. *E* is ruled out as too far from the machine; also, if the fuse be at either *D* or *E,* the current distribution through the other series coils in parallel will be entirely altered.

The most suitable place under all the circumstances, as I read the rule, is at *B* (and possibly noting the last line of Rule 1 *d*, second paragraph, arranged to open the equalizer also, though I do not feel certain about this and rather doubt its wisdom). The objection to *C* is greater risk from the inductive action of its series field. I do not see how any inspector can under the rule insist on *B* rather than *C*, though he may certainly advise it wisely enough.

Protection of Three-Wire Direct-Current Generators.

Question 311. Rule 1d, fifth paragraph, requires a safety device to be put in each armature lead, and connected so as to receive the entire current from the armature. When autotransformers are used with this type of generator in order to get a neutral connection, should these transformer leads be protected and how?

Answer 1(E). Outside my experience.

Answer 2(T). If protection as specified by the Code for three-wire direct-current generators be provided, the leads to transformers or autotransformers as used with this type of generator would not need any further protection.

Answer 3(P)*. Read Rule 23 in connection with this question and then determine whether or not it would be permissible in any given case to supply fuses to the transformer leads, bearing in mind the fact that there are a number of situations in which it is very undesirable to have the neutral leg of a circuit open without the other legs opening simultaneously.

Answer 4(F and G). Reading a little further in this rule, we find the statement that "fuses will not be acceptable." Circuit-breakers only are approved and the safety devices must be so installed that no one pole can be opened without simultaneously disconnecting both sides of the armature from the system. The above rules, together with the question of fusing the transformer leads of the three-wire generator, are based upon the same reasons, namely, the design of a three-wire generator is such that it cannot safely carry an unbalance of more than 25 per cent of its full-load current. Fuses are not permitted because one side only may operate and allow the full load of the opposite side to flow through the neutral connection which would constitute an abnormal unbalance and, of course, interlocking circuit-breakers are required for the same reason. If any circuit-opening devices are placed in the several transformer leads, then the opening of any one of the devices may permit excessive voltage to be impressed upon a section of the transformer winding, with resulting complications and trouble, depending upon the amount of load connected to the generator at the time.

Answer 5(M). Fuses should not be placed in the leads of the auto-transformers used in connection with three-wire direct-current generators. These transformers are interconnected so as to provide a neutral connection which it is believed should be continuous from armature to line.

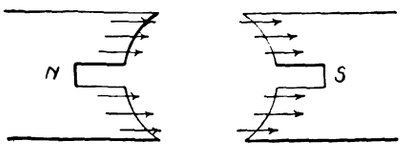
Answer 6(D). In my opinion the transformer leads should not be protected by fuses and these transformers should be located as near as possible to generator.

Answer 7(B)*. For type of machine referred to, a circuit-breaker, so designed that all wires will be opened when breaker operates, should be installed.

Answer 8(O). A transformer used in connection with a three-wire generator, whether or not it is mounted in or on the generator frame, is to be considered a part of the generator itself and does not need fuse protection any more than the shunt-field circuit needs protection. It would seem to the writer very undesirable to open any part of this circuit.

Answer 9 (R)*. Transformers so used should be protected on the primary side to their full capacity.

Answer 10(N)*. A complete reply to



No. 311.—Split-Pole Method of Making Three-Wire Generator.

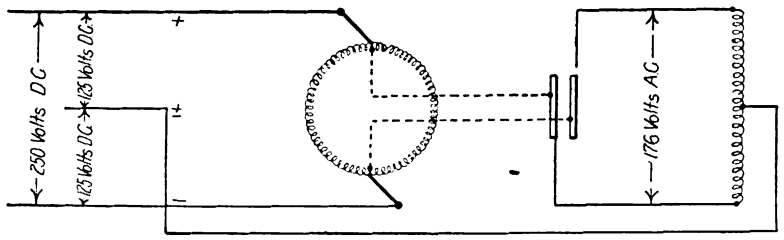
this question would carry us far afield, and hence my reply will be as condensed as possible. There have been several types of three-wire generators worked out, of which two may be mentioned; first premising, however, that the point of difficulty lies in getting a tap to a point in the armature winding which shall always be electrically midway between the positive and negative brush-contact potentials and to which the neutral wire may be connected. The earliest thought was simply to place a third brush on the commutator midway between the + and — brushes, but of course it was found that when the latter brushes were properly placed for sparkless commutation, the so-called "neutral" brush was connected to coils lying in the very strongest part of the field and consequently sparking at that point was so

Digitized by Google

violent as to be prohibitive. The two types above referred to are:

First, the split-pole type in which the *N* and *S* pole pieces are split as shown so as to leave under the middle of the pole a vacant place where the field is very weak and where the "neutral" brush may more readily be placed. Or an ordinary four-pole machine may be used, making two adjacent poles north instead of two opposite ones, and making the two brushes between the two similar poles of each set the "neutrals."

The second type (the one referred to in the question) is based on the Dobrowolsky patents. It is essentially a machine like a synchronous converter or double-current generator. That is, we have an armature of one of the types of winding suitable for these machines and designed for say 250 direct-current voltage. This winding may now be tapped to a pair of slip rings when it will develop a single-phase alternating-current voltage of about 176 volts. Or it may be tapped for three phase or two phase, if desired. Suppose now we connect between these two slip rings an autotransformer of very low resistance, large current capacity and high inductance with 176 turns and hence a voltage drop of one volt per turn, while the alternating-current magnetizing current normally flowing will be almost negligibly small.



No. 311.—Three-Wire Generator With Autotransformer.

If now we tap this autotransformer between the 88th and 89th turns, we have a point which is exactly half way always between the two alternating-current brush potentials; in other words, it is the electrical center of the armature and half way between the two direct-current brush potentials, 125 volts above the negative and 125 volts below the positive and hence a suitable place for the neutral connection.

The connections are as shown. Now when the three-wire direct current is unbalanced, a current will flow over the neutral and back to the armature through the coils of the autotransformer, which, being of low resistance, offers practically no opposition, its inductance not counting of course in this case. In an actual machine three-phase or two-phase arrangements are better as allowing more return paths for the current over the neutral and better distribution in the armature windings.

The wording of the last part of the fifth paragraph of the rule referred to in the question is placed there to distinguish between shunt and compound machines. In the latter we have to split the compounding coils into halves and put half on each side of the armature, otherwise when the three-wire system is unbalanced the machine will not compound properly. Hence we have two equalizer leads to be opened.

A little consideration will show that any fusing of the alternating-current taps and leads might cause very dangerous conditions of unbalanced armature currents, partial or total loss of neutral, etc.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Pacific Telephone & Telegraph Company has entered a formal application asking the Commission to make an investigation for the purpose of determining uniform rates which may apply throughout the state.

MASSACHUSETTS.

Charles A. Russell has been nominated by the Governor as a member of the Public Service Commission, to succeed Clinton White, who retired last spring.

NEW YORK—Second District.

New York & North Shore Traction Company. The Commission has decided, in an opinion by Commissioner Frank Irvine that it has no power to modify the terms of a franchise granted by a municipality to a utility company.

The New York & North Shore Traction Company asked that the Commission determine that the just and reasonable fare between Mineola and Port Washington is 15 cents instead of 10 cents, to which the road is limited by the terms of its franchise granted by the supervisors of Nassau County and the Highway Commissioners of the Town of North Hempstead.

The applicant contended that the power to grant franchises in a municipality was but a power delegated to the municipality by the Legislature, and that the Legislature or the Commission, to whom the Legislature has delegated general power over rates, could amend the franchise.

Judge Irvine in his opinion cites a clause in the Constitution providing that no law granting a street-railway franchise can be passed without the consent of the local authorities and the abutting property owners. He says that if the language of the Public Service Commissions Law giving the Commissions power over rates were to be construed as giving the Commission power to change the terms of a local permission, it would undoubtedly be unconstitutional.

WISCONSIN.

City of Barron Light and Water Utilities. The Light and Water Commission of the City of Barron applied for authority to adjust its flat rates and install meter rates. The investigation was handicapped by lack of sufficient data and confusion in the accounts of the utilities. Tentative meter rates were prescribed by the Commission, which may be revised after the results of metering a portion or all of the service is known.

Commenting upon the necessity of rate revision, the Commission says: "The most important problem which arises in connection with a public utility is the adoption of a satisfactory system of rates. There are, of course, other problems arising, but they are less serious than the problem of determining an equitable rate. The flat rate is glaringly inadequate to allocate charges in an impartial manner. Such rates open up a possibility of waste or reckless and unnecessary use by the consumer, because the cost to him is

Digitized by Google

determined only by the number of fixtures connected and is not based on the water consumed."

In considering proper rates to be charged for service rendered by the water utility to the city, the decision says: "If the relations between the city and the utility are to remain as they have been during the past, considerable uncertainty will exist as to the relative indebtedness of the city to the water department and vice versa. In the past the water department has charged the city with earnings from hydrant rentals. When the water works has to make extensions, etc., beyond the limit of funds on hand, said funds being obtained from earnings of general service, the city is called upon to furnish the money. The difference between the debits and credits to the city under this scheme is incorrectly shown in the balance sheet under the heading 'Depreciation Reserve Fund.'

"The Board of Water Commissioners has asked for the establishment of a different system of relationship between the Commission and the city in place of the conditional arrangements which now exist. It appears to be a good business policy to treat a municipal water plant or electric plant as an enterprise separate and distinct from the municipality itself, and to have accounts kept accordingly. If this policy is followed the city should pay the utility, at a reasonable rate, for all service rendered the city, in order to avoid unjust discrimination in favor of the taxpayers of the city as against consumers; the utility, in turn, should pay the city a reasonable amount as taxes and as interest on the city's equity in the property of the utility, in order to avoid unjust discrimination in favor of the consumers as against the taxpayers. It naturally follows, also, that the city should provide all funds required for plant extensions," etc.

The Chippewa County Telephone Company was denied authority to extend its lines to serve a subscriber in the town of La Fayette. The subscriber is at present served by the Wisconsin Telephone Company, which company filed an objection to the construction of the line in question. The subscriber is a tenant on a farm and desired the change in service so as to be able to communicate directly with his landlord. The Commission finds that his service and the landlord's service are otherwise adequate.

Owing to changes that may take place in the ownership of the farm, its tenancy, or the conditions of the lease, the continuance of any advantage of the service of the Chippewa Company over the present service through any length of time seems problematical. The Commission says: "To permit the extension of a line of telephone to reach a subscriber already having at hand telephone service which would fulfill all of the ordinary requirements, depriving an existing system of a potential subscriber and allowing the proponent company to make an investment that may at any time become idle, would seem to be ruthless treatment of the principle upon which the anti-duplication act is based. The whole spirit of the law is to make for permanency, for settled conditions, in the telephone field, and for that sense of security of telephone investments that comes from a certainty that no encroachment will be permitted upon territory already efficiently served when the company occupying it has not overbuilt its natural boundaries. Considered from the viewpoint of the proponent company this extension, if allowed, would appear unwise; considered from the standpoint of the objector, it would be unfair." * * *

"It is but natural for people to wish to get more for their money. However, when a subscriber to telephone service is offered communication at a fair rental with his neighbors and with his business center he may consider that, so far as extent of service is considered, he should expect no more without an additional charge. Messages that pass beyond the natural limitations of the community in which the subscriber has his ordinary business and social interests may be classed as toll messages for which an extra charge may be made. The fact that a subscriber has made an investment in a locality beyond these natural limits does not entitle him to telephone accommodations to reach that locality without extra charge."

Reduction in Residence Rates of the Milwaukee Electric Railway & Light Company. The Milwaukee Electric Railway & Light Company has made a reduction in rates for residence lighting under its schedule based on consumption per active room. The change is made effective as of October 15, 1915.

The former rate provided a primary charge of 11 cents gross per kilowatt-hour, a secondary charge of 5 cents gross per kilowatt-hour and 4 cents for the excess. The primary charge is left unchanged, but the secondary charge of 5 cents is applied to all energy consumed in excess of that paid for under the primary rate, up to a consumption of 7 kilowatt-hours per active room per month instead of up to a total of 100 kilowatt-hours, and the excess rate is reduced from 4 to 2 cents per kilowatt-hour.

The company also announces that with the increase in the number of customers further reductions in residence rates will be made as a means of sharing with its customers the economies achieved through increased patronage.

The new rates are as follows:

Primary Charge—11 cents per kilowatt-hour for (1) the first 4 kilowatt-hours consumed per month for each of the first four active rooms, (2) the first 2.5 kilowatt-hours consumed per month for each of the active rooms in addition to the first four.

Secondary Charge—5 cents per kilowatt-hour for all energy in excess of that paid for at the primary rate up to a total of 7 kilowatt-hours per active room per month.

Tertiary Rate—2 cents per kilowatt-hour for all excess consumed per month.

These rates are subject to a prompt-payment discount for payment within ten days from date of bill of five per cent of the first $25.00, and one per cent on amounts in excess of $25.00, and a minimum charge of 50 cents per month per meter.

All rooms are considered active, except three bedrooms, bathroom, basement, garret, closets and back porch.

The following agreement for further reductions is also announced by the company: The present customers in Milwaukee and immediate suburbs number 32,276. When the number of customers in the same territory reaches 40,000 the primary rate to residence customers will be reduced to 10 cents gross, or 9.5 cents net, per kilowatt-hour. When the number of customers in the same territory reaches 50,000, the primary rate to residence customers will be reduced to 9 cents gross.

Production Meter to Check Building Operations.

In the construction of the new buildings for the Massachusetts Institute of Technology, at Cambridge, Mass., by the Stone & Webster Engineering Corporation, of Boston, a Productograph, manufactured by Slocum, Avram & Slocum, New York City, is installed as a means of keeping the superintendent informed at all times as to the output of the several concrete mixers on the work.

The annunciator and recording instrument are installed in the superintendent's office, and its five fingers and dials are electrically connected with each of the mixing machines. Not only is the number of batches of concrete produced in a day recorded, but the time taken for the mixing of each batch is also recorded.

The productograph is considered by Superintendent Carr as not only desirable and valuable in stimulating a healthy rivalry between the several mixer gangs, but indeed necessary to produce to advantage.

For the benefit of shipping in the Caribbean Sea, the radio station at Colon, Panama Canal Zone, sends broadcast each day a weather forecast received from Key West.

Digitized by Google

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS.

Annual Convention, Detroit, Mich., September 8 to 11.

The ninth annual convention of the Association of Iron and Steel Electrical Engineers was held at the Hotel Statler, Detroit, on September 8, 9, 10, and 11. The convention excited unusual interest because of the importance of the papers to be presented and as a result there was an attendance of nearly 300.

The first session, on Wednesday afternoon, was opened by a paper by R. F. Patterson on "Improving Non-Condensing Power Plant by Use of Direct-Current Mixed-Pressure Turbine Equipment."

Mr. Patterson described in detail such a change as his title indicates, giving several tables tabulating advantages against disadvantages in very complete fashion. The addition of the turbine, in this case, cost about $83,000 and procured a saving to the plant of $30,500 a year—a net saving of $20,000.

The second paper of the session was "Wire Rope and its Relation to Steel Making," by J. F. Howe.

The author first traced the history of rope manufacture from its origin to present modern methods.

The session then adjourned until Thursday morning.

The Thursday morning session opened with Past President Friedlaender in the chair and an audience which taxed the capacity of the hall.

The first paper was "Recent Developments in Power Generating Apparatus," by P. M. Lincoln. Mr. Lincoln spoke of the extraordinary progress of the past few years in generating apparatus. He cited the units installed for the Interboro Rapid Transit Company, where an economy of better than 11.27 pounds of water per kilowatt-hour at the buss, was obtained. This unit, he said, was rated at 30,000 kilowatts—a size undreamed of only a few years ago, when (in 1898) a turbine of 5,000 kilowatts was the limit. Mr. Lincoln prophesied that the capacity of the future unit will be fixed by the demand, rather than by any inability to produce them in any sizes whatever.

Mr. Lincoln then presented some curves showing the ideal water rate of steam turbines under varying conditions of steam and vacuum and showing the relation between this rate and the size of the unit. These curves, he pointed out, showed the inherent advantage of central-station power over any isolated plant, in view of the so largely increased economy of the former, due to its immense units.

Mr. Lincoln went on to say that economies in water rate was not the only economy resulting from the use of large units. One very important item is economy in labor and also that due to diversity-factor. Mr. Lincoln emphasized this point because of a tendency among steel engineers to consider that the amount of power they require justifies a special plant. He pointed out that his curves show conclusively that "no matter how large an amount of power is required, it can be generated more cheaply if it is made a part of a still larger supply."

In closing Mr. Lincoln spoke of the growing tendency to adopt 60-cycle current as standard, even having replaced 25 cycle to such an extent as to almost "establish a claim to universality."

The next paper was entitled, "Protection and Control of Industrial Electric Power," by C. P. Steinmetz.

Dr. Steinmetz pointed out, first, the many advantages of electricity over any other form of energy, among them being: High efficiency, simplicity of conversion to other forms of power, possibility of unlimited transmission and distribution, concentration of power generation in one station with interconnecting trunk lines in reserve, the availability of any or all of the power at any desired point. These considerations called for the necessity of means of preventing shut downs because of accident.

Therefore, Dr. Steinmetz said, it is necessary not only to limit the power which may, by accident, be let loose destructively; but also to protect the system against any accident in any part.

In limiting or rather preventing the concentration of power at the point of accident, circuit-breakers, fuses and the like are of little avail. Dr. Steinmetz, rather recommended reactance in the generator circuits. Generators should be built with as much internal reactance as consistent with economical and efficient design and the rest of the necessary reactance put in the generator leads. The speaker pointed out that additional feeder reactances were desirable but not essential if the generator circuits were protected.

Dr. Steinmetz then mentioned the reverse-current relay and its use in segregating the apparatus in trouble without shutting down the system.

Lightning and its disastrous effects on transmission lines and electrical equipment, was then touched on. Aluminum-cell lightning arresters are the remedy, here, the writer advocating these as the best known preventative of trouble from this source. However, the aluminum cell cannot protect against high frequency, the only remedy being the overhead ground wire.

"First class installations, high insulation and effective controlling and protective devices are the requirements of efficient, reliable and therefore economical operation. However, they are only half the requirement, and equally important is the operating staff." The latter requires system and organization and above all, accurate records. "Reliable and complete records are essential to get the exact facts, to find what happened and how it happened so as to guard against its recurrence." For this purpose Dr. Steinmetz recommends the "Multi-Recorder," a device which records the exact second when any event in the station takes place, as, for example, the opening or closing of switches or circuit-breakers, recording of grounds or shorts, excess currents, high frequency, lightning discharges, etc.

In opening the discussion Mr. Friedlaender emphasized the necessity for installing reactances and any other protective device which would tend toward "safety first."

Mr. Lincoln advocated the placing of reactances in the feeders rather than in the generator leads. He also advocated the overhead ground wire as the best method of lightning protection—the forming of a "cage" by two or even three wires being recommended.

After some further discussion the meeting listened to E. Friedlaender on "Motor Generators versus Rotary Converters," with J. C. Reed in the chair.

Mr. Friedlaender disclaimed any intention of advocating either type of machine but proposed to compare the two. As a general proposition, he said, if the conversion of alternating-current to direct-current is alone in question, the rotary will give better efficiency and the motor-generator set greater flexibility of operation.

In detail, the writer pointed out that the difference in first cost was too slight to mention; that the "rotaries require considerable more floor space than motor-generator sets," that the difference in efficiency was not important in steel-mill practice, that the rotary operates at unity power-factor and a motor-generator set at 0.8 leading power-factor.

In the matter of power-factor correction, the rotary allows only one-tenth the amount of correction possible with a motor-generator set. "The power-factor correction value of a motor-generator set is limited only by first cost and does not depend upon the load carried by the machine, while such value of rotary is practically nothing and cannot be properly controlled on variable loads."

"In steel-mill service, motor-generator sets seem to be preferable to rotaries only from the standpoint of good regulation." The dependence of

Digitized by Google

delivery voltage upon impressed voltage, in rotaries, presents a serious obstacle to their satisfactory operation in steel mills.

As to load-factor, the writer said "practice has proven that the load-factor of a motor-generator set delivering direct current in parallel with other sources of power, is limited only by the temperature rise, but the load-factor of a rotary under such conditions can hardly exceed 75 to 80 per cent and give reliable service."

In operation, Mr. Friedlaender maintained the motor-generator set far superior to the rotary on the ground of ease of operation, freedom from trouble, and greater reliability.

In conclusion, the writer said that rotaries could only be recommended where the direct-current end is not paralleled with other sources of direct-current power, where even approximately constant direct-current voltage is not required, and where power-factor correction is of no value.

C. W. Parkhurst, in opening the discussion, took issue with Mr. Friedlaender as to his conclusions, maintaining that the rotary was satisfactory with respect to power-factor correction, that the attendance cost was much less, that first cost was less and reliability and efficiency greater than a motor-generator set. He further stated that a rotary could be paralleled with other direct current with entire success.

P. M. Lincoln spoke also in favor of rotaries, making the point that with the transformers which are necessary for a motor-generator set at modern transmission voltages, a rotary will cost much less. And even if transformers are not used with the motor-generator set, the rotary transformers are more to be relied on than the high-voltage motor of the motor-generator set.

He pointed out that because the motor-generator set operated most of the time (in a steel mill) at less than half load, the rotary was far superior in efficiency. He said the capitalized value of the difference in efficiency will equal the first cost of the motor-generator set. Mr. Lincoln agreed with the writer of the paper on the point of power-factor correction where such correction is essential, but maintained that such was not the case in a steel mill.

S. S. Wheeler stated that rotaries would, in general, meet all demands and should have unlimited load-factor in parallel with other sources of power.

Gano Dunn said his views had always been those of Mr. Friedlaender but he was willing to revise them according to the contentions of Parkhurst and Lincoln. He pointed out, however, that the power-factor correction characteristic of the motor-generator set would more than offset any difference in cost and would put the two machines on a par, economically.

Mr. Tyne stated that a motor-generator set permits a higher plant load-factor and that efficiency was unimportant with purchased power.

In closing, Mr. Friedlaender pointed out that the circumstances governing in each plant would determine the choice. He explained Mr. Parkhurst's and Mr. Lincoln's views by the conditions in their plants which warped their judgment in this regard.

The meeting of Thursday afternoon opened before a large gathering with the paper, "Some of the Latent Developments in Electrical Equipment," by K. A. Pauly. The writer first spoke of the efforts of steel engineers to obtain flexibility of speed control with alternating-current motors. He touched briefly on the two best systems of accomplishing this—the Scherbius system, and the rotary-converter system. Several installations of both systems are in operation and each with success—the former being the more usual. The three chief advantages of the Scherbius system are: requires one less machine (rotary); roll motor can be adjusted to operate at synchronous speed at any load; the power-factor of main roll motor can be raised to unity.

Mr. Pauly then spoke of recent electrification of mines, especially in connection of large hoists, automatically operated.

The writer then spoke of the so-called "truck type" of switchboard in which the high-tension equipment is entirely inclosed and out of reach and all apparatus, connections, and small wiring are mounted on a movable truck. The removal of this truck permits access to every part.

In opening the discussion, W. Sykes explained that the objections to the rotary system disappeared if properly installed—that the rotary could operate at two cycles if so low a speed were necessary.

Mr. Sykes said the electric hoist proposition was not new and that "truck type" switchboards have been common in Germany for 10 years. He spoke of the electric reversing mill as the latest development worthy of note.

Dr. Karl G. Frank presented the next paper on "Progress in the Iron and Steel Industry and the Electric Furnace." Dr. Frank outlined the history of the iron and steel industry. He showed, finally, how the demand for very high quality and special alloy steels necessitated the development of the electric steel furnace. Before 1900, he said, the demand was for quantity—since that time stress has rather been on quality—price being really immaterial. Dr. Frank spoke of the electric furnace, not as an experiment or an untried innovation at all, but as an established fact. "The electric furnace," he said, "is to-day without exception, the best means to produce high quality steel." He pointed out, however, that the electric furnace is not intended to and probably will never compete with the blast furnace. It is essentially a refining process and actual melting will always be done otherwise.

The electric furnace offers these manifest advantages over all other methods of making steel:

(1) It produces the highest temperature obtainable.

(2) It produces that temperature without contamination of the charge.

(3) It offers a ready and easy means to control that temperature.

There was very little discussion following Dr. Frank's paper as it dealt with generalities and facts well known to all.

Following Dr. Frank, Prof. W. S. Franklin gave a talk on "Mechanical Analogies in Electricity and Magnetism." He took several well known electrical phenomena and by simple mechanical contrivances gave his audience their exact mathematical analogue. His talk was addressed to the layman with the evident intention of making him see various electrical phenomena in the every-day things of life. For example, he illustrated the effect of power-factor on capacity with two egg-beaters. He showed the effect of introducing capacity and induction in a circuit by a reciprocating rod attached to a lever one end of which is attached to a spring, the other end to a cylindrical mass. The spring represented capacity, the mass, inductance and their respective motions showed the effect of high or low frequency in a circuit and the effect of capacity in correcting power-factor. His experiment with superimposed oscillating waves he demonstrated with a vertical lever on each end of which was a toy car free to move horizontally, the lever being supported by springs. Altogether, the lecture was instructive and held the interest of his audience. There was no discussion.

The first paper to be presented on Friday morning was "The Electrification of Steel Mills and the Use of Central-Station Power," by Brent Wiley and Wilfred Sykes. The authors first called attention to the number of steel plants using central-station power and their tonnage—the large and various field for the profitable installation of motors—and the economies and efficiencies resulting. They point out that the number of motor-driven rolling mills is 200.

Consideration, in installing proper size of motors in a mill, must be given to the following points: Volume of

Digitized by Google

metal displaced; how displaced; time of rolling and number and weight of pieces rolled per hour; type of mill and method of drive.

Of course, accurate and complete records and data are essential to the above considerations.

The authors then cited the chief advantages of motor drive:

"Provides the most practical method of generating and utilizing cheap power.

"Provides an economical method of distributing power.

"Greatly reduces maintenance and general repair charges.

"Insures greater reliability of operations, as there is less wear and breakage of driving unit, and mill parts, including rolls, couplings, pinions, etc.

"Greater average output and better quality of product, due to speed characteristics of driving unit—much more economical use of power.

"Motor drive easily applied to mill.

"Control simple and easy to operate.

"Increased economy of operation of mill, where it is subject to frequent idle periods and where speed adjustment is required.

"Provides means of utilizing favorable propositions from large central-station companies, the principal advantages being as follows: Reduces first cost of installation; management free to concentrate attention to making steel rather than power; central-station power is always available and is very reliable."

In closing, the authors pleaded for greater co-operation between the steel company, the central station, and the motor manufacturer.

There was no discussion of this paper at this time, the next paper being so similar in scope as to render one discussion for both advisable.

C. S. Lankton then presented his paper on "Purchased Power for Steel Mills."

Mr. Lankton first assumed a plant of 3,000 kilowatts capacity. He then traced the cost of such an isolated plant as against the cost of purchasing corresponding power. He pointed out that the former would require two 1,500-kilowatt units and one spare. The latter (central station) having units as large as 15,000 kilowatts and better, require no new equipment. Further, the 1,500-kilowatt unit costs $15.00 per kilowatt and the larger $10.00. There is no saving in building on floor space. Fixed charges on the larger are 30 per cent and on the smaller plant 50 per cent of the producing cost. The refinements of operation necessary to a large plant, but impossible, economically speaking, in a small one, is another item in favor of the central station. Again, the efficiency of the larger unit is 20 per cent greater than the smaller. The labor item is less, relatively, in the big, than in the small plant. The load-factor of the central station being higher than that of a small plant (average steel mill less than 50 per cent) gives the former another advantage. Hence the successful competition of the central station with the isolated plant. The author emphasized the reliability of central-station power as against the erratic operation of a private plant.

The writer did not recommend the wholesale and off-hand adoption of purchased power in steel mills, but recommended that power be bought for extensions and replacements, thus gradually equipping the whole plant with central-station power as being best and most economical from every point of view. A new plant just being built, should exhaust every means of purchasing power before installing its own plant.

In opening the discussion on these two papers, Mr. Friedlaender complimented Mr. Sankton on presenting "the best paper ever presented to this association by an active member." This paper covered the consumer's viewpoint as in distinction to that of the central station. Mr. Friedlaender emphasized the necessity of co-operation between the consumer and the central station to their mutual advantage. He pointed out that the chief factors to be considered in purchasing power were price and reliability or continuity of service.

T. E. Tynes deplored the lack of definite data on relative costs. He objected to the demand method of basing electric charges and advocated a flat rate.

J. C. Reed agreed with Mr. Tynes in the matter of rates.

C. W. Parkhurst said he doubted if the reliability of central-station service was greater than that of a big private plant.

C. A. Menk added to Mr. Sankton's paper the considerations that plant extensions can be made much more quickly with purchased power. He said the question of investment and space required were items vastly in favor of the central station. The central-station management looks ahead and provides for all possible contingencies and growth. This the steel man cannot do. He must meet his problems as they come.

R. S. Huey objected to purchasing power. He complained of the "complicated rates" and peculiar method of billing of central stations. His entire unfamiliarity with the theory of rates was shown when he advocated a flat rate because a steel mill generates its own power at a flat rate—obviously false.

D. M. Petty advocated central-station service as a reserve for emergencies and for carrying the peak load. He called attention to the fact that reliability was entirely a matter of good or bad construction.

W. T. Snyder said a private plant was not justified except at very high load-factor and where there is a balance between waste fuel and the demand for power.

E. Chesrown ridiculed the contention that a private plant could compete with a central station in the matter of reliability of service. He said most steam plants in steel mills existed because of the steel engineers sticking to the traditions of their forefathers or because of the ambition of some young engineer to "show off," or else because of the recommendations of some consulting engineer who had been "subsidized." He pointed out that the peak charge of the central station must be met in an isolated plant in exactly the same way and to the same degree—only greater. "If the charges are reasonable you can't compete with the central station on the peaks or otherwise—least of all on the peaks."

H. C. Gille said the time would come when there would be no minimum bill in electric charges.

R. L. Baker defended the demand method of charging for electricity, showing the injustice to consumer and electric company, alike, in a flat rate.

Mr. Sankton, in rebuttal, added these considerations to those covered by his paper—motor drive gives a decided improvement in the quality of product, it lends itself to the easy procuring of reliable data, and aids in smoke abatement.

The meeting of Friday afternoon opened with D. M. Petty's paper on "Some Electrical Applications in Steel-Mill Practice."

The writer introduced his subject by briefly considering, first, line shaft drive, second, group drive, and third, individual drive. The latter is largely used in steel mills and requires adjustable-speed motors with automatic control. He presented several curves showing the lessened strain on the motors and equipment when started and stopped automatically rather than manually. "The automatic controller protects the motor from not only excessive currents in starting, but excessive voltages in stopping. It decreases the starting and stopping time which will amount to a considerable item when the operation requires frequent stopping."

Mr. Petty then spoke of the reversing motor, laying emphasis on dynamic braking.

To offset the slow speed of direct-current series-wound motors when running at low voltage, the writer suggested additional copper but recommended a series booster set. He added, however, "a better solution of the problem

Digitized by Google

of overloads lies in the fly wheel generator set installed at the end of the line." He stated that the booster set or fly wheel generator, or both, would not be justified because of increased cost of power, were it not for the greatly increased speed of production resulting from their use.

Mr. Friedlaender, opening the discussion, spoke strongly in favor of magnetic control of motors.

P. Caldwell presented several slides showing other methods of connecting the series relay with interlocking device to prevent sparking.

Mr. Kennedy advocated the flywheel generator as a means of lessening the cost of purchased power. He cited an instance where the cost had, by this means, been reduced from 2.4 cents to 0.7 cent per kilowatt-hour.

J. C. Reed advocated steel conductors in place of copper for the transmission of large amounts of power.

Mr. Richardson pointed out that the series field relay should be by-passed so as to give full field strength or reversal of motor,

The next paper was "Latest Development of Electric Cranes for Steel Mills," by E. H. Kendall of the Alliance Machine Company.

Mr. Kendall divided his subject as follows: Control and operation; accessibility and interchangeability; efficiency and maintenance; and safety features. The author treated each of these subjects with respect to the various cranes in use in a steel mill showing the latest improvements in each case and the refinements introduced for certain results.

In discussion Mr. Medicine brought up the question of the lubrication of cranes.

T. E. Tynes recommended oil ring bearings—said the grease cup was all wrong.

Mr. Friedlander said forced-feed lubrication should be insisted on for all cranes and similar apparatus.

W. Greenwood then presented the last paper of the convention on "Installation of Electrical Equipment to Comply with Requirements of Safety."

He said, "When all has been summed up it amounts to this: Only a perfect installation of an entire system, embracing its various units, guarantees immunity from accidents." He went on to say that of course a "perfect" installation was not possible but he took steel-mill electrical engineers to task for apparently often ignoring the underwriters' rules and for giving precedence to economy rather than to adequate safety.

After considering changing the time of year for meeting, and kindred topics of general interest to the members, the technical sessions were adjourned and the convention was brought to a close.

PENNSYLVANIA ELECTRIC ASSOCIATION.

Eighth Annual Convention at Bedford Springs, Pa., September 7-10.

One of the most successful conventions since its organization was held by the Pennsylvania Electric Association at the Bedford Springs Hotel, Bedford Springs, Pa., on September 7, 8, 9, and 10. Ideal weather conditions combined with a record registration of 346 members and a wealth of interesting papers and discussion combined to make the gathering unsurpassed by any preceding year. A very agreeable eleventh hour addition to the list of speakers was the appearance of W. D. Ainey, chairman of the Pennsylvania Public Service Commission, who made a very inspiring address just before adjournment of the convention. The entertainment feature was up to its usual high plane of excellence under the guidance of W. K. Kerford of Philadelphia and consisted of motion pictures, dancing, vaudeville, card games, swimming races, bowling, golf tournaments, mountain hikes, auto drives and musicals. Over 60 prizes were offered by various manufacturers to the successful participants in the various competitions. Twenty manufacturers of electrical appliances displayed their goods in attractive exhibits and Prof. E. E. F. Creighton of Schenectady, performed several interesting experiments of insulators with high-voltage, high-frequency apparatus.

The convention was called to order on Wednesday at 10:30 a. m. by President Walter E. Long in the Convention Hall. The roll-call and reading of the minutes were dispensed with and Secretary Müller occupied the chair while Mr. Long read the presidential address.

Mr. Long briefly reviewed the important events of interest to the members occurring since the 1914 convention and commented on the fact that the Pennsylvania Electric Association is the largest geographical section of the N. E. L. A. in the country. He recommended the adoption of an amendment to the by-laws permitting the employment of a permanent secretary to handle the constantly increasing routine business of the Association. It was also suggested that the Rate, the Engineering and Accounting, and the Welfare Committees should be continued in order that the excellent work of those different committees be taken advantage of. On motion, the president's address was referred to a committee for action.

The report of H. N. Müller, of Pittsburgh, secretary-treasurer, was then received. In it was shown the revenue received and the expenses paid out for the year ending September 6, 1914, leaving a cash balance of $625.87 on hand. Vice-president Stephen C. Pohe, Bloomsburg, next submitted the report of the Executive Committee in which was noted that four meetings had been held in Philadelphia during the past year and that seven Class A member companies had been taken in during that time. The Committee decided, after going into the matter thoroughly, to create a Committee on Publicity. The report of the Membership Committee was also submitted by Mr. Pohe. It was shown that the Association consisted of 80 Class A, 1,407 Class B, 28 Class C, 84 Class D and 1 honorary, members in 1914 as against 95 Class A, 1,425 Class B, 20 Class C, 80 Class D and 1 honorary, members in 1915, a net gain of 21 members. Calling attention to the comparatively small gain in membership during the past year, the Committee mentioned that the abnormal business conditions existing in that time cast a deterrent effect on a larger acquisition of new and the retention of old members. The Committee assigned each of its members to a certain district of the state and a particular effort will be made to increase the Class B membership in the coming year. As to Class A members, it was stated that the Association now includes companies serving 93 per cent of the total population of the state. In accepting the report, President Long stated that the work done by this Committee was really phenomenal and the best ever done by a membership committee.

Chairman H. R. Kern, Philadelphia, next read the report of the Accounting Committee. The work of this Committee was devoted to a reconsideration of the classification of accounts prepared for and submitted at the 1914 convention. The recommendations of the Committee have followed closely the N. E. L. A. standard classification making only such changes and modifications to meet the existing conditions in Pennsylvania. It was noted that existing classifications are in a somewhat transitory state and that systems prepared in preceding years are being subjected to changes dictated by latter-day experience and eventually the improvements may issue into a single system that will be accorded practically universal adoption.

E. H. Davis, Williamsport, thought that a classification as submitted, while it might be the foundation for the finding of the Public Service Commission, it is not an ultimate basis on which rates are determined. The division of the expenses as to various classes of service and the division as to investment in the same classes of service is getting more important day by day, he said, and in many cases, it is very im-

Digitized by Google

portant to keep the capital accounts apart.

Mr. Kern said that the report merely concerns controlling accounts at the present time rather than detailed cost accounting.

W. H. Johnson, Philadelphia, said that there has to be a certain proportion assigned to each class of service when the capital account is to be divided up.

E. D. Dreyfus, Pittsburgh, thought that these detailed matters are ones in which it is necessary for the engineering and accounting departments to get together in the way of seeing what charges should go to different accounts.

Chairman B. Frank Day, Philadelphia, then submitted the report of the Safety and Welfare Committee.

After some introductory remarks touching upon the rapid strides looking to the safety and welfare of central-station employees made during the past year and the good results uniformly obtained therefrom, the report is divided into six parts, each dealing with some particular branch of the ground covered by the Committee. Accident prevention is first taken up and the importance of safety being considered in designing and installing all apparatus whether used in the plant, on the line or in the consumer's premises is given great stress. The prime importance of first-aid treatment is dwelt upon and emphasized by the inclusion of disability due to infected wounds as entitled to compensation under the rulings of most compensation bureaus. The fact that a workman's compensation law goes into effect in Pennsylvania on January 1, 1916, lent much interest in the remarks made by the Committee on that subject. While most of the companies have had some kind of a beneficial association in force for a long time and to whom the compensation act will make little or no difference, the several plans of insurance allowed under the new law are briefly explained and the experience of central-station companies in other states under these different plans were given. Service Annuities, Savings and Investment Funds, Vocational, Education and Physical Development are given quite some attention in the report and the Committee concludes with the admonition that there should be an enthusiastic co-operation of employer and employee for welfare work must be mutual to be of real and lasting effect.

This report provoked considerable discussion which was opened by Irving Samuels, Allentown, who endeavored to show that the greatest importance of first-aid work is in applying it to the line department. He pointed out that in a power station or other department substantially in one particular location, the knowledge of first-aid work need be given to only a small number of the employees in that department while in the line gangs, where accidents happen anywhere from one-half to five miles from the nearest physician, each man should be proficient in first-aid and resuscitation methods.

H. N. Müller, Pittsburgh, gave the experiences of his company and expressed the opinion that contests between gangs of linemen and drills with prizes given for the best attainments, is the only practical way of sustaining interest in the work. Another point brought up was that the physician should be educated to the work to some extent also, as many of them have very meager ideas on the proper methods of resuscitation.

H. H. Ganser, Norristown, after many discouraging experiences in trying to educate his line department, held rallies and awarded prizes for the best work and now has 35 men well qualified to carry on first-aid work.

Mr. Müller, Pittsburgh, in answer to a question, said that experience with the pulmotor has not indicated that it is the best method. He thought that the Schaeffer prone-pressure method is better and that the combination of the latter with the pulmotor is the best combination to be had. J. E. Shute, Altoona, gave some instances of accident cases where the above methods were used.

At this point President Long read a telegram from Dr. C. P. Steinmetz of Schenectady in response to the former's greetings and request for an expression of thought in connection with the part that the central-station man could take in the national defense movement. Dr. Steinmetz replied as follows:

"The most efficient national defense is the patriotism of the masses of people, that is, the wage earners, resulting from their economic conditions being superior to those in all other countries. The central-station men can greatly help directly through their employees, indirectly through their influence on the industrial and educational activities of their community to bring about conditions where the masses have something to defend. Then they will rally to the national defense."

A representative of the Empire State Association then explained the working of the New York compensation law and the measures taken by central stations to comply with it. Chairman Day took occasion to bring to bear on the members the fact that they must make up their mind promptly as to which of the optional methods they want to use under the Compensation Act, as the law goes into effect January 1, 1916. The methods usually adopted in other states were given.

A paper on "Co-Ordination of the Accounting and Engineering Departments," by E. D. Dreyfus, Pittsburgh, was then presented. Mr. Dreyfus said in part:

"There is ever present the economic law that governs all business pursuits which in simple language equates all results in terms of dollars and cents. To determine the true financial showing, careful records of the distribution of money expenditures become indispensable, and here accounting plays its part. The interweave of engineering and accounting in our great industrial structures is therefore quite apparent. The people as a general proposition do not resent attractive profits being made in any business even among those of a public-service character, when it is plain that they are the results of an honest, capable and discerning management. However, they do protest against business gains which are the product of arbitrary systems that are apparently disproportionate and unjustified."

In reviewing the general conditions, the author dwells on the points of contact between the two departments under consideration, the attitude of each, and the common meeting ground. Especially is co-operative action demanded in dealing with valuations, cost accounting and replacement and contingency reserves and the various requirements incidental to each are outlined. The author concludes by making it clear that no over-reaching is to be permitted in the apparent attempt to idealize the working conditions, as all systems in business are in a practical sense restricted within reasonable bounds; however, any time and effort expended to increase the opportunities of the respective departments and their individual constituency must be fruitful.

S. E. Doane, Cleveland, said that in his experience, which has been mostly manufacturing, the manufacturing accounts are far superior to the sales accounts and expressed the belief that the engineer and the accountant have been drawn very close together and that the engineers are pretty fair accountants and that the accountants are fairly good on engineering lines.

F. E. Haag, Bloomsburg, said that harmonious working between the engineering and the accounting departments is the whole kernel in the nut.

Following the discussion on this paper, Mr. Long appointed the Nominating Committee to be composed of E. L. Smith, Towanda, chairman, A. J. Althouse, Hamburg, and A. R. Granger, Chester, and the Auditing Committee, H. R. Kern, Philadelphia, chairman, E. D. Dreyfus, Pittsburgh, and J. E. Shute, Altoona.

Opening the Thursday morning session, J. Grant DeRemer presented a

Digitized by Google

paper on "Opportunities for Central-Station Steam Heating Development."

This paper is a statistical analysis of the results to be obtained from and the benefits accruing to the central station supplying steam-heating service for commercial purposes. Mr. DeRemer, who is an acknowledged authority on this branch of engineering, draws a striking analogy between the thermal conditions under which a steam locomotive is operated and that under which an electric central station operates, the former being no better than 10 per cent efficient thermally and the latter little better with about 15 per cent. For the steam railroads there seems little hope of reducing this enormous waste except by electrification, but for the steam electrical stations, the effective remedy lies in district steam heating. Anticipating the question as to the ability of the country to consume the large amount of heat which must be disposed of to render the sale of this by-product profitable, the author shows that an annual heating revenue of $100,000,000 is possible in the United States. But steam-heating systems must be treated with the same careful commercial management and technical analysis that is brought to bear upon electrical problems. Due consideration must be given to the efficiency of the underground distribution system; to the nature of the business available; to the form of contract for service; to the method of charging; to the rate schedule, and what is most important, the business must be solicited instead of waiting for it to come forward of its own initiative.

Mr. Hobbs, Pittsburgh, in opening the discussion, took exception to the author's assumption that 75 per cent of the steam-electric output in the United States during 1912 was non-condensing. He also said that investors want a return on their investment for 12 months in the year and not six months, which is the heating period in this climate. In terms of conservation, steam heating is a good proposition, he said, but financially it is another matter.

In answer to a question by Mr. Kenney, as to the rates charged for steam heating, Mr. DeRemer said that only a meter rate should be considered and that it should be made large enough to provide a considerable factor of safety for contingencies. He also said that in summer, the steam-heating company should work up the hot-water business as gas is about twice as costly. The maintenance of an underground distribution system comes to $500 per year and the author emphasized the fact that the division of costs on the books between the steam heating and the electric functions of a station should be fair.

The next paper was the "Protection of Distributing Transformers Against Lightning," by R. T. Wagner.

The author takes pains to assert at the outset that lightning protection should be thought of in the sense that the wise doctor will advise a patient as regards analysis of past troubles, remedies for existing conditions and prophylactic measures for the future. It is true that burned-out transformers and blown fuses cost money in repairs and replacements, but this expense is relatively unimportant when compared with the loss in prestige caused by interruptions to service. In tracing out the purpose of arresters and their applications to generating stations and transformers, the author dwells at length on the prime importance of properly installing arresters on the lines and strongly advocates the practice of installing the arresters on the same pole with the transformer. In this connection, the importance of proper grounds was pointed out as the foundation for successful lightning arrester operation. In summarizing, the following points should be borne in mind when installing arresters: Separate and thoroughly reliable grounds should be made for the arresters and secondary neutrals. The arrester grounds should be of low impedance, the secondary grounds of low resistance. Lightning arresters and all grounds should be inspected at regular intervals, particularly just before and after the lightning season. To obtain the best protection the arresters are capable of giving, they should be installed at the terminals of the apparatus to be protected.

H. N. Müller read a written discussion of the paper from C. C. Long, Reading, in which was compared the suggestions made in the paper with the practice as developed by Mr. Long's company.

E. E. F. Creighton of Schenectady, N. Y., was then given the floor and with the aid of apparatus capable of delivering a pressure of 120,000 volts at 300,000 cycles per second, several insulators were tested for breakdown and performance. Prof. Creighton said that there is no complete solution of the lightning problem but that the state of the art has improved to such an extent that perfection is not far removed. There are three problems encountered in this work. First, the manufacturer's problem; second, the operation of the line; third, the insulator problem which is between and overlapping the first two problems. Lightning is of a high voltage and of short duration; therefore, the insulators which are supposed to withstand the stresses of lightning should be tested at that voltage for that duration of time. If the insulator tested under those conditions does not break down within a minute or so, it will not fail at all, tests have shown. Experiments were then shown in which a plain strain insulator without petticoats, a perfect strain insulator with petticoats and a defective insulator were used to show the action of the discharge in each case. In answer to a question by H. N. Müller, Pittsburgh, Mr. Creighton said that the amount and quality of the glazing on the insulator is of little importance from the standpoint of performance.

J. M. Wakeman, general manager of the Society for Electrical Development, followed with a short talk on the coming Electrical Prosperity Week. He outlined the parts to be played by all having to do with electrical matters to help make the week a success and predicted for it the greatest trade revival the world has ever known. Literature on the subject was distributed among the members present.

The next event on the program was two papers on the suject of "Efficiency of Boiler Room Methods," by H. B. Bryans and J. C. Scholl.

Messrs. Bryans and Scholl in their respective papers on this subject, give the results of their experiences in working out methods of boiler-room practice for the object of increasing the efficiency of their boilers and grates and reduce production costs. It was realized at the start that the most important factor in boiler-room efficiency is the workman, and consequently a large part of the study was aimed at a reduction of the waste of human energy and the establishment of conditions favorable to the worker Nor was this considered sufficient, but an effort was made to stimulate the interest of the workers by making them actual participants in the savings effected. The experiments were made at a hand-firing plant and the several parts tending to make an efficient whole, such as co-operation, methods of firing, boiler efficiency meters, flue temperatures, water purification, routine work and records are taken up and discussed in turn. A fac-simile of a daily power-plant report is shown and the results of ten average days of operation are given in some detail. Mr. Bryans states, in conclusion, that all of the scientific apparatus that can be thought of will not be worth the room taken up if the proper amount of supervision and attention, both on the part of the executives and workmen, is not given.

A rather interesting discussion followed these papers. Mr. Gray explained the instruments used to attain boiler-room efficiency, but insisted that the selection of the boiler-room employees is most important. Details of practice differ in different plans. However, there are some of these practices

Digitized by Google

that are common to all. He argued against the bonus system, saying that it should not be necessary to pay a bonus to a workman for doing his duty. In conclusion, he made a plea for standardized boiler-room practice.

G. E. Wendle, Williamsport, advised that in all work of this sort, a clear idea should be had of the limitations in respect to the money wherewith to pay for the changes to be made. Mr. Hobbs, Pittsburgh, stated that co-operation between the men and the executives is the keynote of the whole situation.

The executive session was held on Thursday afternoon. George E. Wendle, chairman, presented the report of the Engineering Committee. The work done by this Committee during the past year has been almost entirely devoted to investigations, analyses, etc., in connection with the specifications for overhead wire crossings, suggested by the Public Service Commission, and was undertaken by a joint committee composed of representatives of the steam railroads, electric railways, telephone and telegraph companies, and the electric light and power companies. The report is quite a complete compendium of information, mathematical deductions and curves of conductor sags.

Chairman R. S. Orr, Pittsburgh, made a verbal report for the Special Committee, as did Chairman George B. Tripp, Harrisburg, for the Rate Committee. Following these reports, a paper entitled "Relations Between Electric Utilities and Their Customers" was given by J. Fred Schaffer, of Sunbury, which occasioned much discussion among the members.

B. Lester delivered his paper on "The Use of Small Motors on Central-Station Circuits" at the session on Friday morning.

This paper is profusely illustrated with cuts showing various applications of fractional horsepower motors for almost every conceivable use. The author treats his subject from the standpoints of purpose of using small motors, benefits to the central stations and the best methods of analyzing the possibilities and pushing the sales of such machines, and following this outline, proceeds to take up the most important uses now being made of small motors in home, office and store. The principal benefit to the central station from the use of fractional horsepower motors on its lines comes from the sale of current largely at the time of off-peak load. The small motor-driven machine has very largely followed the path of electric light. The benefits derived from any central station are similar to those coming to any manufacturer as he increases the production of his established plant, i. e., an increased volume of production, with comparatively small increase in overhead expense or permanent investment. The problem, therefore, which central stations meet in pushing this class of load is a problem of intensification rather than entirely new development and the key to the situation is in getting the public mind to realize that the small operations done by hand are the ones that require so much valuable time and can be largely eliminated by the use of reliable, clean and cheap power-producing units.

Stephen C. Pohe.

Stephen C. Pohe was born August 8, 1885, at Espy, Columbia County, Pa., and received his early education at Catawissa, attending public school. He then studied at the Potts Business College, in Williamsport, Pa., from which he graduated in 1902, going to Berwick, Pa., where he entered the office of the Berwick Light Company, in time becoming assistant to the manager, L. J. Townsend. Upon the latter's death, in 1907, Mr. Pohe was made manager of the company, holding that position for eighteen months; in January, 1909, the company was merged into the Columbia Power, Light & Railways Company, of Bloomsburg, Pa., and Mr. Pohe was made superintendent of new business, with offices at Bloomsburg, which position he held until September, 1910, when he was elected general superintendent. During the year 1912 a controlling interest in the property was purchased by H. D. Walbridge & Company, of New York City; the company was reorganized, the gas and electric properties under the name of the Columbia & Montour Electric Company, and the railway properties as the North Branch Transit Company, Mr. Pohe becoming general manager of both companies. In November, 1913, the Walbridge interests acquired control of the gas and electric properties of the Northumberland County Gas & Electric Company, operating in Sunbury, Selinsgrove, Northumberland and Milton, Pa., and at that time Mr. Pohe was made general manager of that company also, with offices in Bloomsburg. Mr. Pohe is a member of the American Institute of Electrical Engineers and the Jovian Order.

In answer to a question propounded by H. N. Müller, Pittsburgh, Mr. Lester stated that a motor device has been placed upon the market to produce a forced draught for hot-air heating systems, thus enabling the heat to be spread more uniformly throughout the building.

A very interesting discussion took place on the subject of the "Handling of Cases Involving the Theft of Current." In a written discussion, J. B. Seaman, Philadelphia, enumerated methods which have been used to steal current or retard the action of the meter. He advised the practice of running service wires in iron conduit, so arranged as to permit of easy inspection and that the distance between the end of the service and the meter should be as short as possible. The service fuses should always be inclosed in a box and sealed. A standard practice of grounding should also be adopted, in order that the discovery of an installation different than the standard decided upon will excite suspicion. In brief, the detection of theft of current requires eternal vigilance.

R. W. Hoy, Harrisburg, said that an expert was now making a complete investigation in the territory served by that company, in order to determine the extent of theft of current. He stated that stealing of current is mostly practiced in the disreputable saloon districts, on the premises of customers cut off for non-payment of bills, and in boarding houses. Mr. Hoy strongly advocated that services should be removed after the meter is removed.

G. E. Wendle, Williamsport, inquired as to what is considered sufficient evidence in prosecuting cases of theft of current, and Messrs. Walburn and Rockwell, of Pottsville, and Mr. Long, of Scranton, endeavored to illustrate, by means of concrete examples. Most of these actual cases were settled out of court.

A paper by S. H. Blake on "Electrically Operated General Utility Services" was then taken up.

This paper aims to show the great possibilities still existing in the field of general utility devices and the most effective methods of exploiting the advantages of electricity in operating them. Electric service in the home while not regarded as a luxury in this country at least, yet it is not considered by everyone as being absolutely necessary, and the fact remains that there are many more homes without it than have it. The work of educating the public concerning the benefits to be obtained by the home use of electricity must be carried on by those who are vitally interested in the growth and success of the industry. Company display rooms, special campaign sales, mail advertising, attractive show windows, judicious newspaper and trolley advertising and other ways of advancing information on the subject are mentioned and the proper methods of executing these arrangements to the best effect are enlarged upon. A partial list of the most attractive devices from the central-station standpoint are given with brief comments on the part each contributes to the revenue of the

Digitized by Google

company. The author notes that no one can predict what the future holds, but judging from past accomplishments there are many more things that can yet be done to advantage electrically, and each new marvel will tend to advertise and extend the use of electricity.

Following this paper W. H. Acker presented his paper on "Factors Entering Into the Supplying of Rural Communities from Adjacent Central Stations."

In entering upon a consideration of this subject the author arbitrarily considered "a rural community" as being a settlement or collection of inhabitants number from 100 to 1,000 persons and located within a radius of one-half to three-quarters of a mile, and generally not incorporated. After tracing the change in conditions due to the advent of high-potential alternating-current transmission and its advantages for the economic distribution of electrical energy, the statement is made that, broadly speaking, at the present time the supplying or not supplying of service to rural communities is merely a matter of the amount of revenue to be derived and the cost of service. In order to make the service of such communities profitable it becomes of the utmost importance that the cost of the necessary construction is kept at a minimum, while at the same time the construction must be substantial so as not to mitigate or detract from the adequacy and reliability of the service. The author goes on to enumerate the various details of construction of such a line and mentions the factors to be taken into consideration in choosing the methods calculated to best attain the desired end. One of the deciding points in serving a district of this kind is the cost of right-of-way. There are several ways to overcome this handicap, among which are mentioned an agreement with the prospective consumers to provide pole-line rights, or occupying the poles of telephone or other companies already in the field. In conclusion, the author cites the method of running bare line wires to decrease the first cost, since insulation merely serves to limit the short-circuit current due to the accidental crossing or grounding of the conductors, while by proper spacing this trouble could be counteracted and a saving of from 30 to 40 per cent in copper could be effected and strains correspondingly decreased.

President Long then introduced Chairman W. D. Ainey, of the Pennsylvania Public Service Commission, who spoke not on the policies of the Commission, but of certain impressions. He congratulated the utilities of the state for their contribution to the welfare of the state, and especially their demeanor in dealing with the public. Mr. Ainey declared that the Public Service Commission invites the hearty co-operation of the utilities, not in reference to the compulsory side of the law, but to the conference and advisory side, and the doors of its offices are always open, especially to the smaller companies, in order to improve the relations with the public. The experience of the utilities must be drawn upon and the Association rather than the Commission must formulate standard practices for the guidance of the Commission. In closing his very interesting talk Mr. Ainey made a sincere plea for co-operation with the utilities in order that the public may have the benefit of their experience.

Chairman H. R. Kern, Philadelphia, of the Auditing Committee, reported that the accounts of the treasurer were found correct. Chairman F. M. Noecker, Renovo, of the Committee on By-Laws, reported that the Committee recommends the necessary changes to the by-laws, whereby a permanent secretary can be employed and chosen by the Executive Committee in line with the suggestion made by President Long in his opening address. Both reports were adopted unanimously. Several resolutions were here adopted, after which Secretary Müller read the selections of the nominating committee, which were elected as follows:

Stephen C. Pohe, Bloomsburg, president.

George B. Tripp, Harrisburg, vice-president.

Henry N. Müller, Pittsburgh, secretary-treasurer.

For Executive Committee, Ernest H. Davis, Williamsport; E. B. Greene, Altoona; F. M. Noecker, Renovo.

After a few appropriate remarks by the outgoing and incoming presidents the convention was adjourned sine die.

Electric Club-Jovian League of Chicago Resumes Weekly Meetings.

The regular weekly luncheon meetings of the Electric Club-Jovian League of Chicago were resumed on September 9, an entertainment program being provided for the occasion. Victor H. Tousley, vice-president, presided in the absence of President Pinckard.

Homer E. Niesz, Jupiter of the Jovian Order, outlined the plans for the forthcoming annual convention, which is to be held in Chicago, October 13 to 15, and asked for the support of the entire local industry. E. W. Donoho, chairman of the Jovian Membership Committee in Chicago, spoke of the rejuvenation which is to be held during the convention and stated that team and individual prizes will be awarded for securing applicants.

NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

Eighth Annual Convention Held at Portland, Ore., September 8-11.

The eighth annual convention of the Northwest Electric Light and Power Association was held at the Multnomah Hotel, Portland, Ore., September 8 to 11. It was characterized by excellent papers and reports, animated discussion and a good attendance, the registration being 190. There were a number of attendants from California and from the East, the latter including President E. W. Lloyd of the National Electric Light Association, with which the Northwest Association is affiliated.

The first session was called to order at 10:30 a. m. on Wednesday by Franklin T. Griffith, of the Portland Railway, Light & Power Company, who referred to the objects of the Association. These are not only the welfare of the member companies, but that of the communities which they serve. This will be brought about by the increased use of electricity. It is necessary for the companies to increase their efficiency and to gain the confidence of the public.

He then introduced H. R. Albee, mayor of Portland, who made an address of welcome. He referred to the misunderstandings which often arise between the public and the public service corporations, and said that an effort should be made to dispel them.

President's Address.

O. B. Coldwell then delivered the presidential address, which discussed the working organization of the Association, the character and scope of the work done, public policy matters, relations with the national association, topics affecting light and power companies, valuations for rate-making purposes, efficiency methods, electric cooking and water heating, Electrical Prosperity Week, the use of electricity in schools, water-power problems, and ended with recommendations for future work.

Relations with the national association have been improved, and the appointment of more Pacific Coast members on committees will lead to fuller consideration of the problems of the Pacific states. Relations with contractors have been greatly improved.

With reference to valuations, he pointed out that most of the companies were started before the problems of regulation came up, and franchise values were at that time recognized as a property right. There is as yet no definite method of valuation recognized and the result obtained depends largely on the point of view of the person making the valuation. Before new prin-

Digitized by Google

ciples are applied to valuations time for adjustment should be permitted. To neglect intangible values entirely at the present time would do harm to the communities as well as to the companies affected.

He emphasized the importance of school instruction in the applications of electric energy.

He pointed out that great water powers are running to waste while fuels are being consumed, on account of the restrictions placed on use by the federal departments. There is as yet no workable statute under which investors will proceed with developments. Sane legislation is needed to this end. A conference on water power is to be held in Portland, September 21 to 23, at which delegates from the different states will frame recommendations to Congress.

He recommended a closer tie between member companies and Association officials; that the smaller companies take a more active part in the work of the Overhead Line Committee; that national officials and committeemen from the Northwest keep in touch with the local secretary; that a committee be appointed to assist school boards and other educational bodies.

E. G. Robinson then offered a resolution advocating legislation on the subject of water power which would permit development. This was referred to a committee consisting of Mr. Robinson, L. A. McArthur and H. L. Bleecker, as were also a resolution by J. E. Davidson recognizing the need of electrical instruction in schools and offering the services of the Association in assisting applications in school work, and one by A. C. McMicken endorsing Electrical Prosperity Week.

E. W. Lloyd, president of the National Electric Light Association, was then introduced and made an address. He said that in the past there had been some dissatisfaction on the Pacific Coast with the Association, due largely to a lack of participation of those members in its affairs, but this year the needs and problems of the Coast will receive full consideration. Heretofore there has been no general effort for geographical representation. He thought the sections should take up their own local problems. The West has its own problems, such as water power and its use in developing the natural resources of the country. Such problems as the application of power to electrometallurgy should be pushed. He then referred to changes in the organization of the national association. The Hydroelectric and Technical Sections are being combined, a Manufacturers' Section will be formed and will handle questions of standardization; an Accounting Section has already been launched; the Commercial Section is very active and has organized a correspondence school. This sectionalization of the work means greater co-operation by a larger group of men.

L. R. Alderman, superintendent of schools in Portland, then made an address, inviting the members to visit the trade schools where the boys use electric current in the shops and the girls in cooking. The schools need the advice of electrical men, and the electrical companies need men with a vocational training. The greatest progress in a wider use of electric energy will come through the instruction of the young.

H. T. Matthew, of the Society for Electrical Development, Incorporated, then explained the purposes of Electrical Prosperity Week and the plans for their accomplishment. The details must be worked out locally.

Secretary E. H. Le Tourneau read a letter from the Jovian Convention Committee, inviting all to attend the annual Jovian convention to be held in Chicago, October 13, 14 and 15.

Serving Small Customers.

At the session on Wednesday afternoon, Hugo E. Eisenmenger, of Cleveland, O., presented a paper entitled "The Small-Consumer Question."

This paper pointed out that the central stations of this country do not have the proportion of small consumers customary in Europe. The value of the small consumer was illustrated by comparison with other public-service enterprises. The reason this class of customer has not been solicited by the central station is the excessive cost of serving him. This cost is made up of three parts: (*a*) Fixed charges on the investment. (*b*) Cost of meter reading, repairs and calibration. (*c*) Billing, collecting and accounting. This cost can be greatly reduced by using a flat rate, and simplifying the method of accounting. The fairness of the flat rate was justified, since the output cost of serving these customers is a small element. The use of the demand limiter was discussed. The flat rate has the advantages of eliminating disputes regarding bills, makes soliciting easier and securing many customers who afterward are transferred to a meter rate. European practice in this regard is explained and a system of accounting and collecting suitable to such a flat rate is described in detail. This method will be fully described in another issue.

Other parts of the paper are devoted to a proper determination of the flat-rate charge, with consideration or different charges for the summer and winter months; suggestions for the wording of a flat-rate schedule; the financing of the small consumer, and reduction of the cost of wiring by the use of the concentric system or similar methods which have not heretofore been in vogue in this country.

The discussion was opened by H. J. Gille, of Seattle, Wash., who said that the conditions which make this form of rate especially suitable do not exist on the Pacific Coast. In this section of the country about 90 per cent of the residences and flat buildings in cities already use current and 80 per cent of these use electric irons. In Seattle flat-rate customers represent about 10 per cent of the total income. All of the companies are anxious to get the small customers.

F. O. Broili, of Portland, had found that most flat-rate customers with limiting devices soon changed to another class of service.

S. V. Walton, of San Frencisco, stated that the Pacific Gas & Electric Company had started with a flat rate in Sacramento and would like to abandon it, but cannot do so now. The author of the paper assumes a high density of population with low purchasing power. Such conditions exist in Europe and perhaps in some American cities, but are not the general rule here. Most people in the Western States can secure electric service on the usual terms if they desire. The assumed consumer cost of service is larger than he has experienced, in proportion to other costs. In agricultural districts his company has sometimes billed only once a year, which reduces this element of the cost.

E. G. Robinson, of Arlington, Wash., stated that his company has about 90 per cent flat-rate customers. Neither he nor the customers like the flat-rate controller, which does not reduce the demand at peak hours. Electric irons on his circuits do not bring any revenue, now, but will do so whenever a change is made to a meter rate. The system described may be suitable for Europe, but for this country can be regarded only as a device for getting customers on the lines.

C. J. Edwards, of Tillamook, Ore., agreed with the previous speaker in part, but thought the methods described in the paper could be used to get small consumers. He did not approve of permitting the free use of electric irons, as trouble would be experienced when a change is made to a meter rate and the bills increase.

E. W. Lloyd, of Chicago, said that the Commonwealth Edison Company had paid a big price for handling the small consumer, averaging 46 cents. In studying methods to reduce this cost it has been found that service costs more than energy and this would be even more true in the West. He advocated a cheaper system of wiring, provided it is safe. The cost of indoor installation is usually out of proportion to the cost of service connection. Central-station men should work for cheaper methods.

Digitized by Google

W. M. Hamilton, of Salem, Ore., favored the flat rate as an entering wedge, but had not found it satisfactory unless a flat-rate controller was used. This form of rate eliminates complaints of high bills and is an asset against municipal ownership. Customers are usually satisfied with a higher total bill on a flat rate than with the fluctuations on a meter rate.

A. C. McMicken, of Portland, suggested that the effect of a flat rate on the diversity-factor is probably bad.

In closing the discussion, Mr. Eisenmenger said that in Milan, Italy, customers on the lowest rate soon changed to a large installation. Tests there show from 1,000 to 2,300 hours of use of the demand per year. In the illustration used in the paper, 2,200 hours had been assumed, so that the rate would not likely cause any loss to the company. A deterrent to waste of current is the cost of lamp renewals, and the use of high-efficiency lamps was advocated. A different charge in summer and winter months is sometimes urged because there is a similar difference in competitive illuminants. Life tests of flat-rate controllers have given results of one hundred to several thousand hours, according to the current used and the construction. One make tested seemed to have an indefinite life.

Analysis of Cost of Business.

J. A. Rockwood then presented a paper entitled "Apportionment as Applied to Analyses of Cost of the Light and Power Business."

This paper discusses the apportionment for rendering service to different classes of customers. The principles underlying correct apportionment are first discussed and the apportionments then taken up under the following heads: Operating expenses, including repairs, divided into generation costs, transmission costs, conversion (or transformation) costs, distribution costs, utilization costs, commercial costs and general costs; insurance; injuries and damages; taxes; investment; depreciation. Data were given from actual steam and hydroelectric operation, which show that except for fuel and oil the operating expenses are not proportional to output. Consequently the other operating expenses are apportioned in the same proportion as the investment. The latter is apportioned according to the responsibility for the investment. This responsibility is not in proportion to the maximum demand, but to a modified maximum demand which takes into consideration such factors as time of peak and duration of load. An example to illustrate this is given. Most expenses can be directly charged to the class of service for which they are incurred and general expenses are assigned in proportion to the directly assigned operating expenses. Depreciation is assigned in the same proportion as the investment. In conclusion, it pointed out that it is an essential part of the business to know what each part of the business costs and that public service commissions are constantly making such analyses and basing their decisions upon them. Two extremes should be avoided; one is an attempt at too great accuracy and the other that of making assignments without the necessary fundamental information.

G. E. Quinan, of Seattle, opened the discussion. He said that the apportionment of expenses is not at all settled as yet, but closer study is giving trustworthy cost figures. Reasonable accuracy can be obtained without great complexity. He questioned the author's method of apportioning the investment. The modified demand is a rather complex index and may need redetermination from time to time. He offered another scheme in which the investment is divided into two parts, one representing the cost for the same total consumption at unity load-factor, and the other the excess cost above this amount. The first part could be apportioned in proportion to either demand or consumption; the second part in proportion to a responsibility factor, depending on the excess of the demand over the average. This would involve weighting. This scheme could be applied to transmission, transformation and distribution costs.

C. B. Aitchison, member of the Public Service Commission of Oregon, pointed out the importance to utility companies of cost apportionments. These are necessary for the proper conduct of the business, and also on account of the public relations with the patrons. Without cost figures it cannot be known whether an adequate return is secured from any particular class of business, and it is not possible to justify rates which discriminate between different classes. The public has come to believe that charges should be based upon costs, and recent decisions of the United States Supreme Court require each branch of the business to yield a reasonable return. Apportionment cannot be exact when the demands are only approximated, but there may be substantial accuracy with simplicity. The method used should not involve any great mathematical complexity. The final result must be such as to represent in the broadest sense the greatest service to the community or the resulting rates cannot survive. He thought investment charges should be distributed according to benefits rather than according to responsibility for the expense.

S. V. Walton, of San Francisco, said that the paper brought out in a definite way what it is often necessary to explain, by pointing out that light is more of a luxury than electric power and is worth more. He said that load-factors must be improved by serving electrochemical industries, etc. In one instance he had found that a better rate could be made for 24-hour service than for a load used only between 10 p. m. and 6 a. m.

P. N. Jennings, of Seattle, emphasized the importance of value of service in competing with isolated plants.

Henry L. Gray, of Seattle, had found it necessary to apportion expenses in different ways in dealing with different utilities. He agreed with the author on most points and emphasized that operating expenses are never porportional to the output in hydroelectric plants, except for the items of oil and lamp renewals. The investment cost is a large item, and is sometimes proportional to demand, and in other cases, as where a reservoir is necessary, depends upon output. He had found the results not much different with different bases of apportionment.

An evening session was held at the steam power station of the Portland Railway, Light & Power Company on East Lincoln Street, the company supplying special cars to conduct the members and guests to the plant. A paper was presented by E. V. Searing entitled "Special Features of Stand-by Steam Power-Plant Design and Operation."

This paper gives a brief description of Steam Station "L" of the Portland Railway, Light & Power Company, and also outlines the general method of operation. Attention is called to the special features of the station which were embodied in the design, and particularly to the various meters installed and their use in giving accurate records of daily performance. A number of photographs of special and general features and records of performance are reproduced.

After the presentation of this paper an inspection of the plant was made, followed by music, dancing and refreshments.

Overhead Line Committee.

President Coldwell called the session to order on Thursday morning, and the report of the Overhead Line Committee was presented by the chairman, J. C. Martin.

This report considered the situation in the Northwestern States with respect to overhead line specifications, the problems presented by the adoption of rules by the California Railroad Commission governing the construction of lines where inductive interference exists, the probable effects of the adoption of certain requirements in the specification of the National Electric Light Association, and the proposed

Digitized by Google

National Electric Safety Code which is being prepared by the Bureau of Standards. The specifications adopted in Idaho have been drawn up with the conditions peculiar to this territory clearly in mind; no essential safety requirements are omitted, but detailed requirements have not been gone into. The use of distribution voltages above 5,000 volts has been recognized. Regarding the inductive interference rules of the California Commission, a quotation is given from the report of the High-Tension Transmission Sub-Committee of the N. E. L. A., pointing out that the ultimate effect may involve impairment of service, increase in hazard, and general hardship to the power companies; and that the spirit of the ruling puts the entire cost upon power companies for the benefit of the telephone companies. The committee has worked with the N. E. L. A. Overhead Line Committee in avoiding the danger to development which might be involved in the adoption of specific requirements. The far-reaching importance of the safety code proposed by the Bureau of Standards is pointed out, since it provides a detailed construction specification, which may be made mandatory by regulatory commissions. It would be more universally enforced than the National Electrical Code, since the latter can be ignored when it is more economical to carry one's own insurance. Study and discussion of the proposed code is advocated.

E. W. Lloyd proposed that the Northwest Association select a man for membership on the N. E. L. A. Committee on Accident Prevention.

A. Emery Mershon, of Fresno, Cal., explained the status of the California rules. The committee which recommended these rules for adoption by the Railroad Commission included representatives of the power and telephone companies, as well as of the Commission. The ruling was not entirely satisfactory to either set of utilities, and has not yet been fully enforced. The committee is still working on the problem, and the final report will not be submitted for some time. The telephone companies are making few demands at present.

E. G. Robinson, of Arlington, Wash., said that in his state power lines are erected principally on the public highways and a similar ruling there would make development almost prohibitive so far as small communities are concerned. In some cases telephone wires are already erected on both sides of the road.

S. V. Walton, of San Francisco, said that many of the lines in California are on private rights of way, but fully 50 per cent of the bay lines are either on highways or adjacent to them, and these have given the most trouble.

L. T. Merwin, of Portland, said that a reasonable attitude toward the telephone company would generally result in an easy solution of difficulties and gave examples to confirm this.

In closing the discussion Mr. Martin referred to the bitter criticism of the California rules at the convention last year. He said that the telephone companies had gone to considerable expense in moving their lines before demanding that the power companies take steps to avoid interference. The rules in California probably seemed best for that state, but the probable interpretation of such rules in this territory would not be satisfactory.

M. C. Osborn then took the chair while H. B. Peirce presented a paper by himself and L. N. Simpson, entitled "Development of Small Motor and Appliance Load."

Development of Appliance Load.

This paper discussed the methods for obtaining a greater use of electric energy by appliances in residences. The energy consumed by such devices often rivals that used for lighting. The paper gives reports from a number of companies to questions affecting this type of load. It is generally found that the output is increased but the peak load not increased by the use of such devices; in other words, they represent an off-peak load. It is advised that only a few, rather than a large number of appliances be introduced at one time, so that the sales force can be completely familiar with them. The importance of a standard universal plug is emphasized and it is suggested that this matter be taken up with manufacturers; also that small motor bases up to one-sixth horsepower should be of a universal type with uniform bolt holes. Most household devices are sold to women and the appeal should be made to them. There are three classes: (1) those having servants, (2) those with reasonable incomes but preferring to do their own housework, (3) those that must economize and necessarily do their own work. The first class is small and they must usually be seen in their own homes. The second class will attend demonstrations and are the easiest to reach. They usually prefer payment by monthly installments. The third class buys more equipment than might be expected and eagerly use labor-saving devices when once familiar with them. Consumers may be reached through the salesroom, through solicitors calling at residences and through other dealers. Every central station should have a display room and be ready to supply information. Solicitors calling at the home represent the most expensive method and at the same time the most effective. The encouragement of sales through dealers is recommended and this requires that the central station should sell appliances only at the usual margin of profit. This is nearly as easy as selling at cost. "Feature" methods are discussed and described. Advertising should be done in connection with the national advertising of the manufacturer, using cuts supplied by the latter wherever possible. Rates for heating appliances should, when possible, be made low enough to compete with gas. Opinion is divided as to using a separate meter for heating devices. Many companies use a double-throw switch to control a flat-rate heater for water which makes electric cooking practical. It is suggested that a similar scheme might be used for an air heater for the kitchen for the winter months.

William Spalding, of Portland, pointed out the importance of electric vehicles in load building. There is a great field for this—not only in the large cities, but in the small towns. Social leaders are always prospects for closed passenger cars which yield a revenue of about $4.00 a month at usual rates. Merchants can use 500-pound to 700-pound delivery wagons, two types of which are now available at prices under $1,200, and the operation of which is cheaper than for a Ford delivery car. Electric busses using interchangeable batteries are often possible in towns having no street cars.

M. C. Osborn stated that an electric bus used in Spokane had cost 5.8 cents per mile for all operating expenses after 30,000 miles of use.

Lewis A. Lewis, of Spokane, stated that the Washington Water Power Company, found the profit on appliance sales would pay the overhead costs of keeping a representative in many small towns where it otherwise would not be possible. He gave figures showing that the daily consumption on Tuesdays (ironing day) was larger than the night consumption, and the average daily consumption is almost equal to the average nightly consumption. This indicates the desirability of giving 24-hour service even in the smallest plants. Moreover, the day load shows a better load-factor.

S. M. Kennedy, of Los Angeles, said that the Southern California Edison Company had made a large sale of appliances and built up a large day load. After trying all methods of load building he had found them all slow in comparison with sending solicitors from house to house. This company has a chief appliance salesman and 17 assistants. There is good evidence that the appliances are used after being purchased and they bring revenue at the maximum rate.

This paper was also discussed by S. V. Walton, W. R. Putnam, E. A. Wilcox, A. K. Baylor, H. F. Holland, George A. Hughes and W. H. P. Hill.

Digitized by Google

Mr. Hughes, of the Hughes Electric Heating Company, entertained the members of the Association at an electrically cooked lunch.

The afternoon session opened with the election of the Nominating Committee, as follows: J. E. Davidson, W. E. Herring, D. C. McKissick, A. C. McMicken and Eugene Enloe.

Determination of Maximum Demand.

A paper entitled "Determination of Maximum Demand," by V. H. Greisser and H. B. Peirce, was then presented by Mr. Peirce. Determination of maximum demand is desirable in fixing charges and in estimating the capacity necessary for the equipment. It may be determined by measurement or by non-instrumental methods. The latter are based upon connected load, weighting of different classes, assessed valuation of property, or floor area to be lighted. The instruments available for measurement are classified as follows: (1) those that integrate the energy over a definite interval; (2) those that continuously show instantaneous power; (3) those that register a demand regardless of duration. The different classes of instruments were discussed and it was pointed out that graphic instruments give the most reliable information but also require the most attention. Each type of instrument gives greater satisfaction in measuring certain types of load. When all the limitations surrounding the determination of individual demands are considered, it seems good commercial policy to consider only class demands in determining rates.

An exhibit of instruments for determining maximum demand was made by the authors.

Stacy Hamilton, of Salem, Ore., pointed out that it is illogical to seek high accuracy in the measurement of output, and neglect demand, which is just as important an element of cost. Measurement of the latter, however, is more complicated. For small customers it is satisfactory to take a definite percentage of connected load; for large customers the demand should be measured. The time and the duration of the peak should be considered. This can be done by the modified demand as used in Mr. Rockwood's paper. Some method of measuring demand should be standardized.

A. E. Mershon, of Fresno, said that it is impossible to standardize the measurement of maximum demand, since different methods are desirable for different types of load; but standardization for a single class might be accomplished.

S. V. Walton read a discussion by one of the engineers of the Pacific Gas & Electric Company favoring different types of instruments for different forms of load. Graphic records are most accurate but are not convenient for general use. Demand charges should be based upon kilovolt-amperes rather than kilowatts.

E. W. Lloyd said that non-instrumental methods lead to trouble. In Chicago the power demands over 20 horsepower are now measured, as are lighting loads exceeding one kilowatt. Manufacturers have been slow in producing suitable meters for this purpose because they did not know just what was wanted by the central stations. The latter should experiment with demand meters and encourage development by using them. The data compiled by his company on load-factors during the past 15 years is invaluable.

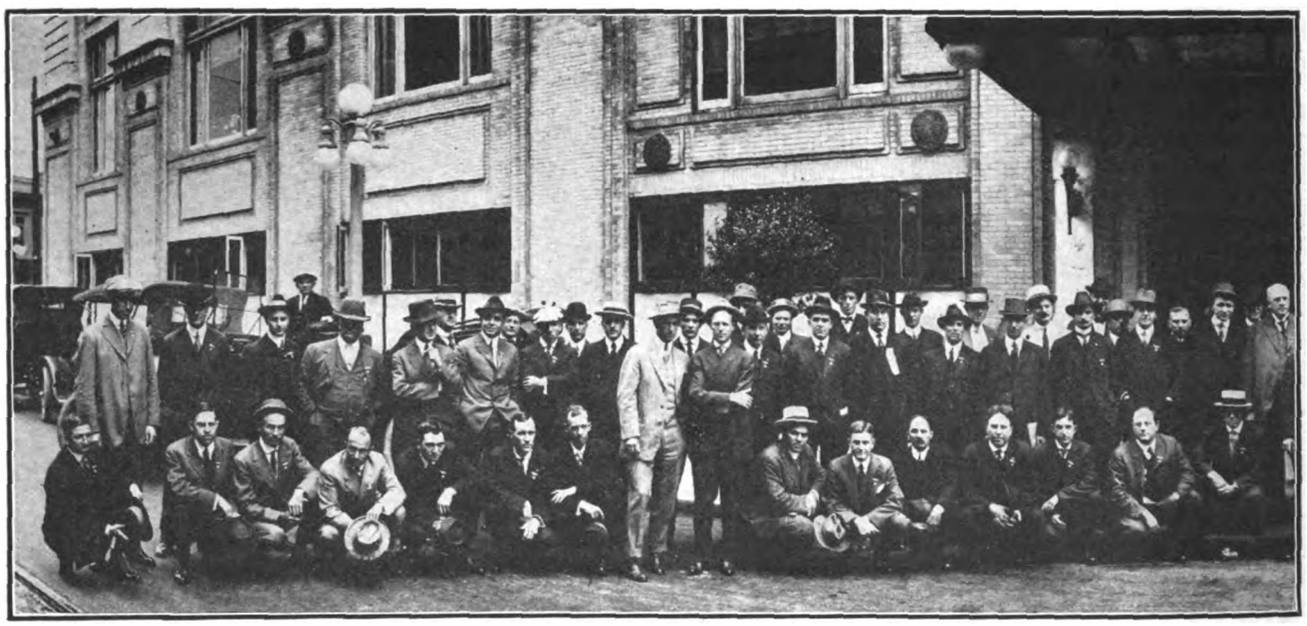
Modern Illumination.

A paper entitled "Practical Application of Modern Illumination," by F. H. Murphy and G. A. Kumler, was then presented by Mr. Murphy. This paper took up the discussion of illumination units, the general principles which are more or less applicable to all lighting installations, a discussion of reflectors and lamps for different types of installations, the steps to be taken in the design of the installation, with examples illustrating the use of various tables and curves included in the paper. Emphasis was laid on the necessity for efficiency, comfort and artistic harmony in lighting installations.

W. M. Hamilton complimented the authors for the excellent collection of available data which they had compiled. He favored the useful foot-candles of illumination on a given working plane in comparing different lamps, rather than considering the total lumens generated. He emphasized the importance of considering visual efficiency as distinguished from physical efficiency, and the importance of avoiding glare. Eye strain may be due to too much as well as to too little illumination.

W. D. Peaslee, of the Oregon Agricultural College, emphasized the rapid deterioration which may result from dust collecting on reflectors. In the case of one room where blackboards were used the deterioration amounted to nearly one-half in 30 days. He considered it inadvisable to use arc lamps for street lighting in small towns unless there were enough to keep one lamp-trimmer busy.

The session ended with a talk by Miss Vera Dickson, of the Public Library Association of Multnomah County, on the development of public library work, with special reference to technical literature.



Group at Northwest Convention—Left Half.

Digitized by Google

On Thursday evening an illustrated lecture was given by Henry Berger, Jr., entitled "The Art of Natural-Color Photography". Views were given of Portland, the Rose Festival, the Columbia River Highway, Mount Hood, Crater Lake and other interesting features of the surrounding country.

The meeting on Friday morning was called to order by President Coldwell at 9:30 o'cloock and the report of the Electric Range Committee was presented by the chairman, W. R. Putnam.

Report on Electric Ranges.

This report consisted mainly of a compilation of answers by central stations in all the Western States to questions sent out by the committee. These answers covered rates, policies, and statistics regarding the electric-cooking and water-heating loads. Comments of central-station officials, public service commissioners and manufacturers were given, as well as extracts from other papers and reports concerning the subject. The committee compiled a number of curves showing the estimated effects of a range load, as well as some actual records of operation. The committee also discussed the data collected and reached the following conclusions. Securing of this business depends upon suitable rates, moderate-priced and efficient equipment, and an active publicity and selling campaign for central stations and manufacturers. Electric cooking cannot compete with fuels on a cost basis, but only on account of its inherent advantages. A block rate with high minimum, using a single meter, was advocated. Water heating should be restricted to night hours, or all hours when the range is not in use. To introduce ranges, central stations must do the bulk of the selling on time payments. As prices go down with increased sales, selling prices should be adjusted so electrical dealers can participate in the business. Advertising and publicity work should include newspapers, booklets, demonstration work, and experts to follow up installations.

The committee recommended the appointment of a new committee with sub-committees to cover the following topics: co-operative advertising between central stations and manufacturers; the subject of discounts in merchandising; the collection and dissemination of cooking data; water heating; and rates for cooking and water heating. A motion was passed adopting this recommendation, and the president appointed the following committee: W. R. Putnam, M. C. Osborn, S. V. Walton, A. C. McMicken, S. M. Kennedy and H. J. Gille.

Group at Northwest Convention—Right Half.

Exhibits of Hughes and Westinghouse ranges were made by the manufacturers' representatives.

Mr. Osborn was called to the chair to preside during the discussion, which was opened by Stanley V. Walton, of San Francisco. In spite of the advantages of electric cooking, he said that cost was the most important factor and that it was only in the case of abnormal rates that electric energy could compete with gas on a cost basis. A flat rate is not desirable. A company having a block rate and single meter is the one having the largest proportion of cooking customers.

H. C. Peirce, of Spokane, said that a sliding scale was used in that city and it is hard to determine the exact income from ranges. Comparison with past years indicates an income of $45 per kilowatt-year of station capacity when the diversity is considered. Some customers desire automatic control of ranges, while others prefer the greatest simplicity. The demand-factor on the power station improves as the number of customers increases. This has been demonstrated by the use of recording meters on typical installations. Water heaters connected on a double-throw switch such that current is used only when the range is not in use, are in demand by customers. Water tanks should be lagged—a laced-on type being the most convenient. The size of water heater necessary depends upon the needs of the particular family.

S. M. Kennedy, of Los Angeles, said that in spite of the fact that in his territory electric energy could not compete with gas upon a cost basis, he expected to install a large number of electric ranges. Water heating is one of the greatest difficulties to be met. The high cost of installation will be reduced with increasing extent of use. He favored selling on the same basis as the contractor and dealer, but in breaking new ground it is necessary to do some business at cost or even at a loss in order to set examples. Electric lighting was introduced in spite of the competition of cheaper gas, and the same can be done with electric cooking. Emphasis should be placed upon its advantages. He favored a single meter. In selling, expert salesmen who are truthful and have a good presence are needed.

H. J. Gille, of Seattle, said that distribution cost is often greater than generating cost, and the cooking and heating load placed a peak upon the distributing equipment. He referred to automobiles as an example that cost is a secondary consideration if electric cooking is found the most suitable means to the desired end. Introduction should be easy in territory where gas

Digitized by Google

is not available. He favored co-operative advertising with the manufacturer.

The discussion was continued at the afternoon session. A. E. Mershon, of Fresno, Cal., said that the sale of the apparatus was the important question and it could be easily effected on time payments.

E. A. Wilcox, of San Francisco, favored a flat rate for water heating, which is an important question in introducing electric cooking. The cooking load represents a large increase in revenue while it represents little increase in investment, at least for hydroelectric plants. He thought that the manufacturers had done more than the central stations in developing the business. Equipment is wanted at a low price, but not by sacrificing quality. It must be serviceable and permanent. Merchandising is a problem of educating salesmen, other company employees, other electrical men, and finally the public.

J. E. Davidson, of Portland, said that rates must depend upon local conditions, but three cents per kilowatt-hour is a fair average. He favored a single meter and purchases on installments. Records of ranges already installed are imperatively needed.

H. L. Walther, of Medford, Ore., has placed 300 ranges in use and the users are good advertisers. The problem is to educate the consumer to the advantages. Satisfied users of water heaters are held in spite of municipal competition. When the irrigation pumping load goes off, electric heating is the only available load to take its place. Farmers utilize this as much as city customers. The only additional investment required is for transformers in certain cases.

Election of Officers.

At the executive session which followed, the following officers were elected for the ensuing year: president, E. G. Robinson, Arlington, Wash.; vice-presidents, Attilla Norman, Eugene, Ore.; E. P. Bacoon, Boise, Idaho; F. J. Roche, Billings, Mont.; and H. J. Gille, Seattle, Wash. Executive committee, M. C. Osborn, J. M. Kinkaid, J. E. Davidson. This committee will appoint a secretary. The place for the next meeting will be Seattle.

A banquet was held at the Multnomah Hotel on Friday evening, at which the principal address was made by C. C. Chapman. The chairman of the entertainment committee was A. C. McMicken.

On Saturday an automobile trip for both delegates and ladies was taken up the Columbia River Highway to Oneonta Gorge, where luncheon was served.

Entertainment for the ladies was provided by a Ladies' Committee, of which Mrs. J. E. Davidson was chairman.

INDIANA ELECTRIC LIGHT ASSOCIATION.

Seventh Annual Convention, Terre Haute, September 8 to 10.

The seventh annual convention of the Indiana Electric Light Association, which was held on Wednesday, Thursday and Friday of last week, was marked by a large attendance of members and guests, and the convention, both from the business and social standpoint was considered by far the most successful meeting that the Association has ever held. The convention meetings were held at the new Hotel Deming, and the excellent accommodations provided by this hostelry through the courtesy of its manager, W. A. Cochran, were commented on by all present at the convention which extended a vote of thanks to Mr. Cochran before its close.

The first session was called to order on Wednesday morning by President T. F. Grover. A cordial address of welcome was made by Mayor James M. Gossom. President Grover than delivered the annual presidential address in which he first pointed out that, despite the very marked depression on all business caused by the war, and the further difficulties arising in the utility business from the attitude of the public toward utilities and the problems connected with commission regulation, the central-station industry has made marked progress during the past year, an achievement that few industries can boast of in these strenuous times. The reports of Indiana electric light and power companies who are members of the Association show an increase in both output and earnings for the year, which is especially gratifying at this time. The efforts made by central stations to urge the use of more efficient lamps, particularly tungsten units, have finally been appreciated by the customers who have taken full advantage of the reduction in cost of lighting and have used current more liberally for this and other purposes. This reduction in cost of lighting has also been the means of adding many new customers to the lines. The continued demand for further reductions in rates is a live matter being carefully considered by the utility companies, who will gladly meet this demand as justice permits. There is probably no other business which can show so decided and steady a reduction in cost to its patrons as the central-station industry and which at the same time has maintained such high standard of service and been compelled to pay increasing amounts for labor and materials. Looking into the future of the industry, Mr. Grover felt optimistic, because it seemed certain that in the not distant future electricity will supersede all other methods for cooking. These and other additions to the load and further improvements in electrical devices augur well for future prospects.

The remainder of the session was taken up with routine business. The reports of the secretary and treasurer showed the Association to be in excellent conditions, both as regards the membership and finances. A recommendation made by President Grover in his address was that the offices of secretary and treasurer be combined, in the belief that the work of these two officers could be greatly facilitated by one individual. This action was taken. Report was made on the membership of the Association, which showed that this total was 105, 67 being active members and 38 associate members; 14 new members were elected, of whom 2 were active members.

A lengthy discussion ensued on the proposition of making the Indiana Association one of the geographical sections of the National Electric Light Association. The Executive Committee was instructed to look into the subject thoroughly, confer with the officials of the National Association and obtain data on the advantages of affiliation with the national body and report back to the next annual convention of the Indiana Association.

The afternoon session was expected to open with an address from Halford Erickson, of the Wisconsin Railroad Commission, the subject of which was to be "Investment and Return"; owing to the inability of Mr. Erickson to be present this subject had to be dropped from the program. A paper entitled "Stability in the Electric Light and Power Industry" was then presented by Frederick Nicholas, of New York City. In this the author gave comparative census statistics showing the progress in capitalization and gross income of various industries. This showed by figures available for the last decade that the electric central-station industry made much greater progress than any other. Data on the returns for the last fiscal year show that continual progress is being made, despite the many hardships which all business has had to contend with. These figures indicate that the central-station industry is one possessing exceptional stability and one which, therefore, should be very favorably situated in the matter of financing. In order to maintain this excellent situation, however, full co-operation between the utility commissions and the utility companies must be assured so that the credit of the central stations may be fully preserved. It is to be hoped, therefore, that no radical measures will be adopted which will be detrimental to the industry at this critical period. In

Digitized by Google

the discussion which ensued the subject of difficulties in financing central-station companies were emphasized.

A paper entitled "Methods of Determining Maximum Demands for Rate-Making Purposes" was then presented by Emmet Ralston, of the Indianapolis Light & Heat Company. This reviewed the various methods which are used for different classes of customers. In the case of small residence customers data are at hand which permit estimating the maximum with a considerable degree of accuracy. In the case of customers whose load is sufficient to warrant the expense and where the load is of a fluctuating character a demand meter should be installed. In the case of large customers the demand meter may be of the graphic or recording type. The subject was discussed at length and the difficulty usually met in explaining to customers the need of taking account of maximum demand in the system of rates was generally commented upon. Several speakers urged that efforts be made to determine a method of ascertaining maximum demand which will fit all classes of customers. This matter was referred to a committee.

A paper entitled "Some Off-Peak Loads—Charging Electric-Vehicle Batteries," which was prepared by Q. A. Brackett, of the Westinghouse Electric & Manufacturing Company, was presented in the absence of the author by F. H. Nealis, of the Indianapolis office of that company. This paper dealt particularly with the great value to the central-station load curve of vehicle-battery charging, most of which can be done in the hours between midnight and 6 a. m. corresponding to the hours of lowest load. This makes this class of business a particularly favorable one for which off-peak rates can be very properly given. The author discussed the possibility of battery charging, not only for vehicles of the pleasure and commercial types, but also for the lighting of Pullman railroad cars, also the charging of lighting and starting batteries for gasoline automobiles. The most attractive load, however, is in the electric-vehicle business, which the central station should stimulate to its utmost. The methods for boosting the use of electric vehicles were described. The central station itself should be a liberal user of electrics. Taking up the methods of charging the author showed that these almost invariably involve some form of rectifying apparatus to permit charging from alternating-current circuits. The relative advantages of the motor-generator set and the mercury-arc rectifier were discussed. The author showed that in the case of large garages the motor-generator is better adapted than rectifier, but in the case of small garages, such as are called upon to charge starting and ignition batteries only, as well as all private pleasure-car garages, the mercury rectifier is the better appliance, both from the standpoint of lower first cost and higher efficiency, as well as ease of operation.

Edward J. Condon.

Edward J. Condon, president-elect, Indiana Electric Light Association, was born in Cambridge, Mass., and received his early education and training there and in Boston. When 21 years of age he went to Chicago and became associated with Swift & Company, meat packers, and for five years was in their employ. He then entered the United States Revenue Service, serving three years. He was then appointed superintendent of streets by Mayor Carter H. Harrison, Sr., of Chicago, and served during his term and that of the succeeding mayor, John P. Hopkins. Mr. Condon resigned to take up a partnership in a large construction firm, which built a large part of the City of Chicago water works and sewer systems, conduits for cables, also private gas and electric plants. In 1906 the Condon Construction Company was organized, and has confined its work to engineering, gas, electric and water plants. During his connection with this firm Mr. Condon has personally directed the work of building or rebuilding 31 plants in several states, among which was the City of Victor water works with its reservoir on the west slope of Pikes Peak holding 100 acres of water 12,000 feet above sea level; he also built the Victor Sewer Company plant at Victor, Colo.; rebuilt the Rochester, Minn., gas plant and operated it for three years, the Vilisca electric light plant, Citizens Gas Company plant at Nebraska City, Neb., Harvard, Ill., light and power plant, and the Baraboo (Wis.) Gas & Electric Company plant. In Indiana, he rebuilt the Seymour gas and electric plant, the Madison gas plant, the Boswell electric light and water works plant, and the property of the Waterloo Electric Light & Water Works Company, which latter has been consolidated with the Indiana Utilities Company. This company operates at the present time, supplying current for the towns of Waterloo, Hudson, Ashley, Pleasant Lake and Angola. The headquarters of this company, of which he is president and general manager, are at Angola. In nearly all of the plants with which he has been connected Mr. Condon has had a working financial interest, believing that it results in an advantage to all concerned. He has three sons in the electric business with him; E. J. Condon, Jr., wrote the paper on overhead construction presented at this convention. Mr. Condon is a member of several fraternal societies, a member of the National Electric Light Association, an associate member of the American Institute of Electrical Engineers, and a member of the Central Electric Railway Association. He appears frequently before public service commissions for his own and other companies. He takes a particularly active interest in the utility associations of which he is a member.

Probably the most interesting subject on the program Thursday was the address entitled "Depreciation Reserve" made by Judge J. L. Clark, of the Indiana Public Service Commission. The purpose for which a depreciation fund is set aside, he said, is to prevent the distribution of capital to stockholders as dividends. If the people are willing to and do patronize the business to an extent and at a charge that will enable the concern to operate and lay by a fund for repairs and replacements that will keep the original investment intact, they have a legal right to demand that it be so kept. If it is not so kept the business eventually must fail. Equally is the investor interested in maintaining the integrity of the property, and he has a legal right, where he has made a prudent investment and prudently managed his business, to demand a rate sufficient to keep his investment intact and pay a reasonable income thereon.

When an investment is once made in a utility plant, Judge Clark said, it at once becomes impressed with a public duty, and the public has a right to demand that the investment be kept in the business in order that this public function can be performed. It is a difficult matter to determine whether a case is one for repairs, to be paid for out of the maintenance fund, or of replacement, to be paid for out of the depreciation fund. The imaginary line between the two is one to be drawn in a way arbitrarily, and yet there should not be too much latitude given or the purpose of the depreciation fund might be largely defeated; as, strictly speaking, the whole matter of repairs and replacements is one of depreciation. Judge Clark said that he regards it as good practice to carry an ample maintenance fund and apply it liberally in keeping the plant intact.

It may be granted that the first prerequisite to a depreciation reserve is a rate that will justify such a reserve. The law contemplates clearly a rate that will not only take care of breakage and natural wear and decay, but that will also enable the utility to replace units that are still serviceable with new units of an improved type, and which may better the service rendered. No utility plant is constructed with the thought that it may be operated until the first or any subsequent installment of equipment is worn out, and then go into liquidation, and in the meantime lay by a depreciation reserve sufficient ta pay back to the stockhold-

Digitized by Google

ers their original investment. No plant could do such a thing. There is much force in the claim that so long as a plant renders efficient service the return should be on the basis of a plant new. One utility plant in Indiana has never been able to carry a depreciation fund, yet its plant is in 50-per-cent condition, and by the prevailing customs in rate-making cases, the return allowed must be on half the value of a new plant; 50-per-cent condition in this case means that half the life of the plant is gone, yet the plant is furnishing first-class service, and so far as the patron is concerned it is 100-per-cent efficient. In such a case the patron should pay a rate as high as he would have to pay on a new plant.

Preston S. Millar, of the Electrical Testing Laboratories, New York City, addressed the convention Thursday forenoon on the subject, "The Incandescent Lamp of 1915." After indicating by a simple comparison with candles the high efficiency of the modern tungsten lamp, he proceeded to discuss the factors which influence the lamp in operation on the premises of central-station customers. By data taken from tests of lamps obtained from various manufacturers through various selling agencies, he showed that the quality of lamps varies largely. With this condition confronting them he urged that central stations control the supply of lamps to their customers, this being the only way in which the quality of the lamps and their suitability for a given service can be assured.

In discussing Mr. Millar's paper, it was brought out that 60-watt gas-filled lamps are now being made in this country and exported. An able discussion of the subject was given by G. S. Merrill, assistant to the chief engineer of the National Lamp Works of General Electric Company. In the course of his remarks Mr. Merrill said that until recently the incandescent lamp has been inherently difficult to control with respect to accuracy of rating. The lamps produced at present, however, will undoubtedly show considerable improvement. As regards the demand for lamps there is a marked seasonal variation and to get a uniform rate of production considerable stock must be accumulated at certain periods of the year. Certain practical difficulties are encountered in getting any improvements or changes in the general market immediately. It is realized by the manufacturers that an improved condition in this respect should be obtained and the standardization of circuits and voltages becomes a subject of considerable importance with the central stations as well as the manufacturers.

Fred L. Dennis, of the Indiana & Michigan Electric Company, South Bend, who has been chairman of the Association's Accounting Committee for several years, read a paper on "Accounting" in which he spoke of the progress being made in this work by the accounting departments.

A paper entitled "Transmission-Line Construction" was presented by E. J. Condon, Jr., of Angola, Ind. This paper dwelt on the rapid increase in the construction of high-tension transmission lines which are connecting the larger with the smaller communities and supplying the latter from large and efficient central stations. When this development originated, cheap construction was commonly adopted, with the result that high depreciation and maintenance is already being noticed in many cases of this type. Mr. Condon was convinced that the supply of electric current to small communities through networks of transmission lines is entirely profitable, if proper attention is given to the construction of the connecting lines. He described the methods followed by the company with which he is associated which has made use of the most approved construction in the belief that substantial construction means not only much reduction in maintenance and depreciation, but a greatly improved standard of continuity of service. In order to avoid making the construction prohibitive in cost, however, much attention is necessary to many details. The practical limit of transmission with a voltage of 13,200 is 15 miles, and, therefore, a transmission potential of 33,000 volts is preferable, the distributing voltage being between 2,300 and 6,600. The common belief that wooden poles are unsuitable for such lines is not warranted, because they are an excellent material for use in lines carrying up to 66,000 volts and transmitting up to 3,000 kilovolt-amperes. By using substantial construction with conductors of high tensile strength it is possible to increase the length of span to 200 or 250 feet, thus reducing the number of poles and insulators required; this calls for more frequent guying, however. Mr. Condon discussed the value of steel towers for some lines. He urged that use of wooden crossarms be confined to the lower voltages; that high-voltage insulators should be selected with very great care; that overhead ground wires be installed over all lines. He discussed the construction of transmission lines built by his company.

A paper entitled "Direct-Current Loads on Alternating-Current lines and Their Value" was prepared by R. E. Russell, of the General Electric Company, but was read in his absence by W. S. Leggett. This paper dwelt particularly on the charging of vehicle and starting batteries through mercury-arc rectifiers and on the supply of direct current for motion-picture theaters. Several methods for aiding in stimulating the electric-vehicle load were mentioned, also the advantages of using the rectifier for charging batteries of such vehicles. This apparatus is also adapted for charging storage batteries used in telephone, railway signal and telegraph service. Since the proper projection of moving pictures requires direct current to get the best results, it is necessary to supply picture houses with rectifying equipment. The author contended that the mercury-arc rectifier is particularly desirable for this.

At the final session the Association's business matters were considered. The Nominating Committee submitted a list of names of officers for the ensuing year. These nominees were elected by acclamation as follows:

President, E. J. Condon, of Angola.

Vice-president, S. W. Greenland, Fort Wayne.

Secretary and treasurer, Thomas Donohue, LaFayette.

Executive Committee, T. F. Grover, chairman, Terre Haute; T. F. English, Muncie; A. R. Holliday, Indianapolis; F. A. Bryan, South Bend; C. C. Perry, Indianapolis.

During the convention a number of entertainment features relieved the strenuosity of the program. On Wednesday evening an informal reception with special music and vaudeville, followed by dancing was held at the hotel. On Thursday evening the annual banquet of the Association was given, at which cabaret entertainment and dancing was included.

The final feature in this line was the automobile trip on Friday to the electrically equipped mines on the west side of the Wabash River. About fifty persons, including a number of ladies, made this trip, which was a particularly interesting one. The party first visited the mine of the Vandalia Coal Company at Liggett, Ind., and then proceeded to the Deering Coal Company's mine at West Clinton. The delegates were taken down into this mine and shown through in a very detailed manner and were greatly pleased at the opportunity of visiting an electrically equipped mine. It is interesting to note that the Terre Haute, Indianapolis & Eastern Traction Company can buy coal in this district, generate current and deliver it to the mines for cutting and hoisting coal and show the operating coal companies a decided saving over burning their own coal under their boilers.

All in attendance at the convention expressed their appreciation of the hospitality of the Terre Haute, Indianapolis & Eastern Traction Company. President Grover, of the Association, who is the Terre Haute manager of this company, made special efforts to provide for the welfare and comfort of those in attendance at the convention.

Digitized by Google

Trade Papers Adopt Standards of Practice.

"Standards of Practice for Business Papers" were adopted at the Tenth Annual Convention of the Federation of Trade Press Associations held at Philadelphia, September 7, 8 and 9. The keynote of the presidential address delivered by John Clyde Oswald, publisher of the *American Printer,* New York, was "Progress," and the strong recommendations of the committee on the president's address indicate for the coming year a period of great activity for the Federation. Chief among the recommendations adopted by the convention were the appointing of a committee on relations with advertising agencies, a committee to confer with agricultural publications, and a committee to establish definite relations with the manufacturers concerned in the various industries to which the trade publications are devoted. This committee will also confer with the leading manufacturers of the country in working out details of propaganda having to do with great national questions which, through lack of understanding, often work to the disadvantage of industry. The work of the Audit Bureau of Circulations was endorsed and a resolution was passed recording the belief of the Federation that prosperity is to a very large degree dependent on the confidence with which men of enterprise are enabled to view the stability of constructive investment, and therefore the Federation favors complete preparedness for the protection and defense of our country to be established on a permanent basis as rapidly as practicable.

Col. J. B. Maclean, of Toronto, Canada, president of the Maclean Publishing Company, in an address entitled "National Politics in the Trade and Technical Press" reviewed the splendid effect which had been produced in many industries in Canada due to the participation of the business publications in leading thought in an intelligent direction with regard to national affairs.

Charles Whiting Baker, editor of *Engineering News,* of New York, in a paper entitled "A Plea for Promoters," showed how necessary it was for the man of genius in constructive development to receive the unstinted support of the communities in which he chose to operate, and of governmental agencies. The harassment of ill-advised legislation and the restriction of legitimate development are now being reflected in the great volume of unemployment which exists in this country. A more reasonable attitude is imperative if industry is to thrive and intelligent endeavor is not to languish.

Charles W. Price, editor of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, of Chicago, presented a paper entitled "The Service of the Trade and Technical Press." This paper was originally presented to the International Press Congress at San Francisco in July. Mr. Price pointed out the significant part that the business publications of the country have played in developing many phases of industry. The great national associations of the country, with which are affiliated practically every enterprise of any magnitude today, have been called into being and fostered by the enterprising trade and technical publications devoted to these industries. His suggestion for a more practical working out and understanding of these relations resulted in the appointment of a committee whose special function it will be to develop this idea.

W. H. Ukers, president of the *Tea and Coffee Trade Journal,* New York, and president of the New York Trade Press Association, delivered a classical address entitled "Standards of Practice for Business Papers," which were unanimously adopted by the convention as follows:

Standards of Practice for Business Papers.

The publisher of a business paper should dedicate his best efforts to the cause of Business and Social Service, and to this end should pledge himself:

1. To consider, first, the interests of the subscriber.
2. To subscribe to and work for truth and honesty in all departments.
3. To eliminate, in so far as possible, his personal opinions from his news columns, but to be a leader of thought in his editorial columns, and to make his criticisms constructive.
4. To refuse to publish "puffs," free reading notices or paid "write-ups;" to keep his reading columns independent of advertising considerations, and to measure all news by this standard: "Is it real news?"
5. To decline any advertisement which has a tendency to mislead or which does not conform to business integrity.
6. To solicit subscriptions and advertising solely upon the merits of the publication.
7. To supply advertisers with full information regarding character and extent of circulation, including detailed circulation statements subject to proper and authentic verification.
8. To co-operate with all organizations and individuals engaged in creative advertising work.
9. To avoid unfair competition.
10. To determine what is the highest and largest function of the field which he serves, and then to strive in every legitimate way to promote that function.

Other papers which attracted considerable discussion were as follows:

"The Relations of the Farm and Business Press," by Hugh McVey, advertising counsellor of *Successful Farming,* Des Moines, Ia.

"Clean Up and Paint Up Campaigns," by Allen W. Clark, publisher of the *American Paint and Oil Dealer,* St. Louis, Mo.

"The Weak Spots in Trade Paper Efficiency," by Elton J. Buckley, editor of the *Modern Merchant and Grocery World,* Philadelphia, Pa.

"How Service Gets More Business," by J. Horace Lytle, advertising manager of *Better Roads and Streets,* Dayton, O.

"How Business Papers can get More Business From Advertising Agencies," by J. J. McPhillips, advertising editor of the *Textile World Record,* Boston, Mass.

"What the Newspaper Can Teach the Trade and Technical Journal," by E. J. Mehren, editor of *Engineering Record,* New York.

At the annual banquet on Wednesday evening, the principal speakers were Secretary of the Navy Josephus Daniels and the Honorable Job E. Hedges, of New York.

Officers were elected as follows:

A. A. Gray, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago, president.

W. H. Ukers, *Tea and Coffee Trade Journal,* New York, vice-president.

Charles-Allen Clark, *American Paint and Oil Dealer,* St. Louis Mo., secretary-treasurer.

Telephone Pioneers Journey to San Francisco.

The Telephone Pioneers of America, an organization of men who have had at least 21 years' service in the telephone field, journeying to San Francisco over an extended route, left New York on Tuesday, September 14. Connections were made at Chicago from Boston, Pittsburgh and other points, the train leaving Chicago on September 15 and visiting Omaha, Denver, Colorado Springs and Salt Lake City. It is expected that the arrival at San Francisco will be made on the evening of September 20. The convention will be held from September 21 to September 23, inclusive. Among those participating in the tour, the total distance of which will be 7,746 miles, are the following: C. F. Annett, Jerome, Ida.; Geo. R. Armstrong, Denver, Colo.; J. T. Blake, Newark, N. J.; W. J. Berry, Detroit, Mich.; H. C. Baker, Hamilton, Ont.; A. F. Brooks, New Haven, Ct.; E. H. Bangs, Chicago, Ill.; O. H. Berthold, New York, N. Y.; F. J. Boynton, Boston, Mass.; E. Corrigan, Baltimore, Md.; A. S. Campbell, New York, N. Y.; C. T. Clagett, Washington, D. C.; J. J. Donnelly, Brooklyn, N. Y.; C. B. Doolittle, New Haven, Ct.; John E. Foster, Boston, Mass.; S. B. Goodloe, Brooklyn, N. Y.; W. C. Graham, Newark, N. J.; F. A. Garrett, Syracuse, N. Y.; F. W. Griffin, Philadelphia, Pa.; W. L. Hermance, Paterson, N. J.; P. J. Hartmann, New York, N. Y.; H. G. McCully, Orange, N. J.; R. T. McComas, Cincinnati, O.; J. H. Mehaffey, Wilmington, Del.; G. B. Pierce, Hyde Park, Mass.; J. W. Stearns, Jamestown, N. Y.; F. R. Starkey, Boston, Mass.; R. H. Starrett, New York, N. Y.; F. B. Uhrig, Kansas City, Mo.; J. G. Wray, Chicago, Ill.; Chas. H. Wilson, New York, N. Y.

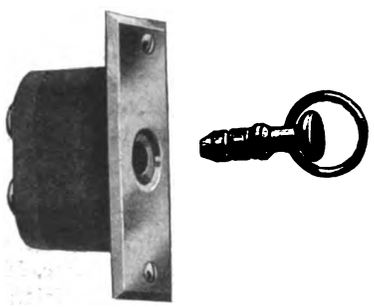
Digitized by Google

New Electrical and Mechanical Appliances

New Cutler-Hammer Switch for Preventing Automobile Thefts.

Every motorist is always in more or less fear of having his automobile stolen. Even though the car may be recovered, there are sure to be costly repairs to be made at his expense. Many automobilists lock their cars by using the standard C-H push-and-pull lighting switch for the purpose of grounding the magneto, placing the switch in some out-of-the-way location known only to the owner or driver.

A new switch has now been designed for this purpose by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This switch, shown in the accompanying illustration and referred to as catalog No. 7171, provides against theft by means of a removable plug. Pulling out this plug grounds the magneto and prevents operation of the car. The switch may be installed in the same location as the lighting switches or in any other place on the car. The ring on the plug allows carrying on a key-ring when not inserted in the switch.



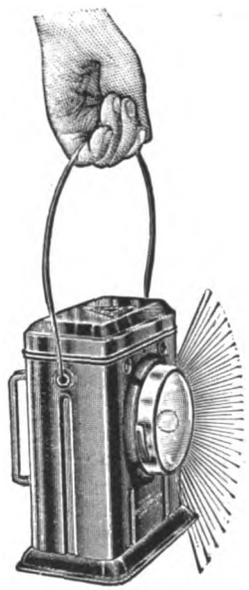
New C-H Magneto-Grounding Switch.

Delta Two-Cell Electric Lantern.

Following the very successful marketing of its now well known Delta electric hand lamp, equipped with a single No. 6 dry cell, the Delta Electric Company, Marion, Ind., has recently placed on the market the two-cell lantern illustrated herewith. This lantern takes two ordinary dry cells, either round or square, thus providing a more powerful light source and one giving longer hours of burning than is possible with a single cell.

The case is of cold-rolled sheet steel, provided with ribs to give additional strength. The case has a flanged base and is given a black enamel finish with nickeled trimmings, making a very neat outfit. Battery connectors are provided for ready connection of the cells, regardless of the type of cell termina. The switch is conveniently placed directly above the rear grip handle. A three-volt high-grade tungsten lamp is used. The silvered reflector and lens are arranged to give an even and wide distribution of the light without filament reflections.

While this lantern is particularly useful on the farm, in railroad service, and in places where the dangerous and unsatisfactory oil lanterns are now employed, it is of value whenever a powerful, safe and reliable portable lantern is needed.



Delta Two-Cell Lantern.

Flexible Metal Electric Heating Pad.

The use of electric heating pads is rapidly superseding the antiquated method of relying upon the troublesome hot-water bottle. Both the types of electric heating pads now on market, the flexible cloth pad and the stiff metal-inclosed pad, have their many advantages and some disadvantages. The cloth type is regarded by some as hazardous because of the possibilities of short-circuiting the wires. On the other hand, the metal-covered pad is reliable and satisfactory in every way except where in certain applications a flexible pad is desired.

In an effort to meet the desirable features of both these types there has recently been placed on the market a metal-clad flexible electric heating pad, which is said to be absolutely safe. It consists of 11 hinged or interlocked units which form a metal jacket or case over the wire-wound mica heating element inside; thus it readily conforms to the body curves and may easily be wrapped around a limb. This appliance is furnished with a washable eiderdown cover, which slips over the metal case and affords a soft soothing surface for application to the skin.

This new pad operates from any lamp socket. It consumes but 40 watts at high heat and is conveniently arranged with a small lever which permits graduated regulation of the heat so that the temperature may be maintained at several points between 100 and 200 degrees Fahrenheit. This lever is so arranged that it can be operated in the dark or underneath the bed covers without fear of getting the wrong degree of heat. The temperature is automatically maintained constant by a thermostat, which automatically cuts off the current and cuts it in again as the temperature fluctuates.

New Hotpoint Heat Pad.

This appliance is known as the Hotpoint Safety Comfo, and is manufactured by the Hotpoint Electric Heating Company, Ontario, Cal.

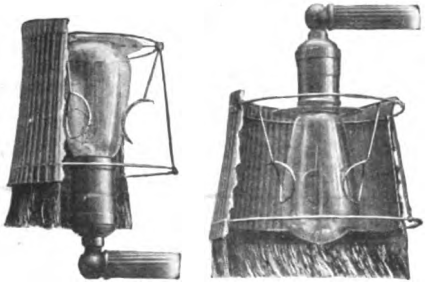
Silk Illuminating Shades.

In view of the growing appreciation on the part of the consumer for softened and colored light, unusual

Digitized by Google

interest is attached to recent developments made in the manufacture of silk shades in various colors which meet the requirements of electric lighting. Shades to fulfill this purpose in a measure have been turned out by the millions; but there has been felt throughout the trade a need for shades that are not alone artistic but which are mechanically fit to cope with actual conditions, thus making for safety, durability and permanent stability. For it is not good business to install shades that will scorch or wear out quickly, or work out of place easily. The simple wire frame, attached in almost any way to the lamp or socket, balanced on the tip of the lamp bulb or loosely fitted into the ordinary shade-holder, was a most unsatisfactory thing. These objections have been done away with, apparently, by the Storrs Mica Company, Owego, N. Y., in its latest productions.

Typical Storrs Silk Shades on Portable Lamps.



Sectional Views of Shades Applied to Upright and Pendent Lamps.

These new shades fit all standard incandescent electric lamps, from the 10 to 60-watt sizes. Special holders are not required. The shade is slipped over the lamp bulb and three positive spring-wire grips, in contact at six points on the sides of the bulb, hold the shade firmly in place. The centering mica disk securely fastened in the top of the shade rests on top of the lamp bulb when the lamp is in an upright position.

With lamps in a pendent position this mica disk fits closely around the neck of the bulb, and as mica is a non-conductor of electricity, the claim is made that it is not possible for the wire frame on Storrs shades to become grounded or cause a short-circuit, as so frequently happens with poorly designed wire frames.

Storrs silk shades produce the proper diffusion of light by a special process treatment on their inner surface with a mica flour—minute particles of ground mica—mixed with a suitable binding fluid deposited on that part of the silk forming the inside of the shade. Another innovation is the circular silk disk of the same material as the shade, fastened in the top of these shades, for upright use, so as to cast a tinted light on wall or ceiling.

The shades are packed in separate cardboard cartons. The frames for electric lamps are furnished without silk coverings where it is desired to use a particular fabric to match other material or for any other reason desired. These shades, it would appear, should prove very serviceable in the home, hotel, or wherever artistic and effective lighting is desired.

New Single-Phase Induction Motors.

A new type of single-phase motors known as "Advance" type WS, has been placed on the market. These motors are of the repulsion induction type, starting as a repulsion motor and automatically short-circuiting at running speed, thus relieving the commutator of all work, except during the starting period. They are made in sizes one-eighth to five horsepower for all standard voltages and frequencies, and finished in baked black enamel in smaller sizes. They have large steel shafts with ring-oiling bronze bearings that are easily changed for wall or ceiling suspension. The sheet steel used in the laminations is of a superior grade and this, with the enameled-insulated windings and careful design, has produced an exceptionally compact and efficient motor. These motors are especially desirable for operation on lighting circuits, as the starting current is small, and they accelerate rapidly with strong torque, and will start on a fuse that gives the motor protection again overload.

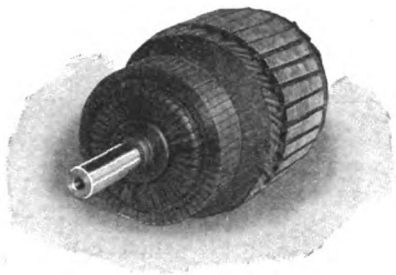


Fig. 1.—Advance Type WS Rotor Complete.

The vital feature of a motor of this type is the device that automatically changes the motor from a repulsion to straight induction machine. To give lasting satisfaction, this must be rugged, reliable and always act at the proper speed. Fig. 1 gives an end view of the commutator, showing the copper short-circuiting weights in the starting position, that is, pulled down out of contact with the commutator segments. The centrifugal force of the short-circuiting weights is opposed by a heavy spring, encircling the shaft and adjusted to allow the circle of weights to expand and make contact with the commutator segments when the motor reaches about 90 per cent of synchronous speed, making a positive copper-to-copper short-circuit of the individual armature coils. Fig. 2

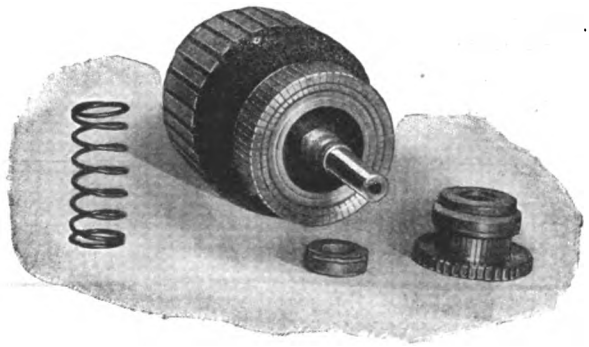


Fig. 2.—Rotor with Parts of Automatic Short-Circuiting Mechanism Detached to Show Simplicity of Construction.

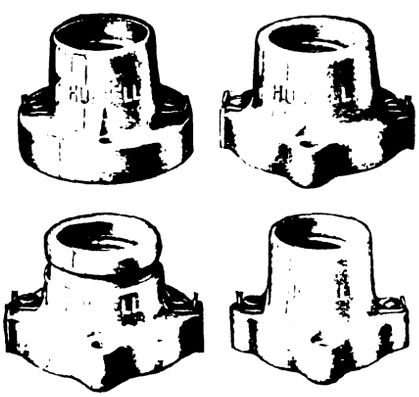
Digitized by Google

shows the whole mechanism, the short-circuiting weights, spring and retaining nut removed, giving an idea of the simplicity of the device. As the contact elements are acted upon directly by the centrifugal force, all connecting rods, bell cranks, governor weights and numerous parts have been completely eliminated. The strong spring tending to hold the weights in the starting position, always exerts a strong pressure against the end of the commutator, insuring a rubbing contact, under heavy pressure, consequently the short-circuit is perfect, and there is no heat or burning of contacts. As each short-circuiting weight is acted upon directly and independently by centrifugal force, there are many points of contact with uniform pressure. All moving parts are of either brass or copper, so there is no chance of rust interfering with the action, even when subject to dampness or infrequent use. This device has now been in use for over three years with the most satisfactory results. It is also applied to automatic self-starting polyphase motors for elevator service, remote control or the like, when it is necessary to keep the starting current down, or secure higher starting torque than the squirrel-cage type gives.

These motors are identical in dimension with motors for direct and polyphase current, so that no change of patterns is necessary in direct connecting, to mount motors for the various current services, or in changing from one to another. They are manufactured by the Advance Electric Company, 22 North Commercial Avenue, St. Louis, Mo.

New Porcelain Receptacles.

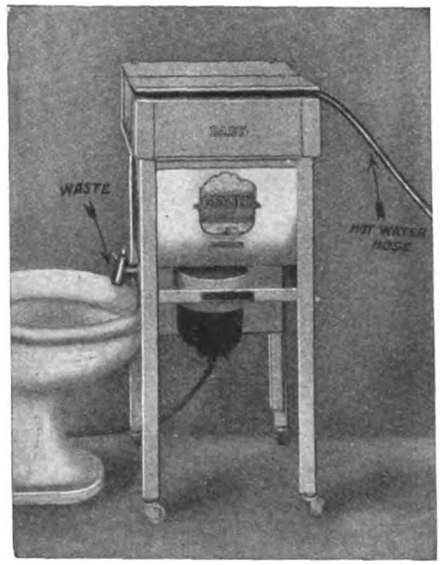
To the extensive line of receptacles produced by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., there have been added recently four new porcelain cleat receptacles, illustrated herewith. These are of various types to meet the diversified requirements of the electrical trade. Each of the receptacles is provided with large binding-screws upset at the ends to save time in wiring. The entire husk is composed of one piece of heavy porcelain to minimize the liability of breakage. One of the receptacles has a bead for the attachment of shade or reflector-holder.



Group of New Porcelain Cleat Receptacles.

Small Electric Washer for Infants' Wear.

It has been said that the coming of a baby brings to its mother the climax of human joys. It is well known, however, that the infant also brings great responsibilities and arduous duties, among which is the frequent changing of the baby's napkins and the washing thereof. This makes almost every day a washday and is the most disagreeable of the mother's tasks.



Baby Geyser Electric Washer.

In the firm belief that electricity is the greatest foe to drudgery, one of the manufacturers of electric washers has developed and placed on the market a compact and very neat machine especially designed for this and similar service. This washer operates on the same geyser principle as this maker's larger "Capital Safety First" electric washer, that is, a motor-driven, two-blade propeller forces a strong stream of hot, soapy water through the clothes, which are churned about in the smooth cylindrical tank and thereby thoroughly cleaned without wear or tear.

The machine is but 14 inches wide and yet has ample capacity for a considerable batch of infant's diapers. It can also be used for taking care of all the washing of a small family. It can hold as much as seven shirts or three sheets in one washerful. A small hand wringer can be easily clamped on the back. This washer is of simple, but substantial construction, and has no gears or other machinery or sharp points on which the clothes might be torn. It is of compact design so as to permit its use in even small bathrooms. No water need be lifted in this case. The hot water can be supplied through a hose and the waste discharged directly into the closet bowl, as shown in the cut herewith.

This new washer is known as the "Baby Geyser Electric Washer," and is manufactured by the Capital Electric Company, 321 North Sheldon Street, Chicago, Ill.

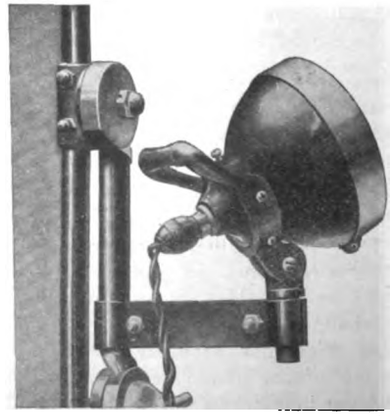
Searchlight With Focusing Adjustment for Any Style of Lamp.

A new automobile searchlight, known as the Pittsburgh Five, is provided with an outside set-crew focusing adjustment, which permits the use of any style lamp, either vacuum or gas-filled, regardless of size or voltage, and makes it possible to adjust the lamp instantly for any kind of beam without disturbing it in any way or removing it from its position.

Due to this accessible adjustment, the lamp may be transferred from one car to another of different voltage at will. It also enables the user to select a bulb to suit his requirements, and in case of accident to use any available bulb as a renewal. Should it become necessary to use the searchlight to take the place of the headlight, the width of the illuminated field can be increased as desired.

Another feature of the device is the double-curvature parabolic reflector, which, though only five inches in diameter, is said to produce as much beam candlepower as any large automobile headlight, with even distribution of light. It is claimed the most powerful searchlight manufactured. A minor feature, but one of considerable convenience, is the design of the handle, which serves as a stand for holding the lamp in an upright position when detached for repairing tires, etc.

This lamp is manufactured by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa.



Pittsburgh "Five" Electric Searchlight.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

NUNDA, N. Y.—Nunda Electric Light Company, Incorporated; light, heat, etc. Capital, $10,000. Incorporators: Harry J. Gordon, Mary L. Gordon and Leon A. Willard, Nunda, N. Y.

ELIZABETH, N. J.—Articles of incorporation have been filed for the Commonwealth Electric Company, 19 Beechwood Road, Summit. The company is capitalized at $500,000, and the incorporators are Carroll P. Bassett, Fred R. Drake, Frank C. Kimball, Stephen W. Borden and H. Marsh Shorrock.

GREER, S. C.—Bonds to the amount of $10,000 have been voted for extending the street electric lighting system. Address mayor.

COLUMBUS, GA.—The Columbus Power Company will increase the capacity of its transformer equipment at the Goat Rock plant, increasing the use of electrical energy in West Point, LaGrange, Newnan and other industrial cities in western Georgia as made this necessary.

NORTH CENTRAL STATES.

TROY, O.—W. E. Hunter, of New York, and John B. Hurst and A. B. Cornett, of Troy, are discussing a plan for the sale by the latter, as owners of the dye mill property, of the water and other rights in connection with it for use for industrial purposes. New York interests, it is understood, will construct a factory building, using the water power for the generation of current for all purposes, to the extent of 1,000 horsepower. L.

WASHINGTON, O.—The Washington Gas and Electric Company has entered into a contract, approved by the City Council, for the installation of a complete new street-lighting system, under plans and specifications prepared by H. Whitford Jones, and settling rates and other details for a term of 10 years. The contract provides for the installation of 406 nitrogen lamps of 100 candlepower, 212 lamps of 250 candlepower for ornamental standards in the business district, and 52 lamps of 250 candlepower for other purposes. The installation is to be completed within six months. L.

KANKAKEE, ILL.—The County Board plans to install an electric lighting system for courthouse and jail. Address Supervisor Frank Hennessey, of the lighting committee.

ASHLAND, WIS.—A $75,000 electrical plant will be constructed by the Ashland Light, Power and Street Railway Company.

LAKEFIELD, MINN.—Plans are under consideration for a new white way. Address city clerk.

BREDA, IOWA.—Bonds have been voted for electric lights. Address town clerk.

STEELVILLE, MO.—The Steelville Electric Light and Power Company has been incorporated with a capital of $10,000, by John Zahorsky, Jr., and others.

HOYT, KANS.—A municipal electric lighting plant may be installed here. Address town clerk.

BARNSTON, NEBR.—A hydroelectric power plant will be installed to supply electricity to towns along Blue River. Address George H. Steinmeyer, mayor.

BLAIR, NEBR.—The citizens have voted to issue $35,000 in bonds to purchase the electric light plant or build a new one. Address city clerk.

LAUREL, NEB. — Bonds to the amount of $12,000 have been voted for the building of a municipal electric lighting plant. It is intended to start the work as soon as the bonds are sold.

SOUTH CENTRAL STATES.

CLAY, KY.—The Perry Light and Ice Company is constructing a three-mile high-tension transmission line. It is planning the purchase of a second-hand, belted, 60-cycle, 2,200-volt, single-phase, 50 to 75 kilowatt alternator, with exciter.

FT. THOMAS, KY.—The Union Light, Heat and Power Company, of Covington and Newport, Ky., has been awarded franchises for electric, gas and water purposes in Fort Thomas, in accordance with bids submitted by the company some time since, and will accordingly extend its service facilities in the town considerably. L.

JUNCTION CITY, KY.—An electric light, power and traction franchise has been ordered sold by the Board of Trustees of this city.

PROVIDENCE, KY.—An election will be held November 7 to vote on issuing $20,000 in bonds to build an electric light plant. Address R. L. Price, clerk.

FAIRHOPE, ALA.—The citizens voted in favor of establishment of municipal electric light plant. Address mayor.

JOURDANTON, TEX.—The Atascosa Ice, Water and Light Company will extend its lighting system to the residence portion of town. D.

WESTERN STATES.

ALBION, IDAHO.—Bonds amounting to $8,000 have been voted, to be used in contracting for power for a lighting and power system. Address city clerk.

KENDRICK, IDAHO.—The City Council has granted A. V. Dunkle, of Plummer, Idaho, a franchise to construct an electric light plant, same to be in operation in 60 days. The estimated cost is $10,000.

RENTON, WASH.—Hugo Thornblade, president of the Pacific Electric Welding & Manufacturing Company, Arcade Building, Seattle, states his company will immediately install machinery for the manufacture of electric welding machines, ornamental iron, etc., in a building which was recently purchased in this city. The company will invest several thousand dollars in the proposition. O.

REPUBLIC, WASH.—A transmission line from Republic to Danville will be constructed in the immediate future by F. R. Clark, who has a franchise to carry out this improvement. The line to be built will derive its current from the West Kootenai Company's power line, from Bonnington Falls, near Danville. It is understood practically all of the electrical energy will be disposed of at the local mines and stamp mills, which, heretofore, have been operated with steam power. S. H. Richardson, of Republic, has begun making surveys for the proposed improvement. O.

EUGENE, ORE.—Definite plans for the construction of a 1,250-kilowatt auxiliary steam plant, to be built by the Eugene Water Board, as an auxiliary to the city's municipal hydroelectric plant, near Waterville, on the McKenzie River, have been announced by the Water Board. The proposed plant will cost between $50,000 and $60,000, and will consist of a boiler and engine, and a set of generators, with sufficient capacity to furnish light and power for the city in case the hydroelectric plant is temporarily out of commission. The Water Board is now taking bids on two sets of specifications, one for the installation of the ordinary type and the other for the installation of a Diesel engine. Closing date of bids has not been announced, although it is understood bids will be opened early in October. O.

PROPOSAL.

LIGHTING FIXTURES.—Sealed bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until October 13, 1915, for electric fixtures for the United States post office at Naugatuck, Conn. Drawings and specifications may be obtained from the custodian of the site at Naugatuck, Conn., or at the office of the supervising architect, Washington, D. C.

NEW INCORPORATIONS.

SPILLVILLE, IOWA.—The Spillville Electric Light Company has been incorporated with a capital of $10,000.

CALMAR, IOWA.—The Calmar Electric Company has been incorporated with a capital of $15,000. Andrew Latimer is president.

STEELVILLE, MO.—Steelville Electric Light and Power Company; capital $10,000. Incorporators: John Zahorsky, Jr., A. H. Harrison and W. E. Evans.

SEATTLE, WASH.—The Vashon Light and Power Company has been organized with a capital of $100,000, by John E. Burkheimer and A. S. E. Robertson.

MILWAUKEE, WIS.—The Roberson Electrical Appliance Company has been organized with a capital of $10,000, by L. C. Roberson, P. A. Klumb and D. C. Madden.

BRONX, N. Y.—Sayles Electric Company, Incorporated. Capital, $1,000. Incorporators: Caspar C. Sayles, Hilda Vielberth and Rudolph Loewenthal, Bronx, N. Y.

NEW YORK, N. Y.—The Bass Company, Incorporated; electrical fixtures. Capital, $20,000. Incorporators: Fabia

Digitized by Google

Wittman, John Kerekes and William Bass, New York.

BRONXVILLE, N. Y.—H. Ward Leonard, Incorporated; electrical work. Capital, $10,000. Incorporators: Leonard Kebler, James W. Good and Allan R. Campbell, Bronxville, N. Y.

WILMINGTON, N. C.—The National Electric Thermometer Company has been incorporated with a capital stock of $10,000. The incorporators are B. W. Jordan, T. B. Jordan and T. W. Davis.

NEW YORK, N. Y.—Joseph P. Day Private Sales Department, Incorporated; electrical sales agency. The incorporators are Joseph P. Day, John S. Turnbull and Roy C. Middlebrook, all of New York City.

GLIDDEN, IOWA.—A company has been organized under the name of the North Glidden Electric Company, to supply electricity for lamps and motors to the farmers in vicinity. Capital is $5,000. A new plant may be built. J. G. Merritt, president.

FINANCIAL NOTES.

The Westinghouse Electric & Manufacturing Company announced that the offer to stockholders to subscribe to the new convertible bonds of the company had resulted in their purchase of all but $457,000 of the issue. Bonds not subscribed for are to be distributed pro rata among the depositing bondholders, who will receive cash for the balance of their deposited bonds at the rate of 105 and accrued interest.

Net earnings from operations of the Edison Company, of Boston, for fiscal year ended June 30 last, crossed the $4,000,000 mark, for the first time in the history of the company, the exact figure being $4,002,292, compared with $3,855,016 in the previous year, an increase of $147,276, or three per cent.

Kansas City Railway & Light Company stockholders have accepted the plan formulated by Federal Judge Hook for the reorganization of Metropolitan Street Railway of Kansas City and Kansas City Electric Light Company. A supplemental plan for the Kansas City Railway & Light will be issued shortly and it will not provide for any assessment on Kansas City Railway & Light Company stocks.

Dividends.

	Term	Rate	Payable
Am. Gas & Elec. com..	Q	2 %	Oct. 1
Am. Gas & Elec. pf....	Q	1.5 %	Nov. 1
Am. Tel. & Tel.....	Q	2 %	Oct. 15
Ark. Ry., Lt. & Pr. pf.	Q	1.75%	Sept. 15
Bell Telephone, Canada	Q	2 %	Oct. 15
Brazilian Trc., Lt. & Pr. pf.	Q	1.5%	Oct. 1
Brockton & Plymouth St. Ry. pf.	S	$3.00	Sept. 15
Cal. Ry. & Pr. prior pf.	Q	1.75%	Oct. 1
Cent. States Elec. Corp. pf.	Q	1.75%	Oct. 1
Duluth-Superior Trac. pf.	Q	1 %	Oct. 1
Eastern Pr. & Lt. pf....	Q	1.5%	Sept. 15
El Paso Elec. Com.....	Q	$2.25	Sept. 15
Galveston - Houston Elect. pf.	S	$3.00	Sept. 15
Ill. Trac. pf.	Q	1.5 %	Oct. 1
Indiana Ltg.	S	1 %	Oct. 1
Manhattan Ry.	Q	1.75%	Oct. 1
Manila Elec. R.R. & Lt.	Q	1.5 %	Oct. 1
Muskogee Gas & Elec. pf.	Q	1.75%	Sept. 15
Phila. Trac.	S	$2.00	Oct. 1
So. Utilities pf.	Q	1.75%	Oct. 1
Standard Gas & Elec. pf. (payable in scrip)	Q	1 %	Sept. 15
Twin City Rap. Tran. pf.	Q	1.75%	Oct. 1
Twin City Rap. Tran. com.	Q	1.5 %	Oct. 1
Western Union	Q	1.25%	Oct. 15

Reports of Earnings.

WESTCHESTER STREET RAILROAD.

Westchester Street Railroad Company reports to the up-state Public Service Commission, for the quarter ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$66,507	$64,464
Net earnings	36,490	11,559
Surplus after charges	22,477	*1,713

*Deficit.

YONKERS RAILROAD.

Yonkers Railroad Company reports to the up-state Public Service Commission, for the quarter ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$190,239	$187,834
Net earnings	46,783	14,295
Surplus after charges	5,610	*26,058

*Deficit.

WESTCHESTER ELECTRIC RAILROAD.

Westchester Electric Railroad Company reports to the upstate Public Service Commission, for the quarter ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$157,898	$146,332
Net earnings	27,136	41,119
Deficit after charges	10,269	*4,979

*Surplus.

HAVANA ELECTRIC RAILWAY, LIGHT & POWER.

	1915	1914
Seven months' gross	$3,199,879	$3,120,189
Seven months' net income to July 31	1,188,225	922,908

WISCONSIN EDISON.

	1915	Change From 1914
July gross	$ 675,707	Dec. 6.42%
Operating expenses.	428,303	Dec. 3.12%
Net earnings.	248,404	Dec. 11.59%
Balance available for holding company and depreciation..	111,118	Dec. 22.72%
Twelve months' gross	8,457,580	Dec. 3.50%
Operating expenses..	5,026,037	Dec. 3.16%
Net earnings.	3,431,544	Dec. 3.98%
Balance available for depreciation and for holding company	1,796,517	Dec. 10.21%

Depreciation reserve for twelve months ended July 31, 1915, was $882,754, an increase of 6.01 per cent over the preceding year.

INTERBOROUGH RAPID TRANSIT COMPANY.

Interborough Rapid Transit Company reports for the year ended June 30, 1915, compares as follows:

	1915	1914
Gross operating revenue	$33,433,743	$33,515,396
Operating expense	12,941,314	12,902,053
Net operating revenue	20,492,429	20,613,342
Taxes	2,133,980	2,081,948
Operating income	18,358,449	18,531,394
Other income	623,631	612,852
Total income	18,982,080	19,144,246
†Interest	10,913,595	11,119,666
Net corporation income	*8,068,484	8,024,580
Dividends	7,000,000	5,250,000
Surplus	1,068,484	2,774,580
Passengers carried	647,378,266	651,886,671

*Equal to 23.05 per cent on $35,000,000 capital stock, as compared with 22.92 per cent earned previous year.

†Rent, etc., including Manhattan Railway guarantee.

CALIFORNIA TELEPHONE & LIGHT.

California Telephone & Light Company reports earnings for seven months ended July 31, as follows:

	1915	1914
Gross earnings	$124,395	$112,470
Net after taxes	55,116	46,150
Surplus after charges	31,127	23,943
Balance after depreciation	26,841	20,667
Balance after preferred dividends	6,682	1,802

AMERICAN PUBLIC UTILITIES.

American Public Utilities Co. reports income account for the fiscal year ended June 30 as follows:

	1915	1914
Gross earnings	$2,932,070	$2,319,595
Net after taxes	1,313,831	980,879
Other income	25,930	45,303
Total income	1,339,761	1,026,182
Expenses	38,101	51,486
Balance	1,301,659	974,656
Fixed charges	952,109	599,309
Preferred dividends	234,840	234,840
Balance	114,711	140,547

DETROIT UNITED LINES.

	1915	1914
July gross	$1,205,881	$1,129,955
Net	340,577	333,553
Surplus after charges..	172,402	170,600
Seven months gross	7,282,569	7,044,772
Net	2,140,008	2,048,159
Surplus after charges..	989,789	956,177

LEHIGH VALLEY TRANSIT.

	1915	1914
July gross	$ 190,563	$ 175,676
Net after taxes and depreciation	83,665	72,816
Other income	11,148	9,977
Total income	94,803	82,704
Surplus after charges..	39,707	20,833
Twelve months gross..	1,939,185	1,866,565
Net after taxes and depreciation	777,386	713,014
Other income	129,626	126,199
Total income	907,013	839,214
Surplus after charges..	247,194	207,488

LAKE SHORE ELECTRIC RAILWAY.

	1915	1914
July gross	$ 136,447	$ 151,999
Net after taxes	57,665	72,778
Surplus after charges..	21,445	37,010
Seven months gross	761,570	810,105
Net after taxes	248,170	299,238
Deficit after charges	4,327	*51,749

*Surplus.

CLEVELAND, PAINESVILLE & EASTERN RAILROAD.

	1915	1914
July gross	$ 44,653	$ 45,282
Net after taxes	22,873	23,338
Surplus after charges..	11,762	12,243
Seven months gross	224,392	232,351
Net after taxes	96,202	108,596
Surplus after charges..	19,391	31,568

MT. WHITNEY POWER & ELECTRIC.

	1915	1914
July gross	$ 64,342	$ 63,305
Net after taxes	39,285	34,857
Surplus after charges..	25,795	22,472
Twelve months gross..	751,603	667,769
Net after taxes	444,138	331,348
Surplus after charges..	291,812	190,674

GREAT WESTERN POWER.

	1915	1914
July gross	$ 224,137	$ 216,936
Net after taxes	170,648	148,346
Total income	187,932	167,015
Surplus after charges..	81,740	66,042
Balance after preferred dividends	69,240	53,542

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 6	Sept. 13
American Tel. & Tel. (New York)	122¼	122¾
Commonwealth Edison (Chicago)	137	136
Edison Electric Illuminating (Boston)	232	237
Electric Storage Battery common (Philadelphia)	75⅝	72½
Electric Storage Battery preferred (Philadelphia)	75⅝	72½
General Electric (New York)	171	170½
Kings County Electric (New York)	119	120
Massachusetts Electric common (Boston)	7	8
Massachuestts Electric preferred (Boston)	39¼	43
National Carbon common (Chicago)	140	140½
National Carbon preferred (Chicago)	119¼	120
New England Telephone (Boston)	129½	129½
Philadelphia Electric (Philadelphia)	24½	25
Postal Telegraph and Cables common (New York)	75¼	76
Postal Telegraph and Cables preferred (New York)	66¾	66½
Western Union (New York)	74	75¾
Westinghouse common (New York)	115¼	114
Westinghouse preferred (New York)	135	134

Digitized by Google

DETROIT EDISON COMPANY.

	1915	1914
July gross	$ 546,600	$ 465,119
Net after taxes	171,072	127,364
Surplus after charges	74,420	53,359
Seven months' gross	4,277,332	3,620,936
Net after taxes	1,578,494	1,239,737
Surplus after charges	974,456	756,104

PACIFIC LIGHT & POWER CORPORATION.

	1915	1914
July gross	$ 259,322	$ 222,191
Net after taxes	178,409	123,831
Other income	9,382	14,966
Total income	187,791	138,797
Surplus after charges	80,329	30,555
Seven months' gross	1,643,025	1,497,005
Net after taxes	1,092,533	862,049
Other income	74,195	104,713
Total income	1,166,727	966,763
Surplus after charges	412,831	252,752

DAYTON POWER & LIGHT COMPANY.

	1915	1914
July gross	$ 76,032	$ 68,456
Net	35,288	27,744
Surplus after charges	17,166	10,528
Twelve months' gross	1,003,033	885,369
Net	465,869	390,628
Surplus after charges	252,024	186,222

SOUTHERN CALIFORNIA EDISON.

	1915	1914
July gross	$ 417,590	$ 407,572
Net after taxes	253,065	250,083
Surplus after charges	165,747	173,416
Balance after depreciation	75,747	83,416
Seven months' gross	2,734,120	2,718,077
Net after taxes	1,536,283	1,396,013
Surplus after charges	952,430	866,226
Balance after depreciation	622,430	536,226

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
July gross	$ 371,736	$ 351,659
Net after taxes	152,033	145,489
Surplus after charges	109,228	94,641
Balance after preferred dividends	83,861	79,536
Seven months' gross	2,128,388	2,073,359
Net after taxes	807,038	807,554
Surplus after charges	446,768	454,871
Balance after preferred dividends	332,465	349,649

PERSONAL MENTION.

MR. THEODORE CLAUSS, for some years secretary of the Union Gas and Electric Company, until succeeded a year or two ago by T. F. Wickham, has resigned his connection with the company, effective October 1, in order to devote all of his time to his duties as secretary of the Cincinnati Gas and Electric Company, whose gas and electric facilities are leased by the Union Gas and Electric Company.

MR. ROBERT MONTGOMERY, commercial manager of the Louisville (Ky.) Gas & Electric Company, is representing the company in the organization of a Safety First League in that city, to be affiliated with the National Safety First League. Street and steam railway, automobile, educational and civic interests have taken hold of the project, which was set on foot by Coroner Ellis Duncan, and the league will formally be organized in the near future.

MR. CHARLES A. RUSSELL, of Gloucester, Mass., has been appointed by Governor Walsh as a member of the Public Service Commission of Massachusetts, to succeed Mr. Clinton White, who retired from the board at the prescribed age limit. Mr. Russell is a lawyer and a Democrat. He is a native of Canton, Mass., graduated from Colby College, Maine, and from the Boston University Law School. He was admitted to the bar in 1880. He was city solicitor of Gloucester for eight years and was its counsel in the litigation between the water company and the city over the taking of works. The new commissioner is an Odd Fellow, Red Man, a member of the University Club of Boston, and of the Salem Club of Salem.

MR. HERBERT ELDER has severed his connection as an electrical inspector of Underwriters' Association of the Middle Department, with which he was connected for about eight years, and he has also resigned his position of engineer of the Underwriters' Laboratories, Incorporated, in charge of its office at Baltimore, Md., for the past four years. He has now associated himself with G. O. Paxson, of Fredrick, Md., who has been carrying on an electrical construction, supply and fixture business. The new firm of G. O. Paxson Company will do a larger and more extensive contracting and fixture business in Fredrick and vicinity, and will be open to take up any branch of electrical contracting that presents itself.

MR. WILLIAM J. DOHERTY, for the past four years general supply sales manager of the Northern Electric Company, Limited, of Montreal, Canada, has returned to the United States and will make his headquarters in Chicago, representing the lines of a number of leading manufacturers of electrical material. "Bill" Doherty started in the electrical business with the Central Electric Company, Chicago, in May, 1899. He left the Central to enter the employ of the Western Electric Company in November, 1902, working in the stores department, purchasing department and sales department, holding the position of supply sales manager for several years before being transferred in 1911 to the affiliated company in Canada. As general supply sales manager he was in charge of sales throughout the entire Dominion of Canada until he resigned on August 1. Mr. Doherty has been a familiar figure in the electrical industry for a long time. A regular attendant at the conventions of the Electrical Supply Jobbers' Association, he has taken an active and conspicuous part in all of their proceedings. He is a Jovian, entering the Order in Richmond, Va., in 1910, and has served as a statesman, statesman-at-large and is at present a member of the Thirteenth Congress, holding the office of Reigning Chiron. Before leaving Montreal, the Canadian jobbers made him a present of a beautiful silver loving cup, mounted upon an ebony base and equipped with three stag-horn, silver-tipped handles. His associates in the Northern tendered him a banquet and presented him with a solid gold Waltham watch as a token of esteem. "Bill" has had a lot of experience, has a lot of good friends and ought to be a strong man for handling a strong line of electrical material.

William J. Doherty

MR. H. M. ROBERTS, until recently railroad representative of the General Lead Battery Company, has been appointed sales engineer of the railroad department of the Edison Storage Battery Company, Orange, N. J. Mr. Roberts graduated with the class of 1905 from the Sheffield Scientific School of Yale University, with the degree of Electrical Engineer, and for six years was connected with the engineering department of the New York Telephone Company in power plant work. After leaving the New York Telephone Company, he spent several years in general contracting-engineering on railroad and other large enterprises with James Stewart and Company, Incorporated, of New York. Mr. Roberts' headquarters will be at the factory and main office of the Edison Storage Battery Company at Orange, N. J.

MR. H. S. COOPER, well known in the Southwest as the secretary of the Southwestern Electrical and Gas Association for many years, has made arrangements whereby, while retaining his official connection with the Association, he is free to engage in consulting and advisory work in the construction, operation and management of electric light and power plants, street and interurban railways, gas works and water works. Mr. Cooper has had a very extended experience with the varied problems that come up in utility management, and his services as consulting or advisory engineer in clearing up problems in relation to utilities should prove highly valuable. Mr. Cooper's office is located at Rooms 405 and 406, Slaughter Building, Dallas, Texas.

OBITUARY.

MR. CHARLES TURBETT, seventy-two years old, who was an engineer in the Newark City Hall for many years, until his retirement two years ago, died Friday, September 10, of heart disease in his home, in the Ironbound district of Newark. He was a native of Ireland, but had lived in Newark nearly seventy years. During the civil war he served in the army and navy. He leaves a wife, one son and one daughter.

MR. ORIN H. NORTON, formerly city electrician of Peoria, Ill., and later one of its pioneer electrical contractors and dealers, died at his home in Peoria on September 5, aged 75 years. Mr. Norton was born in Opelonsas, La., and since he came to Peoria in 1841 has been almost continually a resident of that city. He was the organizer of a volunteer fire company and after a regular fire department was established he served several years as its first chief; for over twenty years Mr. Norton was an active fireman. In 1886 he was appointed city electrician. Later in company with Edgar Wetherell, he formed the electrical firm of Wetherell & Norton. When his partner retired from the business Mr. Norton organized the Central Electric Company of Peoria. He remained president of that firm until total blindness compelled his retirement in February, 1912. Mr. Norton was buried on September 7, with the full rites of the Odd Fellows Order, of which he had been a member for a great many years. He is survived only by his widow.

Digitized by Google

DR. KARL E. GUTHE, dean of the University of Michigan and a physicist of international prominence, died at a hospital at Ashland, Ore., Saturday, September 11, from shock following a capital operation. Dr. Karl E. Guthe was born in Hanover, Germany, March 6, 1866. He was educated at the Gymnasium, in Hanover, the Hanover Technical school and the universities of Marburg, Strasburg and Berlin. Coming to the United States in 1892, he became instructor of physics in the University of Michigan, and was assistant professor in that institution from 1900 to 1903. He was a member of the Bureau of Awards of the St. Louis Exposition in 1904. Doctor Guthe was a member of the American Physicists' Society, the Deutsche Physikalische Gesellschaft, Société Française de Physique, Washington Academy of Sciences and the Iowa Academy of Sciences. He wrote extensively on scientific subjects and was author with J. O. Reed of a manual of physical measurements, laboratory exercises with primary and storage cells and a text book on physics. He was an authority on electricity and wrote many brochures on that subject. He was married to Miss Clare Belle Ware, of Grand Rapids, Mich., in 1892.

DATES AHEAD.

International Engineering Congress, Civic Auditorium, San Francisco, Cal., September 20-25. Executive secretary, E. J. Dupuy, Foxcroft Building, San Francisco, Cal.

American Mining Congress. Eighteenth annual convention, San Francisco, Cal., September 20-22. Secretary, J. F. Callbreath, Munsey Building, Washington, D. C.

Illuminating Engineering Society. Annual convention, New Willard Hotel, Washington, D. C., September 20-23. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York, N. Y.

Telephone Pioneers of America. Annual meeting, San Francisco, Cal., September 21-23. Secretary, R. H. Starrett, 15 Dey Street, New York, N. Y.

New England Electrical Contractors' Association. Annual convention, Springfield, Mass., September 22 and 23. Secretary, H. D. Temple, Worcester, Mass.

Southeastern Section, National Electric Light Association. Annual convention, Grove Park Inn, Asheville, N. C., September 22-24. Secretary, George H. Wygant, Tampa, Fla.

Colorado Electric Light, Power and Railway Association. Thirteenth annual convention, Glenwood Springs, Colo., September 23-25. Secretary, Thomas F. Kennedy, 900 Fifteenth Street, Denver, Colo.

American Electric Railway Association. Annual convention. San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

New York Electrical Show. Ninth annual exposition, Grand Central Palace, New York City, October 6-16. Geo. F. Parker, vice-president, 124 West Forty Second, New York City.

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention. Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention. Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

With the Electrical Manufacturers

The American Steel and Wire Company, Chicago, Ill., has been awarded the grand prize by the Panama-Pacific International Expositon for superiority of its products, and the high character of its exhibit.

The MacGillis & Gibbs Company, Milwaukee, Wis., is sending to purchasers of white cedar poles folders calling attention to its excellent facilities for shipping just as ordered cedar poles and other cedar products.

Horton Manufacturing Company, Fort Wayne, Ind., is sending out to dealers folders calling attention to its co-operatives sales plan for stimulating sales of its electric washer No. 32 with three-way wringer. This machine is backed up by 34 years of experience in the washing-machine business.

The Reliance Automatic Lighting Company, Racine, Wis., recently shipped 25 Reliance time switches to Australia. This order was received through an export merchant, and was in competition with various other makes of time switches. The Reliance Company has recently added to its line a 10-ampere switch.

Hubbard & Company, Pittsburgh, Pa., have published a large illustrated folder calling attention to the construction and obvious merits of the new Peirce Presteel brackets for use in overhead distribution-line construction. This should prove of much interest to central-station, as well as telephone men.

Ideal Lamp Manufacturing Company, Faribault, Minn., has issued a new catalog of its artistic electric portable table and floor lamps, domes, pedestals and other wood novelties. The line of this company's products, which are all made of seasoned wood, has been extended and many neat designs have been added.

Mathias Klein & Sons, Chicago, Ill., has issued catalog No. 16, which is a new complete list of the great variety of Klein electricians', linemen's and mechanics' tools. The new catalog covers 72 pages with several hundred illustrations of the various tools for which this company is well known. Included among these are several new tools of great utility and convenience.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued bulletin No. 1096, describing and illustrating its types K and KC direct-current motors and generators and their applicability to a variety of purposes. Bulletin No. 1635 is devoted to an illustrated description of the hydro-electric plant of the Cerro de Pasco Mining Company, of Peru, South America. This unique plant was completely equipped with Allis-Chamlers machinery.

The Hartford Time Switch Company, through its general sales agent, **A. Hall Berry,** 97 Warren Street, New York City, is sending out a new catalog of the Hartford time switch which describes and illustrates the several types of this well known automatic switch and sets forth its utility for a variety of purposes. This is in line with a nation-wide campaign in co-operation with jobbers all over the country to stimulate the use of these time-controlled switches.

Roller-Smith Company, 203 Broadway, New York City, announces that it has added to its list of agents the Conant Electric Company, Equitable Building, Baltimore, Md. The Conant Electric Company will handle Roller-Smith instruments and circuit-breakers and Columbia meters in the territory comprising the states of Maryland, Virginia, North Carolina, part of West Virginia and the District of Columbia. Associated with S. M. Conant is C. L. Ball, both of whom are well known in that territory.

The Mechanical Refrigerator Company, 1020 Willow Street, Chicago, Ill., has opened a downtown office and display room in the Fisher Building, specially devoted to the demonstration and sale of the company's automatic domestic electric refrigerator. This useful appliance, known as the Domelre, is the invention of Fred W. Wolf, one of the best known inventors and manufacturers of large refrigerating machines, who in recent years has devoted himself to the development of this successful electric household utility.

Westinghouse Lamp Company, 1261 Broadway, New York City, has ready for distribution No. 4 of its series of lamp handbooks for electrical salesmen. This particular copy is unique in giving in simple non-technical language the history, development, manufacture, characteristics and application of the Mazda C, or gas-filled, tungsten lamp. Numerous illustrations serve to further elucidate the subject. As in the case of the earlier handbooks of this series, a copy of No. 4 can be obtained by

Digitized by Google

anyone by merely writing to the company.

Pass & Seymour, Incorporated, Solvay, N. Y., has ready for distribution its new catalog No. 23 of handy electrical wiring devices. This presents the complete array of P. & S. sockets, receptacles, rosettes, pull and pendant switches, etc. A double-page illustrated table gives an excellent idea of the large variety of combinations that can be made with the Fluto interchangeable socket parts. The Shurlok locking socket is specially featured. On three pages are shown in colors the 25 special finishes in which P. & S. sockets and receptacles can be obtained. Among other things worthy of special mention are the P. & S. socket conveniences, outlet receptacles, mogul sockets and receptacles, interchangeable porcelain sockets and receptacles, etc.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently issued leaflets 3805, 3806 and 3807 on the application of automatic control apparatus to cranes and steel mills; they show the scheme of main connections and describe the method of operation of the magnetic unit switches, as arranged for the severe service of steel-mill practice. Among other recent publications of the company are: leaflet 2363-C on Westinghouse small direct-current motors of the type CD, leaflet 3506-A on paper-mill motors for pulp-mill service, leaflet 3568 on condenser-type bushings for high-voltage apparatus, leaflet 3826 on motors for use in oil-well fields, leaflet 3842 on battery-charging outfits of the mercury-arc type for vehicle batteries, leaflet 3846 on outdoor switch houses for use with outdoor substations, and reprint No. 24, entitled "The Jitney and the Small Car," an article by H. S. Cooper, secretary of the Southwestern Electrical and Gas Association.

The Hamilton-Beach Manufacturing Company, Racine, Wis., is now building a new factory adjacent to the Chicago & Northwestern Railway tracks. There will be three buildings, the main building being 300 feet long, 50 feet wide, and three stories high. The offices and main factory will be located in this building. The new factory will have an available floor space aggregating 52,000 square feet, an increase of 300 per cent over the present capacity. The factory as planned, it is claimed, will be one of the most modern in this part of the country. No expense will be spared in its construction and equipment, and the most modern and efficient machinery will be installed. A power plant consisting of a 175-kilowatt direct connected unit will be installed in one of the buildings, while the polishing and plating plant will be in another building. The company has bought eight acres of land in addition to the land occupied by the three buildings now in course of construction, and is, therefore, amply provided for future growth. The business of the Hamilton-Beach Company has shown wonderful growth in the last two years.

Record of Electrical Patents

Issued by the United States Patent Office, September 7, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,152,396. Means for Supporting and Controlling Gyratory Structures. G. W. Combs, Leavenworth, Kans. Has self-contained motor.

1,152,409. Soldering Machine. C. W. Graham, assignor to American Can Co., New York, N. Y. Has a magnetized plate for holding the cans.

1,152,433. Time Switch. T. J. Murphy, Rochester, N. Y. Particular arrangement of contacts and operating mechanism having detent, permitting contacts to be temporarily retained closed.

1,152,434. Gearing. C. H. Norton, assignor to Norton Grinding Co., Worcester, Mass. Arrangement of motor and gearing in grinding machine.

1,152,442. Separation of Coal. F. W. C. Schniewind, Englewood, N. J. Coal separated from mixture with other materials having different hygroscopic properties by moistening and separating electrostatically.

1,152,444. Detector. A. K. Sloan, Jr., Brooklyn, N. Y. Special contact-adjusting arrangement.

1,152,448. Railway Signaling. T. S. Stevens, assignor to Union Switch & Signal Co., Swissvale, Pa. Special arrangement of transformers, relays, etc., for lighting lamps for visualizing signals at night in alternating block system.

1,152,449. Air Can-Testing Machine. E. V. Swangren and M. E. Widell, assignors to American Can Co. Any leakage causing decrease of pressure in air charged into can moves diaphragm to close indicator circuit.

1,152,481. Controlling Device for Hydraulic Elevators. J. E. Boyce, assignor to Otis Elevator Co., Jersey City, N. J. Electromagnetic control of motor operating change-over valve in push-button started plunger elevator.

1,152,501. Brake-Magnet-Demagnetizing Device. E. L. Gale, Sr., assignor to Otis Elevator Co. De-energizing current is supplied to brake magnet of elevator to reduce residual magnetism and aid release of shoe.

1,152,504. Power-Transmission Mechanism. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Electromagnetically controlled gear-shifting mechanism for automobile.

1,152,505. Electrical Furnace. W. H. Hampton, assignor to Conley Electric Furnace Co., Wilmington, Del. Zinc-reduction furnace has baffle blocks in shaft with electrical resistance material in the blocks for heating charge as it passes over.

1,152,516. Electric Change-Over Switch. T. Jessen, assignor to Blohm & Voss Kommandit-Gesellschaft auf Aktien, Hamburg, Germany. For selectively connecting a feeder line to any one of several independent supply lines.

1,152,522. Validating Stamping System. J. J. Leidigh, assignor to National Cash Register Co., Dayton, O. Die mounted in table has perforations to receive pin projections of electromagnetically operated punching head suspended beneath table.

1,152,527. Fire-Alarm System. J. McFell, Chicago, Ill. Has main energized circuit with number of normally closed branches, each including transmitters, alarms, high-resistance test magnet and relay controlling alarms of other branches; operation of a transmitter shunts high resistance aand operates alarms.

1,152,536. Telephone Receiver. A. S. Moffat, assignor to Kunz-Garniss Co., Belmont, Mass. Diaphragm is operated by pivoted armature secured to its center and almost closing the magnetic circuit of the operating magnet.

1,152,541. Stop Motion. O. L. Owen, assignor to Whitin Machine Works, Whitinsville, Mass. Electrically operated throw-off mechanism in stop motion for lap-working machines.

1,152,562. Process of Producing Sound Records. J. C. Sherman, Brookline, Mass. A light path of varying width representing sounds is photographed on ribbon, developed and printed on ribbon of magnetic material, which is then subjected to etching bath to remove parts not covered by light path.

1,152,578. X-Ray Tube. R. H. Wappler, assignor to Wappler Electric Mfg. Co., New York, N. Y. Cathode focuses rays on reflector on anode and conductor point projecting from anode and outside the cathode stream directs current at center of cathode.

1,152,580. Electric Switch. L. Weidlich, Stratford, Conn. For portable lamp standard containing dry cell and lamp mounting.

1,152,581. Adjustable Reflector for Incandescent Lamps. L. Weidlich. Is provided with spring-wire device for securing to lamp bulb.

1,152,586. Electric Furnace. P. Wright, Seattle, Wash. Has smelting zone produced by electric heat; heat conducted from zone heats and dries ore to be smelted, and a preheating zone is between drying and smelting zones.

1,152,594. Alternating-Current Rectifying System. D. M. Bliss, assignor to T. A. Edison, Inc., West Orange, N. J. A number of polarized relays are connected in group with coils in series across alternating-current circuit and contacts in series in rectified circuit, the relays operating in synchronism with the alternating current.

1,152,599. Apparatus for Printing Positive Motion-Picture Films. H. O. Carleton, New York, and E. W. Nelson, New Rochelle, N. Y. Mounting of motor and lamp.

1,152,610. Method of Welding. J. H. L. de Bats, Zellenople, Pa. For welding hard and soft metals together; operation of heating, pressing together and cooling is carried out in a vacuum.

1,152,615. Alternating-Current Rectifying System. T. A. Edison, assignor to New Jersey Patent Co., West Orange, N. J. Groups, as in No. 1,152,594, are each fed from a section of a transformer secondary.

1,152,616. Contact for Electrical Apparatus. T. A. Edison, assignor to New Jersey Patent Co. Electromagnetic vibrator contacts have special structure for dissipating heat.

1,152,622. Alternating Current Motor. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Single phase; has main inducing winding and compensating winding, and induced member having commuted and short-circuited windings, exciting brushes, connected in series with main inducing winding at starting, short-circuited working brushes, and a magnetic shunt for diverting the magnetic flux from the short-circuited winding.

1,152,627. Thermo-Telephone or the Like. B. Gwozdz, Schöneiche, Germany. A Wollaston wire is secured between two halves of a divided body.

1,152,632. Oscillating-Current Meter. J. L. Hogan, Jr., assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. A wave meter comprising a resonant circuit having a variable tuning element and a potential coil shunted by a rectifier and condenser, with instrument to indicate the rectified current.

1,152,642. Electric Contact Device. A. A. Kent, Philadelphia, Pa. Details of sparking device.

1,152,643. Signaling Horn. A. A. Kent. Automobile horn having electromagnetically operated diaphragm.

1,152,646. Alternating-Current Rectifier. S. G. Langley, assignor to New Jersey Patent Co. Particular form of magnetic vibrator.

1,152,666. Windmill Control for Electrical Equipment. C. A. Sterner, assignor to H. L. Sterner, Allentown, Pa. Turbine type of wind motor has shutters for controlling its operation by wind which are automatically regulated under variable wind conditions.

1,152,675. Electrical Oscillator. F. K. Vreeland, assignor to Wirelesss Telegraph Exploitation Co., New York, N. Y. Means are provided for concentrating discharge in mercury-vapor tube; oscillations are excited in oscillating circuit by current variations in tube.

1,152,680. Electrically Insulated Bearing. C. E. Wieselgreen, assignor to Aktiebolaget Svenska Kullagerfabriken, Gottenburg, Sweden. Manner of insulating ball-bearing ring from its support.

1,152,681. Insulated Roller Bearing. C. E. Wieselgreen, assignor to Aktiebolaget Svenska Kullagerfabriken. Modification of above.

1,152,683. Dynamo-Electric Machine. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has annular shell within frame extending about end turns of winding.

1,152,697. Submarine Signaling. T. Bodde, Brant Rock, Mass. Sender secured to hull of vessel below water line has electrodes through which current is intermittently passed through water, thereby setting up sound waves in it.

1,152,703. Illuminated Sign. F. W. Burton, San Diego, Cal. Illuminated char-

Digitized by Google

acters on plates extending at right angles to base.

1,152,704. Motor-Car Signal. J. C. Butler, Pomona, Cal. Automobile direction indicator has interiorly lighted changeable sign and arrow on rotatable standard.

1,152,705. Binding-Post. G. A. H. Churchill, Rumson, N. J. Threaded stud has nut with helical wire adapted to grip conductor between its convolutions.

1,152,707. Trolley Pole. W. W. Clark, assignor of one-half to I. J. Boyce, Portland, Ore. Has means for positively aligning the harp and wheel with the conductor.

1,152,710. Non-Interfering Succession-Movement Fire-Alarm Signaling Machine. G. O. Cranmer and G. V. Tudhope, Oakland, Cal. Senders are electromagnetically interlocked.

1,152,722. Priming Device. F. M. Furber, assignor to A. R. Mosler, New York, N. Y. Special structure of spark plug permitting injection of gasoline into cylinder.

1,152,730. Electric Level-Indicator. G. E. Henderson, Manton, Cal. For electrically designating at a station the height of liquid supply at distant point.

1,152,731. Arc Lamp. C. Henrichsen, assignor to General Electric Co., Schenectady, N. Y. Includes arrangement for magnetically deflecting arc.

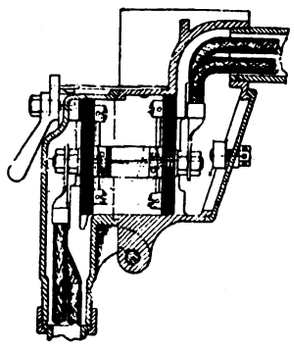
1,152,744. Revaporizer for Internal-Combustion Engines. B. MacNutt, South Bethlehem, Pa. Electric heater in pipe between carburetor and engine.

1,152,758. Electric Switch. C. D. Platt, Bridgeport, Conn. Structure of switch body and cover for push-button switches.

1,152,762. Trolley. W. F. Ream, Seanor, Pa. Manner of joining harp and pole end.

1,152,772. Cathode for Electrolytic Cells. F. G. Wheeler, assignor of one-half to Kimberly-Clark Co., Neenah, Wis. Perforated cathode supported by diaphragm having parts entering perforations and backed by electric conductor.

1,152,790. Switch and Signal System. R. V. Collins, assignor to Collins Switch & Signal Co., New York, N. Y. Train-controlled electric signals interlocked with switch-operating mechanism.



No. 1,153,019.—Connection Box.

1,152,791. Switch-Throwing Mechanism. R. V. Collins, assignor to Royal Engineering Corporation, New York, N. Y. Contact secured to trolley wire; is electromagnetically operated by trolley.

1,152,801. Liquid Rheostat. G. H. Dorgeloh, assignor to General Electric Co. Has main and auxiliary electrodes which are successively immersed.

1,152,806. Multiple Coin Chute. C. H. Green, assignor to National Piano Mfg. Co., Grand Rapids, Mich. Electromagnetically operated device for discharging the lowermost coin in chute.

1,152,807. Lamp for Vehicles. T. L. Griffiths, Birmingham, England. Electric lamp with globular body has front and rear hemispherical portions relatively rotatable to adjust attachments fitting on rear portion.

1,152,822. Battery-Controlling Device for Axle-Driven Generators. R. C. Lanphier, Springfield, Ill., and E. M. Fitz, Columbus, O. Connection of battery and lamps with generator controlled by ampere-hour meter.

1,152,841. Electrically Operated Piano-Player. W. C. Reed, assignor to Telelectric Co., Pittsfield, Mass. Playing magnets corresponding to notes are connected in parallel and a variable resistance in series insures predetermined current strength in all magnets whose circuits are closed.

1,152,842. Variable-Resistance Device. W. C. Reed, assignor to Telelectric Co. Resistances in two circuits are electromagnetically controlled and may be varied simultaneously or individually.

1,152,843. Circuit-Controller. W. C. Reed, assignor to Telelectric Co. Comprises series of spring-wire contacts resting on spring support balancing the collective pressure of the spring contacts.

1,152,877. Repeater for Telegraph Lines. H. C. Cahill, Akron, O. Special arrangement of relays, batteries, etc., for repeating electrical impulses.

1,152,878. Electric Lighting and Battery-Charging System for Vehicles. A. Churchward, Boston, Mass. Regulation secured by automatic control of resistances in shunt field and also in charging circuit.

1,152,880. Fault-Detector. W. H. Cole, Waltham, Mass. If one of three or more conductors in parallel in a system develops a fault, the unbalancing of the current automatically disconnects the faulty conductor from the system.

1,152,881. System of Electrical Distribution. W. H. Cole. Divided conductor having its two legs in parallel and insulated is automatically disconnected when insulation breaks down so that current can flow from one leg to other.

1,152,909. Trolley Hanger. W. T. Robinson, and C. D. Hylton, Ethel, W. Va. Particular structure of yoke for securing to guard timbers extending along trolley wire.

1,152,913. Electrical Regulating Device. R. E. Sagle, Roseville, O. Helical conductor on insulating cylinder; slider contacting with conductor moves longitudinally as cylinder is turned to vary amount of resistance in circuit.

1,152,914. Apparatus for Actuating Conduit-Covers and Collector-Plows for Electric Railways. D. Samaia, Milan, Italy. Automatic apparatus to open and close axial conduit covers, manipulate plow, switch, etc.

1,152,932. Automatic Fire-Alarm. W. F. Caldwell, assignor to J. A. Riggs, Hot Springs, Ark. Special arrangement of signals between subscribers and central stations.

1,152,942. Fire-Alarm System. F. Gottschalk Stirling, N. J. Thermostatic device controls telephone switch hook.

1,152,943. Wire-Clamping Device. W. L. Hall, Newark, O. For gripping wire to pull it; engages wire over large area.

1,152,950. Hot-Plate-Heating Means for Corn-Popping Machines and the Like. F. Hoke, assignor to Holcomb & Hoke Mfg. Co., Indianapolis, Ind. Rotary plate has heating resistor and switch for regulating it.

1,152,953. Means for the Prevention of Accidents on Railways. T. C. Kerr, Stevenston, Scotland. Collision-preventing means comprising partial circuits on two vehicles running on track rails acting as conductors, each of the partial circuits being adapted for connection with the rails and including a switch and battery cells controlled by a speed governor.

1,152,963. Non-Interfering Switch Device. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Specially adapted for telephone circuits; three or more push keys are interlocked to prevent operation of more than one at a time.

1,152,968. Subscriber's Autoswitching System for Intercommunicating Telephones. R. F. Pickens, St. Louis, Mo. Intercommunicating party line; party-line switch and receiver hook interlocked.

1,152,982. Method of Forming a Shell for a Spark Plug. W. E. Scherbondy, assignor to Bigsby Rotary Mfg. Co., Cleveland, O. Manner of forming metal shell with dies.

1,152,983. Process for Forming a Sheet-Metal Shell for a Spark Plug. W. E. Scherbondy, assignor to Bigsby Rotary Mfg. Co. Modification of above.

1,152,984. Tool for Forming Polygonal Sides Upon a Hollow Metal Shell. W. E. Scherbondy, assignor to Bigsby Rotary Mfg. Co. Relates to above.

1,152,986. Electrical Indicator. R. S. Smith, Jr., assignor of one-half to G. C. Gunn, Burlington, N. J. Comprises adjustable spark gap for connection in parallel with spark plug to test ignition.

1,153,003. Miner's Safety Lamp. M. Albrecht, Frankfort-on-the-Main, Germany. Battery lamp has diffusion chamber and U-shaped passage connected therewith, is interposed between the lamp and spectator, its limbs being adapted to display distinctive colors.

1,153,005. Spark Coil. B. Ames, Lowell, Mass. Vibrator formed of superposed metallic leaves has them secured together in such manner as to avoid noise and permit long make and quick break.

1,153,006. Armature for Magnetos. B. Ames. Particular structure facilitating assembling and insulation of primary and secondary coils.

1,153,019. Connection Box. W. F. Bouché, assignor to Gould Coupler Co., New York, N. Y. Two-part box permits removal of insulating plates carrying terminals and knife-blade contacts, to facilitate inspection, etc. (See cut.)

1,153,029. Telephone Attachment. J. H. W. Champion, Hermon, Cal. Automatic reel for winding receiver cord mounted in base of desk instrument.

1,153,037. Magnetic Ore-Washer. E. W. Davis, Minneapolis, Minn. Magnetic ore separator has material fed upwardly in inclined trough beneath which electromagnets are arranged.

1,153,039. Electric Horn. W. W. Dean, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Electromagnetic vibrator operates diaphragm of automobile horn.

1,153,044. Exterminator. J. E. Dunham, Portland, Ore. Electric light bulb is mounted within perforated cap at end of flexible tube through which fumes may be expelled.

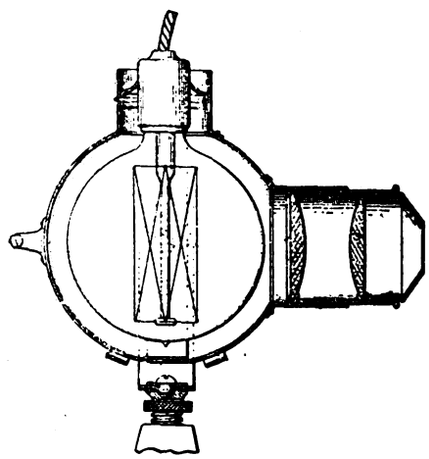
1,153,067. Ventilating Device. L. S. Hackney, St. Paul, Minn. Arrangement of motor and fans in cabinet of window ventilator.

1,153,076. Dynamo-Electric Generator. J. O. Heinze, Jr., Lowell, Mass. Special structure having stationary armature and rotating pivoted field-pole pieces which move away from armature under centrifugal force against action of spring.

1,153,110. View-Changing Device. C. F. Jenkins, Washington, D. C. Projecting apparatus is provided with electromagnetic means for advancing the film controlled from a distance.

1,153,127. Magnet-Charger. P. Lynch and H. Wochner, Rock Island, Ill. For permanent magnets; comprises adjustable energizing coil to accommodate different sized magnets with provision for maintaining electrical connections to the coils and good magnetic connections for the magnet in different positions of adjustment.

1,153,142. Float-Operated Circuit-Closer. D. F. Thomson, Bettsville, O. Double-cone-shaped structure on wall of liquid tank, through which float-operated stem passes.



No. 1,153,161.—Stereopticon Lamp.

1,153,161. Lamp for Stereopticons. H. M. Hill, Kirkwood, Mo. Special structure of housing surrounding and supporting lamp and having lens aperture. (See cut.)

1,153,168. Electrolytic Apparatus. I. H. Levin, assignor to International Oxygen Co., Newark, N. J. Has bipolar electrode, the anode surface being of nickel and the cathode surface of iron.

1,153,182. Purification of Coal. F. W. C. Schniewind, Englewood, N. J. Lustrous and non-lustrous coal constituents are electrostatically separated.

Patents Expired.

The following United States electrical patents expired on September 13, 1915:

610,524. Electrically Controlled Valve for Hydraulic Presses. W. B. Cleveland, Cleveland, O.

610,539. Electric Clock. F. Hope-Jones and G. B. Bowell, London, England.

610,620. Commutator Brush-Holder. W. K. Bassford, Jr., Bound Brook, N. J.

610,626. Composition Containing Casein for Electric Insulating or Other Purposes. P. H. Hansen, Copenhagen, Denmark.

610,704. Telephone System. W. W. Dean, St. Louis, Mo.

610,705. Brush for Electrical Machines. J. W. Dickey, New York, N. Y.

610,712. Apparatus for Starting and Controlling Electric Motors. T. W. Kloman, New York, N. Y.

610,726. Art of Bending Armored Conduit Tubes. W. T. Ruete, New York, N. Y.

610,767. Magnetic Separator. A. Monell, Munhall, Pa.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 13. CHICAGO, SATURDAY, SEPTEMBER 25, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Standardization in the Electrical Industry.....547
Disposition of Refuse from Woodworking Plants.....548
The Rupture of Dielectrics by Transient Voltages.....549
Inductive Interference.....549

DEPARTMENTS:
Commercial Practice.....555
Electrical Construction.....558
Public Service Commissions.....564
Questions and Answers.....565
New Electrical and Mechanical Appliances.....587
Current Electrical News.....590
Record of Electrical Patents.....593

LEADING ARTICLES:
Electricity in Twine and Rope Mills.....551
Methods of Disposing of Refuse from Woodworking Plants.—By F. O. Alton.....556
Notes on the Installation of Motors.—By M. F. Arloe.....558
American Institute of Electrical Engineers—Panama-Pacific Convention 567
Illuminating Engineering Society Convention Opens in Washington 574
Convention of New England Section, National Electric Light Association 577
Advantages of Standard Motor Speeds.—By Harry N. Gilbert 586

MISCELLANEOUS:
Convention of American Electric Railway Association to be of Exceptional Importance.....550
N. E. L. A. Wiring Committee Meets.....550
Railway Signal Association's New Officers.....550
New Display Room for Athens Company.....550
Gloucester (Mass.) Electric Company Expands.....554
Officers of Westinghouse Electric Export Company.....554
Ohio New-Business Men Hold Important Convention at Sandusky 555
Crayon Factory Run by Central-Station Power.....556
Will Fight to Retain Electric Signs at Atlantic City.....557
E. S. Marlow 557
Results of Safety Work at Columbus.....557
New York City Board for Examining and Licensing Electricians 563
Among the Contractors.....563
Low Fire Losses in Berlin.....579
Edison Rents Vehicle Batteries on Monthly Charge Basis.....586
Electrical Supply Jobbers.....586

Copyright, 1915, by Electrical Review Publishing Company, Inc.

STANDARDIZATION IN THE ELECTRICAL INDUSTRY.

It has been characteristic of the development of most industries that as they progress standardization of their products becomes more and more marked. This is especially true of industries in which applied science predominates. Taking the electrical industry as a whole, this is certainly very true. In the early days of the industry standardization was unheard of; as the industry has evolved and its lines of development have become more and more clearly marked, the necessity for standardization has become more urgent. An illustration of this is the extent to which the Standardization Rules of the American Institute of Electrical Engineers have grown from the first modest draft, which appeared in 1899. In the last edition of these rules, which was promulgated to take effect on July 1 of this year, these rules required a pamphlet of nearly 100 pages in their published form and comprised nearly 1,000 sections.

The Standardization Rules of the American Institute have been drafted with the chief idea of defining the terms and conditions which characterize rating and behavior of electrical apparatus, with special reference to the conditions of acceptance tests. As stated in the preface to the rules, it has not been the purpose to standardize the dimensions or details of construction of any apparatus, lest the progress of design and production should be hampered. In other words, it may be stated that these rules have for their primary object the setting of definite standards of quality for electrical apparatus.

There is another kind of standardization which becomes more needed as the growth of an industry requires that not only shall the quality of its products be standardized, but that certain dimensions and other characteristics thereof be made uniform so as to permit as free interchange as possible. Probably the best example of this type of standardization is in the very extensive sets of rules laid down in the railway industry. The origin of this is primarily to permit ready interchange of cars from one system to another and such interchange necessarily involves accurate specification of such dimension as gauge of track, height of couplers and uniformity in type of couplers, etc. In the electrical industry much has already been done without any special deliberate and comprehensive action that may be characterized as a code of standardization of this character. For example, the almost universal voltage that has been in use in this

Digitized by Google

country for a great many years for lighting circuits and other circuits requiring relatively small power is 110 volts or in the neighborhood of 110; lamp sockets are well standardized by adoption of the Edison screw base type; many other examples of such electrical standardization readily come to mind. The hampering of development which would result from any tendency to abandon the two simple standards referred to, for instance, would cause untold difficulties.

The question of further standardization of sizes, voltages, speeds and other characteristics of electrical apparatus is now being taken up by several organizations. Among these is the National Electric Light Association, whose proposed manufacturers' section will prominently consider questions of standardization. One of the committees of this association has during the past year made considerable progress in the effort to secure standardization of plugs and receptacles. The Electric Power Club, an organization of motor manufacturers, has developed some standardization ideas as regards motor speeds and sizes of pulleys. As pointed out in the article by Mr. Harry N. Gilbert, which appears on another page of this issue, there are numerous advantages to such standardization. Among these are that the manufacturer is able to carry stock machinery and stock parts and can, therefore, supply orders much more promptly; the calls for odd speeds and special ratings being diminished, the manufacturer can concentrate his efforts on the more efficient production of standard machines with reduction in the cost of manufacture and lowering of selling price.

The subject of motor standardization was also taken up at last week's convention of the New England Section of the National Electric Light Association, which is reported in this issue. This particular discussion related to the standardization of motor voltages and a number of speakers advocated that motors of 7.5 to 25 horsepower should be 220-volt motors, while those over 25 horsepower should be 550-volt motors; others spoke in favor of adopting 2,200 volts for the very large machines.

The standardization of dimensions, voltages, speeds, shapes, etc., will become more and more important and should be given all encouragement to have it carried out in the most reasonable manner. The national organizations, such as the National Electric Light Association and American Institute of Electrical Engineers, should take up the matter and after a thorough discussion attempt to bring about greater uniformity without restricting possible future beneficial development. It should be kept in mind that the primary object of such standardization should be greater utility of the apparatus through more extensive interchangeability and also through possible reduction in cost. Both of these considerations will make for greater use of electrical apparatus of all kinds and, therefore, be of mutual benefit to all branches of the electrical industry.

DISPOSITION OF REFUSE FROM WOODWORKING PLANTS.

There is a natural tendency on the part of central-station power engineers and salesmen, in soliciting new business, to avoid at least for as long a time as possible, woodworking plants, especially those having large amounts of refuse. Invariably the manager of such an establishment, when approached by the representative of the utility company, points to the fact that wood refuse is available for power generation and in view of this it would be grossly extravagant to purchase central-station power, even granting that the advantages set forth by the salesmen are true.

There are some few cases where progressive woodworking plants have discarded isolated steam-plant equipment in favor of electric power solely on the basis of greater reliability, flexibility and more uniform speed of the driven machines, disregarding entirely the question of refuse and its apparent value as fuel. In the majority of instances, however, the securing of this class of business hinges largely on the cost per unit of power and the question of refuse disposal becomes then of paramount importance.

The actual solution of this problem is entirely a local consideration depending, of course, upon the conditions in each individual case. That the solution rests with the power engineer is equally apparent and if the business is to be secured a careful study of all phases of the problem must be made. There are many localities where a demand exists or where through the ingenuity of the power salesman a demand can be created for sawdust, shavings, kindling, etc., for packing purposes, bedding, butcher shops, bakeries, etc. It is obviously the duty of the central-station man to investigate what outlet can be found for the refuse, ascertain the prices that can be secured and upon these data base the company's proposition.

No single item has contributed more to the failure of central stations to secure the business of the woodworking plants than the tendency of the salesman to accept the statement of the manufacturer that because of the refuse being available his power "costs practically nothing." In one notable instance the power engineer after accepting this answer on several visits obtained permission to make an analysis of actual conditions. He found that because of the rapid accumulation of waste the chief duty of the fireman was to get it out of the way, regardless of fuel requirements and efficiency. This policy worked out satisfactorily in summer but during the cold months when heat was required in the building and the dry kiln made extra demands upon the plant, enough money was expended for coal to practically pay for the cost of central-station power. The conditions were outlined to the manager and a contract subsequently signed. Under the new regime all wood refuse not burned to supply the kilns was saved for use during the heating season. In addition large

Digitized by Google

quantities of sawdust and shavings were sold and the revenue thus secured applied on the cost of power.

While this may perhaps be an extreme case it serves to illustrate the importance of considering the question of refuse disposal from every angle. Too many manufacturers honestly believe that because waste material is burned power costs nothing and an intelligent analysis will at least correct this impression and aid that much in strengthening the position of the power company.

On other pages of this issue there appears an article by Mr. F. O. Alton, of Columbus, giving his experiences in disposing of refuse from woodworking plants. Many new plans are presented and the paper is worthy of the careful perusal of all those interested in securing this class of business.

THE RUPTURE OF DIELECTRICS BY TRANSIENT VOLTAGES.

That both time and energy are necessary in the production of an electric discharge through an insulating medium has been recognized for many years and has been frequently reiterated by the engineers from Schenectady, who have done so much investigation in high-voltage phenomena. Another contribution to this subject was made by Mr. F. W. Peek, Jr., at the convention of the American Institute. This paper described the effect of the application of transient voltages to insulating materials and furnished definite and quantitative information upon a subject which has heretofore been understood mainly in a qualitative way. The results of these experiments serve to explain a number of phenomena which have been observed in operating experience, but the causes for which have not heretofore been clearly understood. It may be of value to summarize here some of the results obtained and the conclusions deduced therefrom.

The requirement of the expenditure of energy to rupture a dielectric naturally introduces a time element which is of no importance where voltages, direct or alternating, are continuously applied, but which is of great importance in the case of transient voltages. Thus a surge with a steep front may pass entirely by a spark gap before spark-over occurs, even though the same voltage applied continuously would cause a spark; thus apparatus intended to be protected does not receive the desired protection. The more rapidly the voltage is applied, the higher the value which will be attained before a discharge passes. In some cases this instantaneous voltage may be twice as great as the continuously applied voltage which would produce a discharge. The magnitude of this ratio depends upon the amount of energy required. Thus, for a sphere gap it is much less than for needle points. The time lag and the voltage rise for a given gap are not definite quantities, but are dependent upon the rate of application of the voltage. They are greater in case where the field is non-uniform.

The effect of initial ionization in air is generally not great but may be so under certain conditions. For dissimilar electrodes, the spark takes place at the lowest voltage when the electrode in the densest field is positive. For uniform fields the polarity is of no importance. On smooth surfaces of solid dielectrics the time lag is very small but becomes greater where there are corrugations.

In oil and other liquid dielectrics the energy and consequently the time lag and the relative voltage are greater than in air. The lag and relative voltage are highest in solid dielectrics.

The quantitative values obtained by Mr. Peek for the various conditions affecting these phenomena will add greatly to the available information and data pertaining to this subject.

INDUCTIVE INTERFERENCE.

The two sessions at the Panama-Pacific convention of the American Institute of Electrical Engineers which elicited the greatest interest were those dealing with the appraisal of public utilities and with inductive interference between power and telephone lines. These subjects involve economic and financial considerations, and it is notable that the engineer of the present day has as lively an interest in matters of this kind as in the more strictly technical and engineering questions.

The report of the California Committee on Inductive Interference contained not only an outline of work which has been done during the past year and that contemplated for the future, but also carried some encouragement to the representatives of power companies who have felt that the first report of this Committee, and the rules promulgated by the California Railroad Commission as a result thereof, would represent considerable hardship to them if generally adopted in other territories. These rules have appeared to give to the telephone companies the power to say what constituted a parallel, and to put upon the power companies the burden of avoiding such a condition. The members of the Committee assured the meeting that this was not the intention and that the final report of the Committee will make clear, not only what constitutes a parallel line, but other points which have heretofore been involved in considerable uncertainty, and thus clarify the rules which are already nominally in effect. The issuance of this supplementary report will be awaited with considerable interest by the power companies of other states as well as in California, as it is realized that the precedent set by the California Railroad Commission may be followed elsewhere. The work of the Committee on Inductive Interference is indeed of national importance and an attempt is to be made to secure the interest and financial assistance of power companies outside of California in continuing the work of the Committee. The telephone interests involved already represent more than the local operating companies. The Railroad Commission of California has contributed but a part of the expense of this work, and to secure the best results outside assistance will be needed.

Digitized by Google

Convention of the American Electric Railway Association to be of Exceptional Importance.

The thirty-fourth annual convention of the American Electric Railway Association and its five affiliated associations, which will be held in San Francisco, Cal., October 4 to 8, will be of unusual importance to the industry that it represents. The program includes 22 addresses and papers, 80 reports of committees, and a number of written discussions.

Many men distinguished in public life or by their achievements in the field of electric transportation will speak before the convention. Governor Hiram W. Johnson of California will deliver the address of welcome. Ex-Senator Jonathan Bourne, Jr., of Oregon, will speak on "The Evils of Government Ownership." As a national legislator, Mr. Bourne was the author of the Parcel Post Law; he has long been one of the most efficient workers in the country-wide movement for the construction of good roads, and in other matters of national importance. "Welfare Work" will be the subject of Jesse W. Lilienthal's address; he is president of the United Railroads of San Francisco, a lawyer of eminence and a director in many corporations that have played an important part in the upbuilding of the Pacific Coast. He has become famous throughout America as a philanthropist of high ideals and great practical achievement.

Bion J. Arnold will discuss "The Foundation Principles of the Valuation of Electric Railways." No one is better qualified to speak authoritatively on such a subject, which is one of the most pressing questions of the day. Mr. Arnold has been the chief consultant or executive, or both, in the building or direction of many great transportation lines. He is the chief engineer and chairman of the Board of Supervising Engineers, Chicago Traction, under whose supervision the rehabilitation and extension of the Chicago surface lines has and is taking place; he is also consulting engineer of the Public Service Commission, First District, New York City, on matters connected with subways and street-railway properties; consulting engineer, Detroit United Railway, and also holds a similar position with the cities of Pittsburgh, Providence, Kansas City, Los Angeles and San Francisco. As an inventor whose devices have aided materially in the progress of electric and steam transportation, he is no less famous.

Among the many committee reports, that concerning the operation of motor vehicles and summarizing the investigations regarding the "jitney" situation will be of especial interest. Another report of a committee of the American Association, that on the Cost of Passenger Transportation Service, is also noteworthy, including as it does the results of the exhaustive studies which the Bureau of Fare Research has been making for the last year.

P. V. Burington, secretary, Columbus (O.) Railway, Power & Light Company, will present before the Accountants' Association a paper on "Electric Railway Accounting—A Review," and Prof. Carl C. Plehn, of the University of California, will speak on "The Taxation of Electric Railways."

The Engineering Association's Committees on Power Distribution and Way Matters will present reports of unusual value. The report of the Committee on Heavy Electric Traction, and the joint report of the Engineering and Transportation and Traffic Associations' Committee on Block Signals will be thorough and comprehensive.

In the meetings of the Claims Association the subjects of the principal papers will be: "The Prevention of Motor Vehicle Accidents," by S. B. Hare, Altoona, Pa.; "Standardization of Claims Statistics," by E. E. Slick, Anderson, Ind.; "A Card Index and What It Means," by J. J. Reynolds, Boston, Mass.; "Safety and Its Relation to Conservation," by B. F. Boynton, Portland, Ore.

The Transportation and Traffic Association's Committee on Construction of Schedules and Time Tables, and that on Fares and Transfers, will render reports that, in their conclusions, represent distinct advances along the lines concerned. A notable address before this association will be "The Relation of Electric Railways to Agriculture," by Paul Shoup, president, Pacific Electric Railway Company, Los Angeles, Cal.

N. E. L. A. Wiring Committee Meets.

A meeting of the Wiring Committee of the Commercial Section of the National Electric Light Association was held on September 17 at the headquarters in New York City.

On the question of the standardization of plugs and receptacles a report was presented from Mr. Benjamin, representing the manufacturers of the angle-pull type, and Mr. Sargent representing the manufacturers of the straight-pull type, and other information was presented to the committee which will be submitted to the manufacturers of both types before being further published.

On the question of bare concentric wire, several members reported on installations already made in their cities, using standard American fittings, and H. R. Sargent, of the General Electric Company, reported that in accordance with the request of the committee, the General Electric Company was going ahead with the preparation of special fittings and possibly a few special tools and hoped to have these ready by the middle of November.

It is the opinion of the committee that as soon as these fittings are ready, a very large number of additional installations will be made with the permission and for the information of the Underwriters and other inspectors.

On the question of the solid neutral, it was reported that the Sprague Electric Works are getting out a bulletin showing panelboards designed for the use of solid neutrals without fuses or switches on the grounded wires, either the grounded neutral or the grounded side of two-wire circuits, which would result in a very distinct reduction in the cost of large installations as well as being in accordance with the new safety rules.

It was recommended that the various members of the committee take steps in their various cities to have this principle recognized and approved by the local inspectors.

Circular 54 of the Bureau of Standards had been referred to the committee by the National Electric Light Association for report and a number of recommendations in regard to the same were drawn up which will be submitted to the representatives of the National Electric Light Association who are to appear before the Bureau of Standards at a conference on October 27.

It was decided to hold the next meeting of the committee in Schenectady, N. Y., some time in November when the new concentric-wiring fittings of the General Electric Company will be ready.

Railway Signal Association's New Officers.

The Railway Signal Association held a very successful convention at Salt Lake City, Utah, on September 13 to 16. On the concluding day of the meeting the following were elected as officers for the ensuing year: W. J. Eck, Washington, D. C., president; C. A. Dunham, St. Paul, Minn., first vice-president; W. H. Elliott, Albany, N. Y., second vice-president; C. C. Rosenberg, Bethlehem, Pa., secretary-treasurer.

New Display Room for Athens Company.

The Athens Electric Company, of Athens, O., has made arrangements to open a downtown office which will also serve as a display room for various electrical appliances. Bills will be payable at this office, and sales of electrical goods carried on, as well as work in connection with house-wiring, which will be handled by the company on easy terms, in pursuance of its policy.

Digitized by Google

Electricity in Twine and Rope Mills.

Twine and rope mills offer a particularly attractive field to the central-station company because of their high load-factor and the necessity for close speed regulation. This article comments on the advantages of electric drive and gives data on the installation in a large eastern mill.

Twine and rope mills offer especially attractive business to the central station as the load-factor is high and the demand for current is during the off-peak part of the day. In-so-far as the advantages of electric drive are concerned, this industry may be classed with many others in a great many respects, but there are a few specific advantages which may be mentioned. Group drive is principally employed so that only short lines of shafting and comparatively light belts are required, which reduces speed variations due to belt slippage to a minimum as compared with long lengths of shafting and other mechanical transmission devices. The uniform speed thus secured means an increased production and a more uniform product. In all rope and twine mills there is always prevalent a large quantity of dust and small particles from the raw product distributed over the girders, which are extremely inflammable. Heated journals, frequently occurring with heavy shafting, and static sparks from heavy belts are a constant menace as such conditions are always liable to ignite the waste material and cause a serious conflagration.

Spinning Room of International Harvester Company's Twine Mill.

Any group of machines may be shut down to facilitate repairs without interfering with the operation of any other group, and what is still of greater importance, in case of an accident it is possible to bring a section of shafting to rest in a much quicker time than it would if mechanical power from a central source was used. Although due precaution for the safety of employees is generally present in mills of this class, the "safety first" principles demand a quick means of stopping machinery and auxiliary appliances.

In general the manufacture of twine is the first stage of rope making, the latter process consisting of combining the twine or fibers by twisting them by proper machinery. Obviously any size rope can be made by combining the proper number of strands. The materials used for the manufacture of cordage and rope are hemp and jute. Hemp is a tall annual herb of the nettle family with small green flowers, and a tough bark. A strong and tough fiber is obtained from it which is especially adapted to the manufacture of cordage. The fiber is similar to flax, but coarser and stronger. Sisal-hemp, a species of Agave, produced in large quantities in Yucatan and Key West, is superior to the true hemp and is used for some classes of product. Jute is obtained from two tall annual Asiatic herbs of the linden family from which fiber is

Digitized by Google

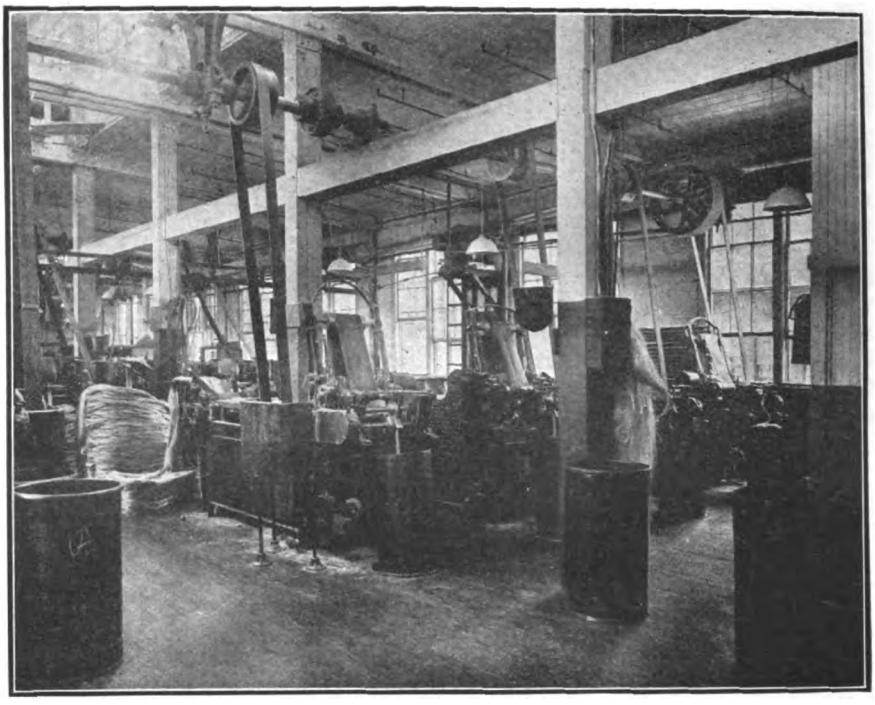
also obtained. In the manufacture of cordage and rope the different qualities of hemp and jute are frequently combined to produce various grades and strengths of the output.

The first operation is carried on in the opening room where the raw material, which is received in bales, is unpacked and shaken out. Next, the material is passed through a series of breakers which consist of an endless traveling belt provided with hackle pins which comb or straighten out the fibers and even them up. The material is fed into one end of the breaker and emerges in what is known as a "sliver" two or three inches in diameter, where it coils itself in a barrell-like container. The material then passes through a second or third breaker and similar machines for further refinement, when it is transferred to the spinner for spinning into cord or yarn. The first part of the spinning machine is similar in construction to a breaker with the addition of mechanism for spinning and reeling onto a bobbin. Some spinners "tube" the yarn, that is, pass it through a tube to render it smoother.

From the spinning room the bobbins are taken to the tar house and placed in frames conveniently arranged with reference to the tar box which is filled with tar or similar preparation. During tarring the liquid is maintained at 220 degrees Fahrenheit by means of steam heaters. The cord or yarn is led from the bobbins in the frame through two or more single guide plates working in a vertical plane over the tar box convenient for lowering into the tar. The cord or yarn is then led to the further end of the tar box and passes between metal rollers which press out and return to the box superfluous liquid. It is then wound onto a drum for cooling and finally wound onto a fresh set of bobbins with great regularity.

If the product is to be used as cordage, the bobbins are transferred to automatic balling machines and the cord or yarn is balled ready for the packing room and shipment. If the product is to be made into rope the bobbins are placed in the rope machines which first prepare the strands, generally consisting of three yarns. In the rope machine proper the strands pass through a circular revolving plate and other mechanism which gives the strands the proper twist to form the rope.

The following description relates to the twine and rope mills of the International Harvester Company at Auburn, N. Y. These mills have a capacity of 51 tons of binder twine daily, with a rope department which turns out enough small rope for baling the finished product. At the present time approximately one-third of the entire mills are electrified, the motor drive being distributed through all departments. From this it will be evident that electric power takes care of about 17 tons of finished product daily. There are 25 electric motors in operation, all of which are General Electric three-phase, 25-cycle, 440-volt machines with the exception of one direct-current motor which operates a bale hoist in the warehouse. Some half mile distant from the mills the company maintains a pumping station that furnishes condensing water for the steam equipment. These motors are not included in the schedule as they do not enter directly into the manufacturing process. The aggregate horsepower of the motor installation is 720, the individual motors varying in ratings from 10 horsepower to 75 horsepower.

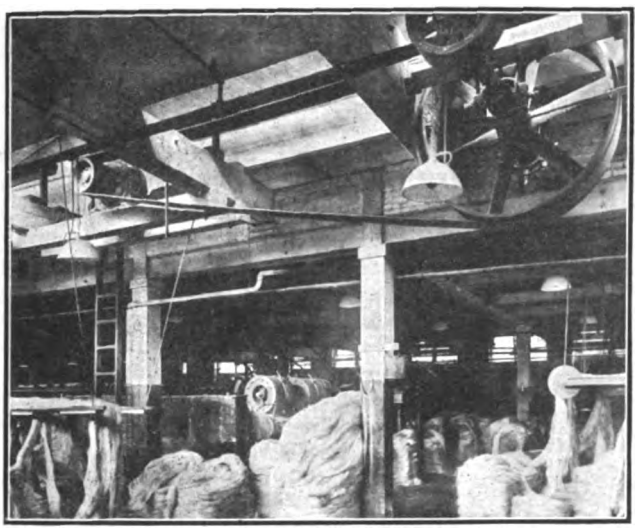


Finishers and Sett Machines Driven by 35-Horsepower Motor.

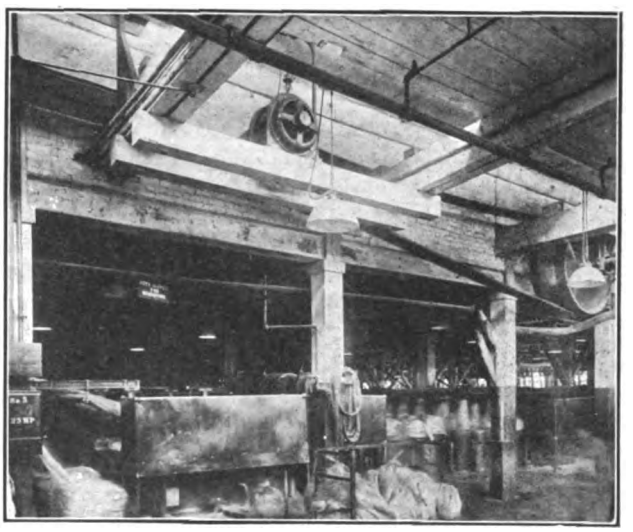
All of the product of the twine mills is used by the International Company in connection with its harvesting machinery. The various departments of the twine mills include opening rooms, preparing rooms, spinning rooms, balling rooms, shipping department, and rope department. In the preparing room where the preparation of the raw material for spinning is carried on, the equipment includes breakers, spreaders,

Fifty-Horsepower Driving 52 Spinning Frames in Twine Mill.

Digitized by Google



American Finisher Driven by 35-Horsepower Motor.



Three Twine Machines Driven by 25-Horsepower Motor.

indicators, Sett machines and finishers. All of these machines are used in the preliminary manufacturing process and the raw material is further refined as each succeeding machine is passed. There are two preparing rooms, one for what is known as the Irish process and the second for the American process. Both processes are similar in principle as well as the machinery but vary in the combination of the raw materials.

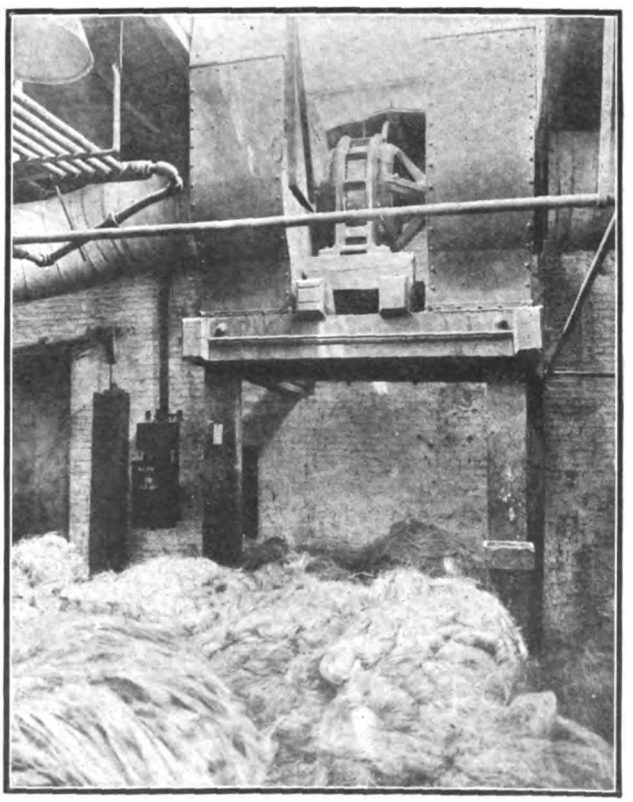
Manual operation only is employed in the opening room, but to remove the dust there are two 50-inch exhaust fans driven by a 50-horsepower motor placed between the two and direct coupled to the fans. The fans and the driving motor are mounted on a platform supported by the ceiling girders. In all departments the motors are mounted on I-beams supported by the roof girders and are placed in such a location that a reasonably short belt only is required to drive the jack shaft which is in turn belted to the driving shafts of the group of machines.

It must be understood that these mills were formerly entirely driven from a central steam plant and that the location of the various machines corresponds to that idea. With the installation of electric power the machines have been divided into groups for the various motors with a view to compactness and not of logical sequence of operations. At the present time similar machines may be driven by both mechanical and electric power. It is the intention to electrify the entire plant, but of course this is a matter of transition.

In the electrification of the mills the motor speeds and the pulley diameters have been proportioned to give the same machine speeds as with mechanical drive.

In the Irish preparing room the motor-driven machines consist of two first breakers, three second breakers, three third breakers, four spreaders, one roving frame, four indicators, three Sett machines and three finishers. The breakers were briefly described at the beginning of this article but are, of course, somewhat more complicated and have many refinements and minor

Two 75-Horsepower Motors, Each Driving 62 Spinning Flyers.



Two 50-Inch Exhaust Fans Direct-Coupled to 50-Horsepower Motor.

Digitized by Google

details. The spreader is based upon the same principle as the breaker as well as the indicators, Sett machines and finishers.

Indicators, or bell machines as they are sometimes called, derive their name from the fact that they indicate by the ringing of a bell when a predetermined amount of raw material has passed through the machine which is generally set at 370 pounds. Any variation in the weight indicates that the wrong proportion of materials is being fed through the various machines. Material from two indicators is combined in the Sett machine. In this way two varieties of the raw material can be combined.

In the Irish preparing room the machines with the driving motors are grouped as follows: two first breakers and one freight elevator driven by a 20-horsepower motor; two second breakers, one spreader, one third breaker and one roving frame, driven by a 25-horsepower motor; one second breaker and one spreader driven by a 10-horsepower motor; four indicators and three spreaders driven by a 35-horsepower motor; three Sett machines driven by a 20-horsepower motor; three finishers driven by a 25-horsepower motor.

In the American preparing room the equipment of machines is smaller and consists of one first breaker; one second breaker; two spreaders; one indicator; three Sett machines and nine finishers. This enumeration of machines refers, of course to the motor-driven apparatus. The grouping is quite similar to that of the Irish preparing room as will be seen by reference to the motor data table. The removal of dust in the Irish finishing room is provided for by two 36-inch exhaust fans driven by a 20-horsepower having the same mechanical arrangement as the fans and motor in the opening room. In the American preparing room the exhaust fan outfit consists of a 40-inch and a 60-inch fan driven by a 35-horsepower motor.

There are two spinning rooms, one with an equipment of 52 spinning flyers driven by a 50-horsepower motor, and two groups of 62 spinning flyers each driven by a 75-horsepower motor. In the second spinning room there are two groups of 46 flyers each driven by a 50-horsepower motor. Electric drive is used exclusively in the spinning rooms. The balling room has an equipment of 32 balling flyers driven by a 35-horsepower motor. The rope department as stated before is maintained for furnishing packing rope for the twine mills product and is therefore small in comparison to the mills proper, the group of machines consisting of two card machines, one draw frame, three formers, two rope layers and one picker. This group is driven by a 25-horsepower motor.

Conduit work is used throughout the mills and all auto-starters are mounted on building pillars in close proximity to the motors they control. Empire Gas & Electric Company's service is used, the transformers and main switchboard being located at the No. 2 mills of the International Company about one-half mile distant.

MOTOR DATA.

International Harvester Company's Twine Mills, Auburn, New York. Three-phase, 25-Cycle, 440-Volt System.

No.	Horse-power.	Application.
1	20	Two first breakers, one freight elevator.
1	25	Two second breakers, one spreader, one third breaker, one roving frame.
1	10	On second breaker, one spreader.
1	35	Four C. B. & C. indicator machines, three spreaders.
1	20	Three C. B. & C. Sett machines.
1	25	Three C. B. & C. finishers.
1	15	One first breaker and one spreader.
1	35	One second breaker, one third breaker, one spreader, two indicators.
1	35	Three Sett machines, nine finishers.
1	20	Fifty-two spinning flyers.
1	75	Sixty-two spinning flyers.
1	75	Sixty-two spinning flyers.
1	50	Forty-six spinning flyers.
1	50	Forty-six spinning flyers.
1	35	Thirty-two balling flyers.
1	25	Two card machines, one draw-frame, three formers, two rope layers, one picker.
1	50	Two 50-inch fans for dust exhaust. Opening room.
1	20	Two 36-inch fans for dust exhaust. Preparing room.
1	35	One 40 and one 60-inch fan for dust exhaust. Preparing room.
1	15	Machine shop.
1	10	Freight elevator.
1	10	Coal conveyor.
1	10	Coal crusher.
1	20	Operating direct-current generator, furnishing current to bale hoist.

Gloucester (Mass.) Electric Company Expands.

The Gloucester Electric Company, Gloucester, Mass., has recently installed a 600-kilowatt alternating-current generator, direct-connected to a twin engine, each unit of which is of 375 horsepower rating, and has a cylinder of 18 inches diameter with 36-inch stroke. The machine operates at 150 revolutions per minute and produces 2,300-volt energy. The generator is capable of considerable overload, and has developed as much as 750 kilowatts for a short time.

The other generating units in use are a 600-kilowatt alternator, direct-connected to a twin engine operating at 120 revolutions per minute, and a 500-kilowatt vertical turbine.

The company's summer business is greatly in excess of that during the remainder of the year, owing to the fact that the territory served, outside the city of Gloucester, is given over largely to summer residences. The summer load is about 900 kilowatts and is fast increasing.

A five-mile transmission line carrying 4,400 volts serves an exclusive summer colony, the rate for residence lighting being high according to usual all-the-year standards, thereby compensating for the period of non-use of material on which an adequate return is properly earned. The Oceanside Hotel is another customer, taking 300 kilowatts.

In the opposite direction from Magnolia is the granite-quarrying town of Rockport. The industry is principally controlled by the Rockport Granite Company. Up to the present time compressed air, with steam plants in connection, has been the motive power for drilling in the quarries, cutting and polishing the stone. A central steam plant on the ground originally furnished the power for compressing, but as the industry increased several local plants were installed, in various locations as conditions demanded.

Now that some of the earlier equipment has become obsolete, the granite company is beginning to substitute electric power derived from the central station at Gloucester, and the Gloucester Electric Company has just closed a contract with the Rockport Granite Company to furnish power to 350 horsepower in motors for polishing processes. This is regarded as merely the initial installation, with complete substitution of central-station energy for private steam plants to follow in the course of time.

This type of business provides the best possible load for central stations, in that all the granite industry is closely limited as to working hours, and the plants are completely shut down at 4 p. m. daily, the power load never overlapping the regular lighting load even in the shortest days of winter. In Vermont, where the Montpelier & Barre Electric Light & Power Company furnishes energy for the operation of the great quarries and granite finishing works at Barre, the central station has found this type of load to be most advantageous, warranting a rate which, together with considerations of convenience, cannot be met.

Officers of Westinghouse Electric Export Company.

It is announced that at a meeting of the board of directors of the Westinghouse Electric Export Company, held in New York City, the following officers were elected: E. M. Herr, president; L. A. Osborne and Calvert Townley, vice-presidents; Maurice Coster, managing director; J. C. Bennett, secretary; H. D. Shute, treasurer; F. E. Craig, auditor; W. H. Jones, assistant secretary and treasurer.

President Herr announces the appointment of the following additional officers: E. D. Mills, manager; E. R. Ellis, European manager; H. F. Griffith, assistant export manager.

Digitized by Google

Commercial Practice Management, Rates, New Business

Ohio New-Business Men Hold Important Convention at Sandusky.

How to better co-operate with the electrical contractors to increase the consumption of electrical energy and methods of disposing of refuse from woodworking plants, were among the important topics discussed by Ohio central-station men at a meeting of the Committee on New Business Co-Operation of the Ohio Electric Light Association, held at Sandusky on September 15. This was the first of a series of similar meetings to be held during the year, and is in accordance with the policy of the Association adopted two years ago, which has proven so successful. Representatives from the commercial departments of practically every Ohio company were in attendance, and much valuable discussion took place on the topics presented for discussion.

The delegates were welcomed to Sandusky by E. A. Bechstein, manager of the local central station, who spoke of the value of frequent meetings for the interchange of ideas among men engaged in the same line of work.

J. E. North, of Springfield, chairman of the committee, responded briefly. A paper was then presented by Thomas F. Kelly, of Dayton, entitled "How to Make Electrical Prosperity Week a Success." Mr. Kelly, after reviewing the general plans and organization in Ohio, for carrying out the work, made the following pertinent suggestions to central-station men: Get the electrical contractors and dealers interested, and tell them what Electrical Prosperity Week can be made to do in your town. Enlist the home chamber of commerce, the editors of local papers, and the city officials in your campaign. Put up electric signs and notices that the public may read. Include Prosperity Week "copy" in newspaper advertising. During the week before the celebration install festoons of lamps along the sidewalk and outline your building. Trim up your salesroom and windows in gala dress. On Monday of Prosperity Week hold an afternoon and evening reception, sending invitations to every customer, present or prospective. Provide music and a flower for every lady. Offer special easy-payment propositions to cover every appliance sold during Electrical Prosperity Week. Keep a register of every visitor to your display room. Get the merchants interested in outlining their buildings, temporarily if not permanently. Photographs perforated with pin pricks will demonstrate the effect. Carry the spirit of local festivity as far as possible. Install a slogan sign, if possible, with appropriate dedication ceremonies. Set apart one day, perhaps, as a local prosperity day. All of the suggestions can be carried out in any community.

A paper by A. E. Loeb entitled "Co-operation Between the Electrical Contractor and the Central Station" was then read by Chairman North.

In his paper Mr. Loeb takes the attitude that the buying public is fair. They want right service with as low a price as is consistent with value received. They are willing to pay a decent profit for a service performed, as long as they feel that the price is justifiable. The central station, however, has taken the path of least resistance, and instead of helping to maintain the electrical merchandising business on a paying basis, have tried to meet the popular demand for something cheaper, by cutting the price and taking the business at cost or less, with the hope of getting it back in current revenue, instead of injecting salesmanship into their proposition and convincing the public that they already were getting a square deal, and that the price was in line with good practice and service. So that now the public does not know whether the price is high or low, and think that whatever they pay is too much, and that there must be a lot of money in the business.

Continuing, he says: "The central station for its own good should if necessary go out of its way to assist and encourage the dealer, thereby adding another asset to its new-business department. If the dealer's prices are too high, go into the matter with him. Get into his confidence, get him to co-operate with you. Let him know that you want to be fair with him and he will be the best booster you have got in town. Help him keep down expenses. Let him have space in your office, charge him a nominal rate for rent. Help him to put on your house wiring and cooking appliances campaigns, and then see if he won't cut out selling gas fixtures, plants and the like.

"A great many central-station men have said that they could not get co-operation from dealers, and lay all the blame on them, but try and get their side of the story, and you will find in nine cases out of ten that they, too, have a grievance, many times justified that with a little diplomacy could be rectified and another good friend for the company gained.

In the discussion, Mr. Messer, of Kent, related the various experiences his company had had in connection with wiring work, and said they abandoned this business a few years ago. They now have in their city three contractors who take care of all the wiring, and the plan seems to be very satisfactory.

Mr. Maul, of the Ohio Service Company, stated that they had had considerable difficulty with contractors, and he thinks it was due, primarily, to the fact that the contractors were ignorant of the actual wiring work. He went to the contractors and had meetings at various times, and finally straightened out the difficulty. He made a careful canvass of the costs for wiring and established a standard rate for outlets. He called a meeting of the contractors and standardized methods of figuring wiring, and he said new business had increased very rapidly since they ceased wiring. Mr. Beebe, a Sandusky contractor, when asked his opinion on the subject, said that the contractors in Sandusky were well satisfied with the way in which the central station in that city had been treating them, and had no suggestions to offer.

E. A. Beckstein, of Sandusky, said his company had done some wiring several years ago, but they had entirely eliminated same, and that the contractors were handling the work very efficiently. He stated that they held meetings with the contractors quite frequently. Their company makes the contracts for wiring old houses, pays the contractor cash and carries the accounts for a year.

Mr. Hancock, of Youngstown, thinks the trouble in large cities is quite similar to the trouble in smaller cities, and suggested that the central stations ought to have a man who is capable of checking up and figuring wiring prices. He suggested also that a considerable amount of trouble would be eliminated if a standard handbook on wiring was used by all contractors. He claims he

Digitized by Google

has been in on various bids and maybe one bid would be approximately 100 per cent higher than another. He thinks it would be well to teach the contractors the proper way to figure out their costs.

Mr. Rust, of Greenville, said his company did wiring at this time, in order to hold prices within reasonable limits. He claims that the stock of the company in his city is all owned by the people there, and the people look to them to take care of their wiring in each and every case, and that they have no trouble at all with the contractors.

Mr. Yocoll, of Youngstown, said their company had trouble with the contractors getting together, and finally decided on a house-wiring proposition based on so much per house, with so many rooms and submitted the same to the contractors, and it has solved the problem for them. He claimed some of the contractors could not take this business, inasmuch as they claimed their costs were entirely too high, but other contractors in his city apparently have been very successful.

Mr. Beckstein referred to Mr. Yocoll's remarks, and said he thought the Youngstown Company was justified in sticking to their existing proposition, provided they could get the contractors to do the work at the prices made.

After luncheon an interesting address on 'Salesmanship" was delivered by Major C. B. Wilcox, chairman of the Board of Directors of the Sandusky Gas & Electric Company. The speaker mentioned the qualifications of salesmen for the electrical industry and made a plea for education of salesmen through organization.

At the afternoon session a paper entitled "Methods of Disposing of Refuse from Woodworking Plants" was presented by F. O. Alton, power engineer of the Columbus (O.) Railway & Light Company. This paper is published elsewhere on this page.

Crayon Factory Run by Central-Station Power.

The Amercina Crayon Company, of Sandusky, O., has recently contracted to purchase central-station power to the extent of about 300 horsepower, for its plant. Heretofore the company has generated its own electric power, but as its needs increased found it more economical and otherwise desirable to use central-station service.

The current is furnished by the Sandusky Gas & Electric Company (a W. S. Barstow & Company property), and is three-phase, 60-cycle, delivered at 220 volts. The American Crayon Company is the largest producer of school and industrial crayons in the world, and its principal plant is located in Sandusky. It also manufactures hardwood boxes for the general trade.

METHODS OF DISPOSING OF REFUSE FROM WOODWORKING PLANTS.

By F. O. Alton.

The subject of refuse disposal is one that the power engineer is always confronted with whenever a steam-driven woodworking plant is to be changed to electric drive, and a clear solution of the problem must be worked out, and presented to the manager before you can expect him to sign your power contract. To some managers this seems impossible to do, and the engineer then has a real chance to demonstrate his ability as a salesman and convince him that the refuse of his plant has a value, which in some cases equals the value of coal sufficient to run the plant, but this fact must not be referred to, because you will have all your work to do over again if he makes a change to coal. At the best it is like swapping dollars, but coal is easier to handle and safer.

There is one important factor in motor drive to be considered, and that is "the reduction in the insurance rate." This saving is sure to be 20 to 30 per cent on brick construction and 30 to 40 per cent on wood-frame construction. This saving, however, will vary in different places, and must be determined by a reinspection, and if capitalized to its full value will in itself solve the problem of disposing of the refuse, because the manufacturer can afford to give it away. This is never necessary, because it has a value which, however, is a variable factor, and all depends on the manufacturing interests near at hand, because it cannot stand transportation and handling costs, except when baled.

Clear sawdust can be used in a number of different ways. Large quantities are required by cold storage plants to absorb moisture on the floors and prevent foul odors, because they have no ventilation, and this precaution is necessary from a sanitary standpoint. Fruits, such as grapes, peaches, pears, etc., placed in cold storage are better protected when packed in sawdust. It is sold for about $2.50 per load of 2.5 or 3 cubic yards.

The chips and shavings are used for horse bedding, and find a ready market at the present time on account of the price of straw. It is also used for packing glassware and china and canned goods for shipment in barrels or boxes, and breweries use large quantities for packing bottled beer in barrels. The income from shavings and chips is usually from 22 to 25 cents per 80-pound bale.

The short ends and small pieces find a ready market the year around for fire wood, and this pile will never be more than the size of a wagon load, because there will be a waiting list if the manufacturer advertises at $2.00 a load.

It has often occurred to the writer that a good way to dispose of the refuse in small plants would be to find a man with a horse and wagon and sell to him at a fixed price and let him hunt his market. This would do away with all bother, and be a saving in the end, because all wagons are not the same size.

There is another way to dispose of the refuse by installing a dry kiln and burn this refuse to make steam to dry lumber. This result will be a big saving in a year's time, and is the method used at one plant in Columbus.

The Year Book of the Department of Agriculture, 1912, states that this country imported 5,000 tons of wood ash from Canada, valued at $66,000 which is proof that there is a market in this country. Wood ash that contains an average of 3.77 per cent potash is valued at $12.60 per ton.

The *Literary Digest,* of December 19, 1914, in the article on "Ashes as a Commodity," states that to convert wood ashes into potash figure six pounds equal to one pound of potash. As you all know, there has been a strong demand for a domestic supply of potash since the war started in Europe and our supply was cut off from Germany. The market price of potash was $35.00 per ton before the war, and it is $300 per ton today, so you can figure the value of wood ashes at the present time. They can be sold at the fertilizer plants for the value of the potash, determined by chemical analysis, and at a price far in excess of their value before the war. The visible supply of potash in this country is not sufficient to supply the demands of the fertilizer industries for more than this year's output and some new source must be found to meet the future demand of this established industry, and wood ashes offers the only supply of any magnitude at the present time, so a woodworking plant that uses its refuse for a dry kiln obtains two profits—first, the profit in the dry kiln and second the profit in the wood ash. It has been stated that if the total supply of refuse could be obtained and reduced to potash that we would not have to depend on Germany for this supply. This, in a general way, will solve the problem of the disposal of the refuse in woodworking plants, where the ordinary kinds of wood are handled.

We have in Columbus a plant that uses only two kinds of wood, 80 per cent of which is hickory and 20 per cent of ash. The refuse from this plant has been used as fuel for a steam drive, and this practice has been going

Digitized by Google

on for the past fifteen years, but at the present time this prospective customer has been convinced that an electric drive is by far the best, and an electrical installation will be made just as soon as the company has decided upon the best method of disposing of the chips and sawdust. These hickory chips and sawdust will be sold to one of the larger meat-packing houses in Columbus, as great difficulty has in the past been experienced in obtaining hickory wood for the "smoking" of their hams and sausage. The short lengths of wood are cut to sizes for wheel rims, spokes, broom handles and dowel rods. All short ends and pieces are to be sold for fire wood. The high potash value of hickory wood ash may be of sufficient magnitude to justify the reduction of this refuse to wood ash and dispose of it in the potash market.

This will serve to illustrate that each instance has its own peculiar problem, for which the engineer will invariably find a local solution.

Will Fight to Retain Electric Signs at Atlantic City.

Concerning the agitation started by certain interests in Atlantic City, N. J., looking toward the removal of all overhead and roof electric signs, Dr. Underwood Cochran, prominent broker and president of the Sane Sunday League, has announced his readiness to take the field at the head of an army of defense made up of Boardwalk property owners, and other interested citizens.

"Space for signs on top of buildings facing the Boardwalk," he declared, "rents for from $300 to $1,500 a year. I have heard it said that in one or two instances $2,000 is paid, but I do not believe it. This money is practically all velvet for the owners, for it involves no outlay whatever on their part. As for the charges made by Joseph W. Salus that the signs create fictitious values, I know that in one instance $800 derived from the rental of a sign space made it possible to take $200 per annum each off the rental of four stores and helped the lessees without doing the landlord any harm.

"And that isn't all by any means. Take down the signs and the city will have to spend $25,000 a year more than at present to make up for the lost illumination. The signs have been wholly misrepresented. They are not a menace. They cannot fall in any one direction, because they are braced."

The combined output of the electric light and power properties under the management of H. M. Byllesby & Company, for the week ended September 4, showed a gain of 16 per cent over the corresponding week of 1914.

SUCCESSFUL COMMERCIAL MANAGERS.

E. S. Marlow.

There is being held this week in Washington, D. C., one of the most successful conventions in the history of the Illuminating Engineering Society. Those who are in a position to know, unhesitatingly give credit for a large share of the success of this event to E. S. Marlow, chairman of the General Convention Committee, and manager of the commercial department of the Potomac Electric Power Company. Mr. Marlow has always taken a keen interest in illuminating engineering affairs, and has been, in a measure, responsible for many of the notable lighting installations made in Washington.

Serving a community in which manufacturing plants are practically unknown, and in which, therefore, the sale of energy for power is necessarily extremely limited, the Potomac Electric Power Company has had to extend unusual effort to increase its business among other classes of customers, and in this work the commercial department, under the direction of Mr. Marlow, has been particularly successful.

E. S. Marlow,
Manager, Commercial Department, Potomac Electric Power Company.

Washington is among the foremost cities in point of electric vehicles in use, particularly of the passenger variety, and this record is due to the activities of the local central station, as well as the Washington Section, Electric Vehicle Association, of which Mr. Marlow is chairman. In fact, he organized the Section, and has been instrumental in conducting a number of sociability runs, which have given great impetus to the electric in the National Capital.

Mr. Marlow started his electrical career as office boy and assistant bookkeeper for the United States Electric Light Company. This was over 30 years ago, in the days when Edison bipolar machines were in use, and when the opportunities for the sale of electricity were very limited. After serving the United States Electric Light Company in various capacities, Mr. Marlow was elected manager and treasurer, which positions he held until the consolidation of the United States Electric Light Company with the Potomac Electric Power Company. Since then he has been manager of the commercial department. Among other branches of work that come under Mr. Marlow's direction is that which looks after the sale of electricity.

Mr. Marlow is a member of the trade bodies of Washington, and a charter member of the Columbia Country Club. He is also a member of a number of technical and engineering societies.

Results of Safety Work at Columbus.

The Columbus Railway, Power & Light Company, Columbus, O., which, in the opinion of its officers ranks second to no other similar public service corporation in the country with respect to safety-first effort, is giving out some results along this line realized during the first six months of 1915. On January 1 of the present year its safety-first council became effective. This body is composed of committees from each department and sub-department of service, and is made up of men from the ranks as well as from officers and foremen. One of its duties is to pass upon suggestions invited from employees and from the public on greater efficiency and safety methods.

All told, 458 suggestions were received during the six months, of which 266 have been put into effect; 51 are being held for further consideration and 141 were disapproved. Of the latter class some were found excellent in theory, but could not be worked out in practice, owing to prohibitive expense or other reason.

Though the public is showing an increasing interest in this form of co-operation, the preponderance of suggestions came from employees. Some pertained to reforms of a very trivial nature, but were none the less welcome. Another activity of the council has been the constant posting of bulletins, covering all sorts of duties and emergencies.

It will take a longer comparative period to determine in dollars and cents just what the company is saving through its new safety policy, but officials approximate it at 60 per cent.

Digitized by Google

Electrical Construction

NOTES ON THE INSTALLATION OF MOTORS.

By M. F. Arloe.

The frames of all motors should be grounded, that is, connected to the earth by low-resistance substantial conductors, to minimize fire and life hazard. Motor frames should be grounded for the same reasons that dictate the grounding of generator frames.

Where frame grounding is impracticable, the frame should be thoroughly insulated from the earth. In this respect the practice is the same with generators as with motors. The generator frame should be either effectively connected to the earth or thoroughly insulated from it.

The wiring for motors should be installed in accordance with the same general rules that apply to inside wiring (that is, Class C, National Electrical Code) for electric lighting or other purposes.

The wiring for 550 to 3,500-volt motors should be done with multiple conductor, that is, duplex or triplex lead-sheathed cable, carried in metallic conduit. When this conduit is grounded the possibility of the high pressure imposed on the conductors creating a fire or increasing life hazard is much decreased for essentially the same reasons that grounding generator and motor frames and transformer secondaries decreases life hazard. Grounded metal sheaths should be used for incasing all high-tension apparatus for the same reasons. Approved bushings are used at the ends of such conduits because it obviously would be impracticable to carry the lead cable through the approved outlet boxes which are required at all conduit terminations in ordinary conduit wiring.

A high-tension cable-conduit outlet is shown in Fig. 1, which indicates the preferable method of terminating a conduit run which carries a high-tension lead-covered cable. In order to meet Code requirements, it is merely necessary to screw a standard conduit bushing on the end of the conduit so that the lead sheath of the cable will be protected from abrasion. However, it is probable that where the portion *A* of the sheath of the lead-covered cable is not protected by the iron conduit and is subject to mechanical injury, a metal sleeve extending from the conduit bushing to the cable pothead should be installed. Such a sleeve, which might be made of cast or sheet iron, brass or copper, can be made in two pieces and secured in place with a band.

The wires constituting the branch circuit serving one direct-current motor must be at least large enough so that they will carry, in accordance with Rule 18, 1.25 times the full-load current of the motor. For example, Fig. 2 shows a set of tap conductors *AB* carrying the current to one direct-current motor. Assume that the current taken by this motor at full load, as indicated by the name plate on its frame, or by computation, is 20 amperes. Then the wires composing the tap *AB* must be capable of carrying $20 \times 1.25 = 25$ amperes. Then (referring to Table A of Code Rule 18) a wire at least as large as No. 10 would have to be used if rubber-insulated conductor is to be utilized, or it would have to be as large as No. 12 if other insulation than rubber (Rule 18, Table B), such as weatherproof or slow-burning, is to be used. If the tap *AB* were quite long, it might be necessary to use wires considerably larger than those just specified in order to maintain the voltage drop within reasonable limits, but No. 10 or No. 12, respectively, would be safe from a current-carrying standpoint and are the smallest wires that should be used. The conductors must always be of such size that the fuses through which the current feeds to them will protect them in accordance with the requirements of Rule 18, and in no case should the main fuses be smaller than the fuses protecting the tap circuit to the motor.

When a number of direct-current motors tap from a main, as at Fig. 3, where the main is represented by *CD*, the wires composing each tap carrying the current of only one motor, as *E*, *F* and *G*, must

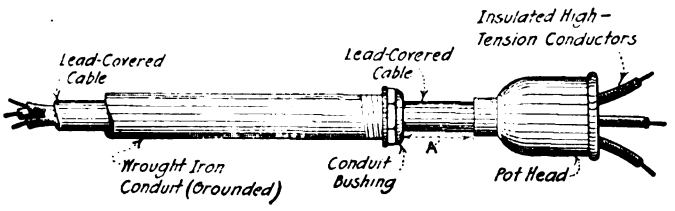


Fig. 1.—Bushing End of Conduit Carrying 550 to 3,500-Volt, Lead-Covered Cable.

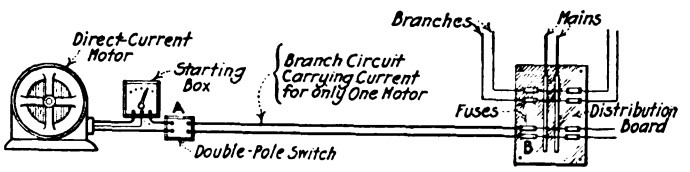


Fig. 2.—Protection for Tap Serving One Direct-Current Motor.

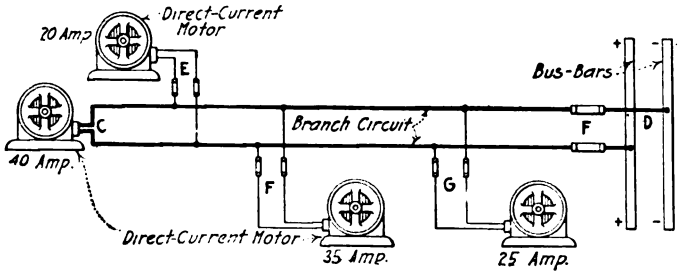


Fig. 3.—Arrangement of Protection for a Main Serving Group of Direct-Current Motors.

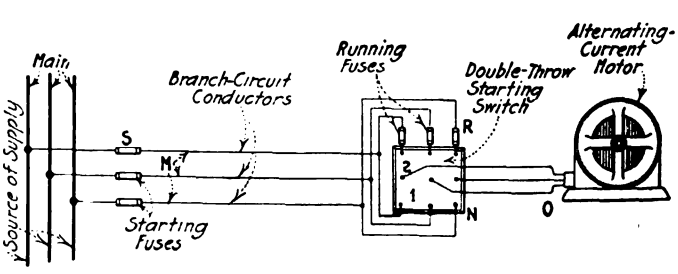


Fig. 4.—Arrangement of Fuses for Tap Serving One Alternating-Current Motor.

Digitized by Google

be large enough to carry (in accordance with Rule 18) a current 25 per cent greater than the full-load current of the motor. The wires used for the mains *CD* may be of any reasonable size, provided the fuses *F* which protect them are of such capacity that the wires *CD* cannot carry a greater current than is allowable under Rule 18.

The usual method of determining a wire size for a direct-current motor main like that of *CD* which supplies several motors, is to add together the full-load currents of all of the motors and then assume that the current in the main *CD* will never exceed from possibly 60 per cent to 75 per cent of this total. For example, if the full-load currents of the motors of Fig. 3 were, respectively, 20, 30, 45 and 25 amperes, the current in the main *CD* would be, if all of the motors were operating at full load at the same time, 120 amperes. Experience has shown that it is seldom that all of the motors of a group will simultaneously draw their full-load currents. It is therefore allowable to use the "demand-factor." The demand-factor of an installation is the ratio of the maximum load which the installation imposes on the supply system, to the total connected load of the installation.

Assume a demand-factor of 75 per cent (a fair one for average direct-current conditions); then the main *CD* should be proportioned to carry $0.75 \times 120 = 90$ amperes, that is, with rubber-insulated wire (see tables of Rule 18) No. 2 should be used. and with other insulation No. 4. The main fuses at *F* should have a capacity of 90 amperes. In any case, the conductors must be of such size that the fuses through which the current feeds to them will protect them in accordance with the requirements of Rule 18. In no event should the capacity of the fuses which protect the main be smaller than the fuses protecting the tap circuit to any one motor.

The minimum permissible conductor size for a branch for one alternating-current motor may be determined as will be outlined. Practically all alternating-current motors have the characteristic of drawing much greater current, possibly two to five times as much, at the instant when they are first connected to the line as they draw after their rotors have attained full speed. Because of this fact special precautions should be taken in wiring alternating-current motors. Usually, for all except the smallest alternating-current motors, two sets of fuses, Fig. 4, are used. The starting fuses *S* must be of sufficient capacity to pass the starting current taken by the motor. If this starting current continued to flow for any considerable length of time in the motor windings, it would "burn them out," hence the starting fuses of themselves do not provide adequate protection for the motor. To protect the motor against excessive currents, after it has attained speed, running fuses, shown at *R*, Fig. 4, are inserted in the circuit.

Alternating-current motors are usually started by using a double-throw switch. Fig. 4, with unessential details omitted, shows the arrangement. The starting switch is first thrown to position *1* and current is forced through the motor which starts it, only the starting fuses being in series between the source and the motor. After the rotor has attained normal speed, the starting switch is thrown to the running position *2* and then both the starting fuses and the running fuses are in the circuit. The running fuses ordinarily have a capacity such that they will pass a current 25 per cent greater than the full-load current of the motor. All motors will carry a 25-per-cent overload for a considerable period. The starting fuses on the other hand frequently have capacities such that they may pass 200 per cent or more of the full-load current of the motor.

In selecting the wire size for a branch circuit for one alternating-current motor, the starting current taken by the motor un-

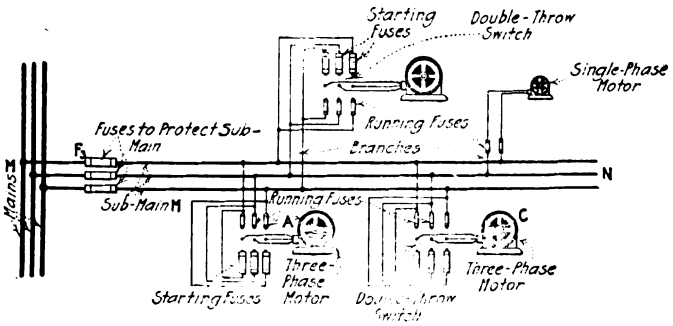


Fig. 5.—Overload Protection for Main Serving Group of Motors and Protection for the Motors.

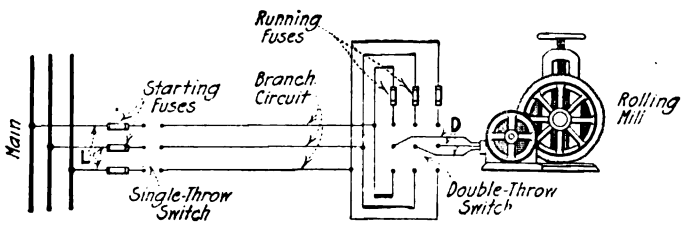


Fig. 6.—Overload Protection for Conductors Serving One Alternating-Current Motor Driving a Roll.

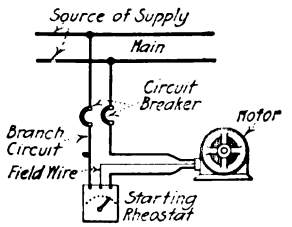


Fig. 7.—Circuit-Breaker for Overload Protection and Acting as Main Switch for Motor.

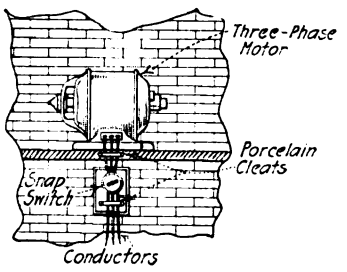


Fig. 8.—Small Motor Controlled by Enclosed Snap Switch.

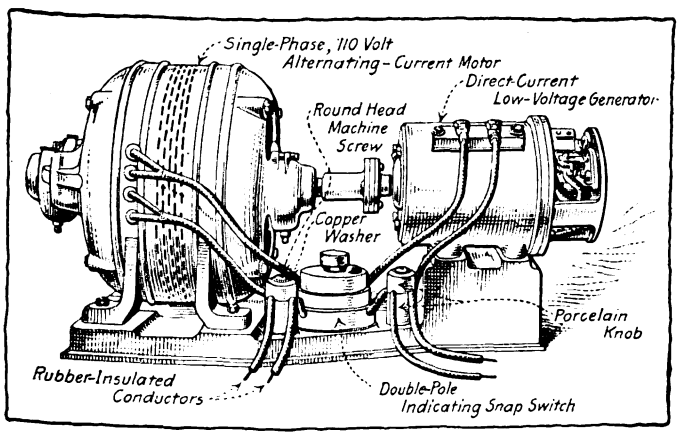


Fig. 9.—Snap Switch Used for Control of Small Motor-Generator Set.

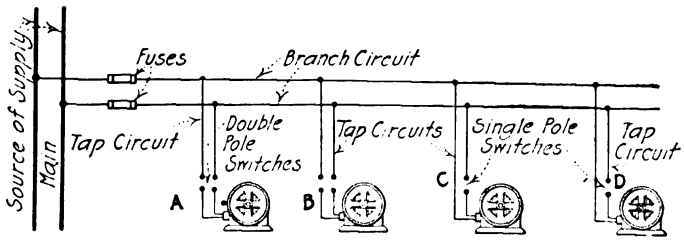


Fig. 10.—Group of Small Motors Protected by a Single Set of Fuses.

Digitized by Google

der the specific conditions of operation to which it will be subjected should be ascertained from the manufacturer or by experiment. Then the starting fuses (*S*, Fig. 4) must be selected of such capacity that they will pass this starting current. Then the branch-circuit wires, *M*, *N*, *O*, must be selected of such size that they will be protected, in accordance with the requirements of Rule 18, by the starting fuses *S*. Note that, according to

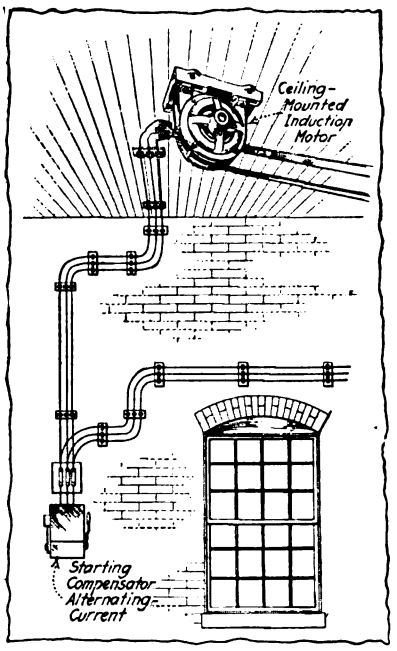


Fig. 11.—Open Wiring for Induction Motor.

Rule 8*c*, last paragraph, rubber-covered conductor branch circuits to alternating-current motors may be protected in accordance with the safe current values of Table B for insulations other than rubber, unless time-limit circuit-breakers constitute the overload protection provided for the motor.

For example, consider a motor that has a full-load running current of 20 amperes, and a starting current of 40 amperes. At *S* (Fig. 4) 40-ampere fuses would be used and with "rubber insulation" or with "other insulations" No. 8 wire (Rule 18, Table B) would be used for branch wires *M*, *N*, and *O*. No. 10 wire would not be large enough because it will carry safely only 30 amperes, whereas 40-ampere fuses must be used at *S*. The running fuses should be capable of passing a current about 25 per cent in excess of the full-load running current of the motor or 20 amperes $\times$ 1.25 = 25 amperes. Hence the running fuses *R* should be 25-ampere fuses. Note that starting compensators, or autotransformers, not shown in the illustration, are extensively used for alternating-current motor-starting equipments to minimize the starting current. The inclusion of such equipment in the circuit would not alter the principles outlined.

The determination of the smallest wire permissible for an alternating-current main serving several motors is made by practically the same method as that used in determining the permissible wire size for a direct-current motor main as described above, except that a greater demand-factor should be used. The maximum current that will normally flow in an alternating-current motor main as *MN*, Fig. 5, will probably in the average case be equal to from 45 per cent to 85 per cent of the sum of the full-load currents of all of the motors, that is, the demand-factor will range somewhere between 45 and 85 per cent. Where specific information is not available a demand-factor of 0.80 may be used.

Hence the fuses F_3 should be selected to have such capacity that they will pass the maximum line current thus determined, and the wires constituting the main *MN* must be of such size that the fuses will protect them in accordance with the requirements of Rule 18, Table A. However, if it is found that the current in *MN* is greater than was anticipated and it is necessary to increase the sizes of the fuses F_3 to enable them to pass the normal running current in the main, new conductors for *MN* must be selected of such size that the new fuses will reliably protect them.

In no case, however, should the fuses at F_3 be smaller than the starting fuses for any one of the motors. The conductor and fuse sizes for the branch to each motor may be determined by the method described in the preceding paragraph.

In determining wire sizes for taps or branches for varying-speed motors the fact that the current taken by the motors is subject to extremes of variation must be considered. It is seldom the case in practice that the current of a varying-speed motor is constant. The nature of the loads and the characteristics of the motors are such that the power output

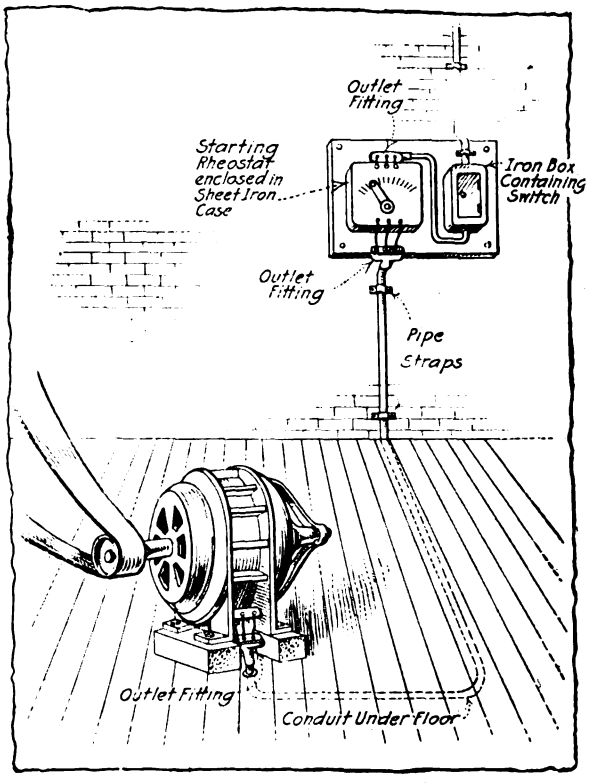


Fig. 12.—Motor Wiring Installed in Conduit.

of the motor and the current input may be zero at one instant and a maximum after a short interval later, hence it is undesirable to rate these motors on the basis of the horsepower output they will deliver continuously. Instead, they are usually rated in the basis of their output for 30 minutes. Obviously a motor will have a greater power output on the basis of its 30-minute rating than it will on the basis of a continuous rating because the power that any electrical machine can deliver is determined to a considerable extent by the heating of the machine. The temperature at no part of the machine should ever exceed a certain maximum, usually about 100 degrees centigrade, or 212 degrees Fahrenheit. It is apparent that the machine can carry a greater load for 30 minutes without its temperature exceeding 100 degrees centigrade than it can continuously. It is for these reasons that constants must be used in determining the wire size for varying-speed motor leads.

For example, consider the case of Fig. 6, where the rolling-mill motor on the basis of a 30-minute rating takes 100 amperes. Then leads *LD* would have to be of such size that they would safely carry at least 100 amperes $\times$ 1.50 = 150 amperes, where "1.50" is the constant.

Potheads should be provided on high-tension motor cables to prevent injury to

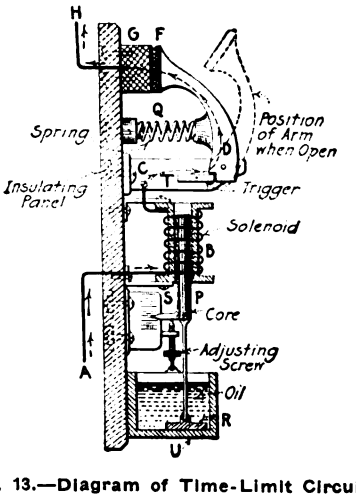


Fig. 13.—Diagram of Time-Limit Circuit-Breaker.

Digitized by Google

the conductors. There is always danger of moisture entering the cable or of the insulation of the conductor becoming cracked at the point where it leaves the cable unless a pothead is provided. All conduits and metal protective casings of the high-tension insulation should be electrically interconnected, that is, connected together, so that there can be no difference of potential between the parts and so that all protective metal parts will be connected to ground.

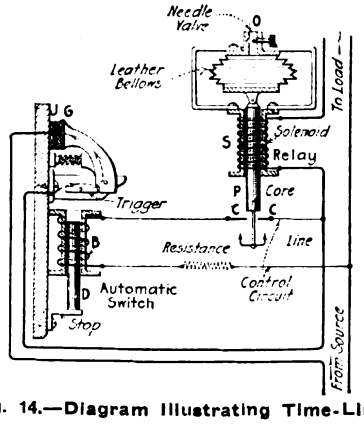


Fig. 14.—Diagram Illustrating Time-Limit Relay.

The protective and starting devices in the branch circuit to a motor are shown in Fig. 7. In the illustration a circuit-breaker is shown in lieu of fuses, circuit-breakers being acceptable under certain restrictions, as indicated below, and they are preferable to fuses in certain cases.

Switches indicating whether they are

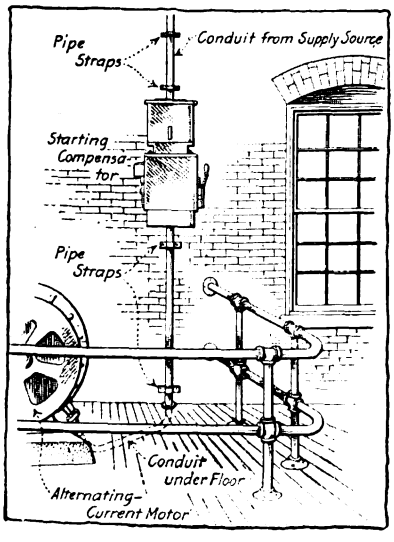


Fig. 16.—Protective Railing Around Motor and Starting Device.

on or off are procurable in several types. A knife switch which is exposed to view obviously indicates whether the circuit it controls is closed or open, and indicating snap switches or flush switches, Figs. 8 and 9, give the same information. Fig. 9 shows a Wagner battery-charging motor-generator. The motor input and the generator output is less than 660 watts, hence a double-pole snap switch is used, one pole cut in the generator circuit and the other pole in the motor circuit. Connected in this manner the one double-pole switch is equivalent to two single-pole switches.

A group of small motors may be protected by a single set of fuses, where the total load does not exceed that (660 watts) ordinarily allowed on an incandescent lighting circuit. Fig. 10 shows a group of small motors so protected, the entire group being fed through one set of fuses. Note that small motors where the power output does not exceed 660 watts may be controlled either by a double-pole switch as shown at *A* or *B*, or by a single-pole switch as shown at *C* and *D*.

The switch and rheostat should be located within sight of the motor so that the operator in starting or stopping the motor will observe the motor's performance when he operates the switch or starting device. Furthermore, they should be so located that if any difficulty with the motor occurs it can be readily stopped. Fig. 11 shows an open-wire installation for an alternating-current motor arranged in accordance with this requirement, while Fig. 12 shows a similar installation for a direct-current motor where the wiring is in conduit.

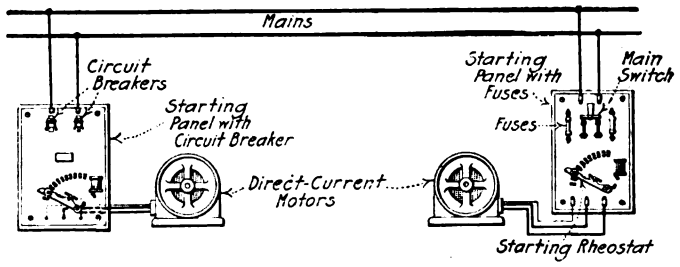


Fig. 15.—Self-Contained Starting Panels for Direct-Current Motor.

Circuit-breaking devices disconnecting all wires of the motor circuit are frequently incorporated in control equipments, such as those for elevators and other automatic controls. These devices perform all of the functions of a switch and hence may be used in lieu thereof.

Overload-release devices on starting rheostats as a rule do not provide adequate overload protection because they are frequently of frail construction and in any case do not provide protection to the portion of the motor branch circuit between the starting device and the main.

Automatic circuit-breakers perform the functions of both fuses and switch where the breaker disconnects all of the wires in a circuit, as in Fig. 7. This means that if a circuit-breaker is to be substituted for the fuses and a switch in a two-wire motor circuit, that a two-pole breaker must be used, or on a three-wire three-phase circuit a three-pole breaker should be installed.

Rubber-covered conductors serving alternating-current motors may be rated as to current-carrying capacity in accordance with the currents allowable for insulations other than rubber (Rule 18, Table B). The reason for this is that the starting current for such motors is much greater than the running current. But inasmuch as, under normal conditions, the starting current flows for only a short period there is no danger of overheating the conductor and thus damaging its insulation, even if a liberal current-carrying-capacity rating is allowed. Consider an example, Fig. 4. Assume that the branch circuit to the motor is to be of rubber-insulated wire and that the starting current taken by the motor is 100 amperes. Ordinarily, according to Rule 18, No. 1 rubber-covered wire should be used to carry 100 amperes, but in the case of the branch to one alternating-current motor, No. 3 rubber-covered wire could be used because No. 3 wire with insulations other than rubber will safely carry 100 amperes (Rule 18, Table B).

Time-limit devices are arrangements whereby a circuit-breaker is prevented from opening on a sudden overload, but which permit the breaker to open if the overload is continued. Fig. 13 illustrates the principle of one type. With the breaker closed, the current enters at *A*, passes through the solenoid *B* and continues via course *C*, *D*, *F*, *G* and *H*. When current flows, the solenoid *B* is energized. When a current smaller than that for which the breaker is set at *S* flows through the breaker the attraction of the solenoid is not sufficient to lift the disk *R* and the iron plunger *P* and draw it up into the solenoid. However, if the current becomes greater than that for which the breaker is set, the magnetic attraction then overcomes these restraining

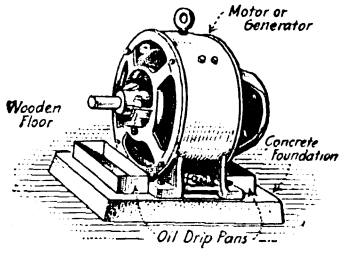


Fig. 17.—Drip Pans to Catch Surplus Oil from Motor Bearings.

effects and the tendency is to pull the plunger up into the solenoid until it strikes the trigger *T* which will release arm *D*. Then the spring *Q* will force the arm out to the position shown in dotted lines, opening the circuit. However with the time-limit circuit-breaker, the plunger is prevented from rising immediately because of the restraining action of the time-limit device (*U* and *R*) due to the cohesion of the smooth bottom

Digitized by Google

of the disk *R* to the bottom of the cup *U*, which contains oil. But, if the overload persists, the continued pull exerted by the solenoid on the plunger will overcome the cohesion between the disk and the bottom of the cup and it will then permit the plunger to rise and the circuit-breaker will be opened. Note then, that although the breaker of the type diagrammed in Fig. 13 will open under an overload that lasts for several seconds it will not open under a momentary overload.

Fig. 14 illustrates the principle of a time-limit circuit-breaker of another type. With this device the main current, or a certain definite portion thereof, circulates around the solenoid *S*. If this current becomes greater than that for which the instrument is set, the plunger *P* of the solenoid tends to rise. It is, however, restrained from rising abruptly by the leather bellows which must force the air it contains out of its air chamber through the small orifice *O* before the plunger can be raised any great distance. However, if the pull on the plunger due to the solenoid *S* is continued, the air will be forced out of the bellows, the plunger will rise, and the contactor *CC* will close the auxiliary circuit permitting current to circulate around the solenoid *B*. Then the plunger *D* will be attracted and the breaker will be tripped, opening the main circuit at jaws *J* and *G*. Figs. 13 and 14 are merely diagrams to illustrate the principles involved in the operation of these devices and are not intended to show their actual construction or exact proportions.

Starting panels for direct-current motors are shown in Fig. 15. On these panels is mounted all of the equipment required for protection and starting of the direct-current motors. Panels such as these provide neat installations because they eliminate the necessity of wiring between protective devices, switches and rheostats. They are very simply installed, inasmuch as where they are used it is only necessary to carry two conductors to the line side of the starting panel and to run three conductors from the motor side of the starting panel to the motor.

Most autostarters are now provided with casings which inclose all current-carrying parts. In some makes of autostarters the cutout arranged to receive the fuses has bare current-carrying parts, and in such instances this cutout can be inclosed in a metal cabinet.

Railings should be provided around motors where there is any possibility of accidental contact with either the bare current-carrying parts of the motor or its starting device. A typical installation thus provided with a railing is shown in Fig. 16.

Motors located in wet, dusty or dirty places should ordinarily be inclosed either in a ventilated inclosure or in a room, Fig. 18, prepared for their reception. The room should be big enough so that the attendant can work around the apparatus without difficulty and it should be provided with windows and artificial lights: where there is danger of fire the windows should have wire glass. Where the motor is suspended from a ceiling, a room can be arranged around it by providing glass partitions from the floor of the motor platform to the ceiling. It is seldom necessary to inclose alternating-current motors of the types in which brushes are not used, such as squirrel-cage induction motors.

Enclosed motors have the advantage that all dust and dirt is excluded, but they have the disadvantage that inclosing a motor or any electrical machine, as shown in Fig. 19, *II*, so decreases the ventilation that the capacity of the motor is materially reduced. For example, if a motor has a capacity of 15 horsepower when open as shown in Fig. 19, *I*, the same motor enclosed, as shown at *II*, may have a capacity of only 7 horsepower. Where it is desired to protect the working parts of the motor from mechanical injury rather than from finely divided particles, perforated covers *IV* can be used instead of the solid inclosing covers *III*, without materially decreasing the output of the motor. As noted above it is seldom, if ever, necessary to enclose alternating-

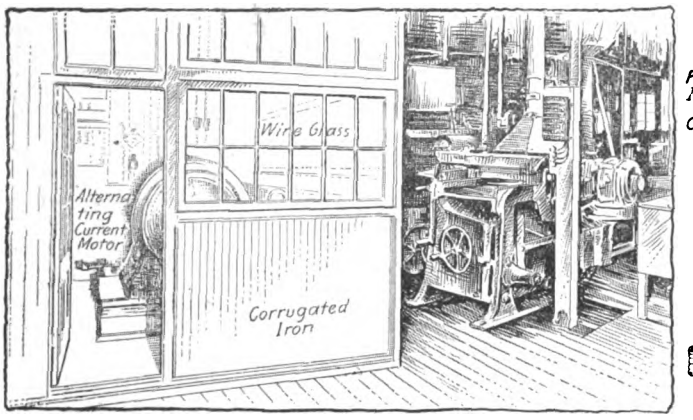


Fig. 18.—Fireproof Motor Compartment.

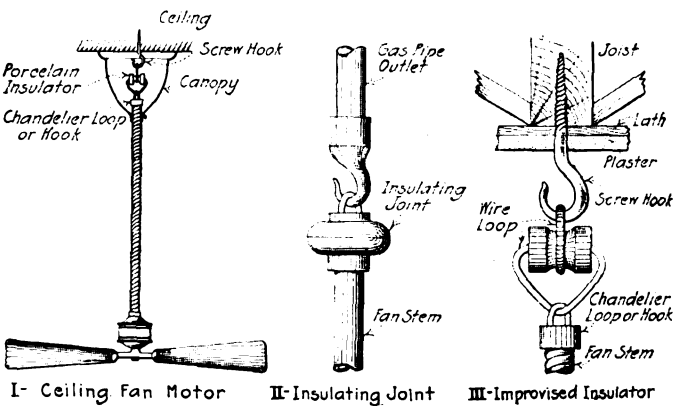


Fig. 20.—Method of Insulating Ceiling Fan Motors.

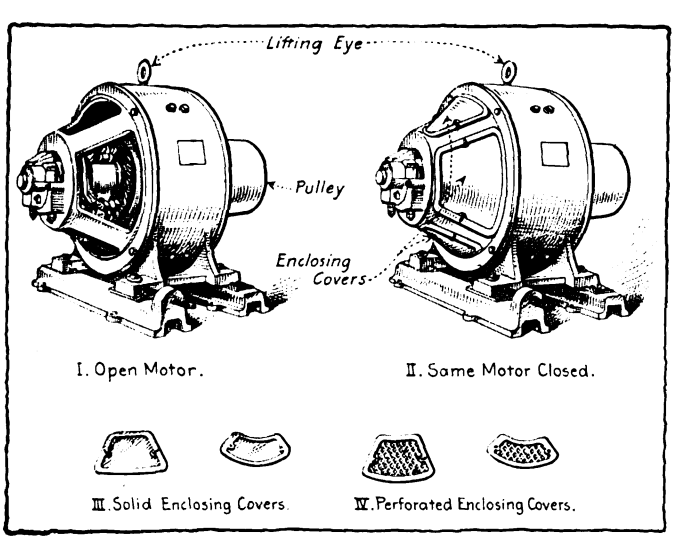


Fig. 19.—Motor Open and Provided With Enclosing Covers.

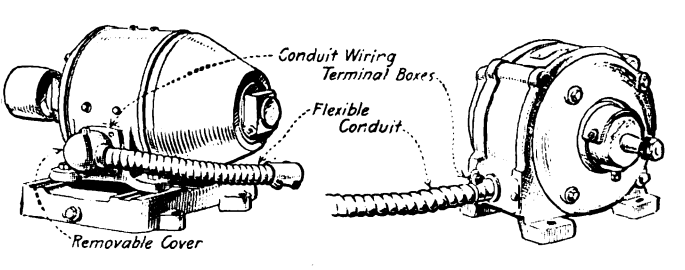


Fig. 21.—Conduit-Wiring Terminal Boxes on Motors.

Digitized by Google

current motors of the types that do not have brushes.

Oil-drip pans may, where necessary, be provided as shown in Fig. 17 to catch any oil that may drop from the bearings. Such oil, if allowed to fall on and soak into a wood floor or other combustible materials, would greatly increase the fire hazard. It is seldom that it is necessary to provide modern motors with drip pans, inasmuch as their bearings are so designed that the oil does not ordinarily leak from them.

Ceiling fan motors should be insulated

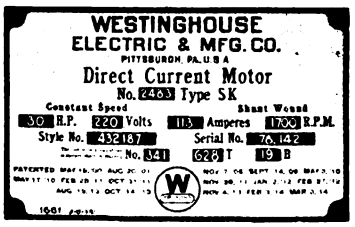


Fig. 22.—Typical Name Plate for Direct-Current Motor.

from the ceiling as shown in Fig. 20, so that there will be no possibility of a leakage current to ground, causing a fire. The frames of ceiling fan motors are always thoroughly insulated from the supporting surfaces, inasmuch as it is not usually practical to ground them like it is the ordinary motor and generator frames.

Typical motor name plates are shown for a direct-current motor and for an alternating-current motor in Figs. 22 and 23, respectively. These name plates give information similar to that given on generator name plates and are required for the same reasons. The authoritative data that they provide tends to prevent the

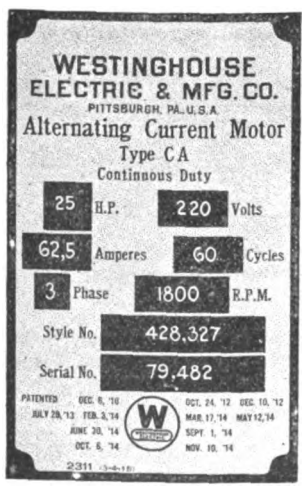


Fig. 23.—Typical Name Plate for Alternating-Current Motor.

possibility of the overloading and consequent overheating of the machine.

Terminal blocks on motors perform essentially the same function as those on generators and hence are similarly constructed. Where motor wiring is to be installed in conduit it is always desirable to secure motors provided with terminal boxes, Fig. 21, arranged for conduit wiring. Where these boxes are used, all of the conductors are enclosed and there are no loose ends or "pig tails" to catch dirt and lint.

All direct-current motors should be so wired that the field will be excited before current flows in the armature circuit of the motor. The armature of a direct-current motor (Fig. 24) has a very low resistance, hence if the normal electromotive force of the circuit is impressed upon it (with the armature stationary) a large current will flow which will probably melt fuses, and might, under some conditions, cause a fire due to overheating of certain parts. However, if the motor armature rotates in a magnetic field there is induced in it a counter electromotive force. When the armature of a direct-current motor rotates in its magnetic field, this counter electromotive force is always in such a direction that it opposes the external electromotive force which is applied to the motor and which causes rotation, and thus the current through the armature circuit is limited to a safe value. It is

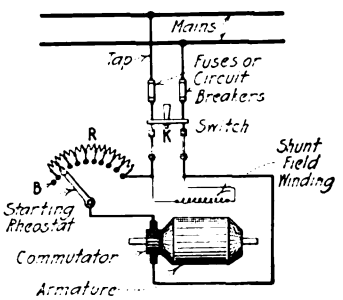


Fig. 24.—Diagram to Show Correct Method of Connecting Motor so that Shunt Field Will be Excited Before Current Flows in Armature.

apparent then that if the armature of a motor is connected across a supply circuit, the field circuit of the motor not being excited, the supply conductors will be short-circuited. But if the field of the motor is first excited and then the armature is connected across the supply circuit, it will at once commence to rotate and induce the counter electromotive force which will limit the current through it. However, resistance, *R*, Fig. 24, should always be provided, in series with the supply circuit and the armature, to limit the current through the armature at the instant of starting. As the armature attains speed, this resistance can be gradually decreased until finally when the armature has attained full speed it may be connected directly across the line. Note in Fig. 24, when the motor is not operating, knife switch *K* should be open and the rheostat handle should be on button *B* so that the armature is not in circuit. Then in starting the motor, *K* is closed. This permits current to flow immediately through the shunt-field winding. No current can flow through the armature until the rheostat handle has been moved one button to the right. Then a small current will flow through the armature, but when it does flow the field will be excited and the armature will commence to rotate.

Bushings for motor leads should be of non-absorbent and preferably of non-combustible materials for the same reasons that such materials are desirable for generator bushings.

New York City Board for Examining and Licensing Electricians.

Pursuant to Chapter 9 of the Code of Ordinances of the City of New York, Commissioner William Williams, of the Department of Water Supply, Gas and Electricity has appointed the following-named persons, all of New York City, as a board to determine the fitness of applicants for licenses to be issued pursuant to said chapter in relation to installing, altering or repairing electrical wiring or appliances for light, heat or power in buildings:

Hubert S. Wynkoop, chairman, electrical engineer, Bureau of Gas and Electricity, Municipal Building.

John P. Ryan, employing electrician, 26 Cortlandt Street.

Paul McNally, journeyman electrician, 63 Park Row.

Joseph C. Forsyth, Underwriters' electrical inspector, 123 William Street.

Arthur A. Pope, electrician, New York Edison Company, Irving Place and Fifteenth Street.

Fred G. Webber, builder, 29 West Thirty-fourth Street.

Elmer D. Coulter, real-estate owner, 23 West Twenty-sixth Street.

This board will proceed at once to the formulation of rules and regulations governing the issuance of licenses, which will be published.

Among the Contractors.

The largest electrical contract awarded in Baltimore, Md., during the present year, was recently given to the E. S. Downes Company, of Philadelphia. The contract was for the wiring of the new grain elevator erected by the Western Maryland Railroad at Port Covington, which is just outside of Baltimore. This is the first grain elevator in that vicinity to be operated by electric power and the motors represent a total of 1,500 horsepower.

J. F. Shore & Son have opened a new electrical shop and repair department at 507 West Third Street, Davenport, Ia. The company will undertake electrical contracting of every description.

H. J. Mullen has opened an electrical store and repair shop at 213 College Street, Burlington, Vt. In addition to the repair shop a complete line of electrical supplies will be displayed on the first floor and storage batteries will be repaired and recharged.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The Interstate Public Service Company was authorized to issue $23,000 par value of bonds to reimburse the treasury of the company for expenditures made on account of underlying bonds of the Corydon light and water plant, and on account of expenditures for betterments and purchase of new properties and equipment, between May 1 and July 31, 1915. The bonds are to sell at not less than 80 per cent of par.

The Central Indiana Lighting Company was authorized to issue $14,000 of bonds to reimburse its treasury for $3,000 expended in the retirement of underlying bonds of the People's Gas, Electric & Heating Company, and $11,000 for extensions and betterments made in the cities of Bloomington and Columbus.

The City of Greenfield was granted authority to put in effect reduced rates for electric service furnished by its municipal plant. The former schedules provided rates of 10 cents to 6 cents per kilowatt-hour for light, and 4.5 cents to 2.5 cents a kilowatt-hour for metered power. The new rates are graded from 7 cents to 2.25 cents per kilowatt-hour.

NEW YORK—Second District.

The Depew & Lancaster Light, Power & Conduit Company was authorized to issue $49,000 of its 5-per-cent bonds at not less than 80, to net $39,200, to be used in the construction of its distribution plant in the town of West Seneca.

OREGON.

The Hood River Gas & Electric Company and the Hydro-Electric Company applied for and were granted permission to substitute a straight prompt-payment discount of 10 per cent of the amount of the customer's bill for the discount provision in their schedules, as fixed by the former order of the Commission, issued July 14, 1915. (ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, July 31, 1915, page 191.) The former order provided a discount of one cent per kilowatt-hour for the first 30 kilowatt-hours and one-half cent for each kilowatt-hour over 30 for payment within ten days from date of billing. The Commission says the proposed straight discount is substantially the equivalent of that prescribed, and "will apparently be more convenient for the utilities."

Eastern Oregon Light & Power Company. In reply to an inquiry as to whether or not newspapers may lawfully be given a rate for electric current used by them in the operation of their electrical machinery which differs from the published tariff, the Commission handed down a general conference ruling which reads in part as follows:

"The act (Public Utilities Act) permits certain concessions in favor of specified classes of persons. Newspapers do not appear to be named by the Legislature as entitled to such specific consideration.

"The act, as a whole, contemplates that utilities may classify their customers. Whether the character of service furnished the newspapers is so different from that contemplated in the existing classes of customers provided in the company's tariffs does not appear, and, therefore, no opinion is expressed thereon. Manifestly any classification of customers should be based upon service conditions, so that it would be applicable to all customers who may have similar load and service characteristics."

WISCONSIN.

Washington County Telephone Company. In an investigation to determine proper rates to be charged by the Washington County Telephone Company, it appeared that the company's investment was somewhat larger than is the usual investment for companies operating somewhat similar systems. It developed that the company had purchased the property of a competing concern which was operating in practically the same territory and paralleling its lines in many cases. The amount paid for the property was, apparently, considerably more than the reasonable value of the property. Moreover a large part of the property was scrapped in eliminating duplications which existed under competitive conditions. The Commission says: "Whether the applicant credited its property and plant account with the cost of portions of its property which were scrapped, the evidence does not show, but the rather high book value of the property would seem to indicate that the property and plant account had not been credited with the cost new of property removed from service."

Consideration is given the fact that better service was secured by the consolidation of the properties.

"That the long-distance connection thus obtained, and the elimination of duplication were of sufficient value to the general body of subscribers to justify the company in charging rates at the present time sufficient to meet the fixed charges on its entire investment, a very large part of which is not represented by tangible property at the present time, is not clear from the records before us. That there have been certain advantages to subscribers from the unification of the telephone systems and the ability to secure long-distance service, there appears to be no reason to doubt, but we do not feel that the book value of the property representing, as it does, a large investment made necessary to eliminate a competing company from the field, and probably a large investment also in physical property which has been discarded, can be accepted as controlling for the purpose of this case.

"It is true that under the present laws physical connection may be secured between telephone systems wherever reasonably necessary, but such connection, even at the best, is not likely to be equivalent to service of equal extent furnished by a single company. The company has undertaken to furnish this more valuable service, and although a part of the fixed expenses resulting from the consolidation should probably not be thrown back upon subscribers, but should be considered as a loss to the company, resulting from its having operated in a competitive field, it seems to us to be reasonable to expect that subscribers should bear a portion of the fixed expenses which were incurred in eliminating a condition unfavorable to good telephone service."

The Interborough Rapid Transit Company, New York City, has received 61 all-steel cars for subway service. This is the first part of an order for 478 steel cars to replace cars with composition car bodies. The older cars, as they are replaced, will be put in service on the elevated lines.

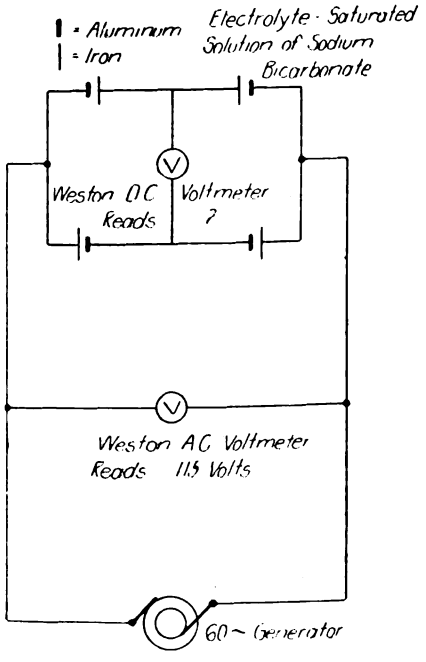
Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectified direct-current voltage be?—A. G., Fort Monroe, Va.



No. 304.—Nodon-Valve Voltages.

No. 307.—Special Type of Induction Motor.—A new type of induction motor has been invented in which the bars of the squirrel-cage rotor are made of special composition possessing characteristics which automatically limit the starting current. Has this construction been applied to any large motors and is it effective in operation?—C. M. D., Gary, Ind.

No. 308.—Aluminum Solder.—Can aluminum wire be soldered and what is the best way for doing it, if it can be done?—S. H. L., Joliet, Ill.

No. 309.—Automatic Cutout.—It is desired to keep an electric water heater taking 550 watts in circuit as continuously as possible. A few other devices and lamps are also on this circuit, but are turned on for short intervals only. Is it possible to devise some automatic means for temporarily cutting out the heater while the other load exceeds one ampere? The device must reconnect the heater as soon as the other load is cut off or reduced to less than one ampere.—V. B., Milwaukee, Wis.

Answers.

No. 303.—Rewinding Motor for Lower Frequency.—I have a three-phase, 220-volt, 60-cycle, three-horsepower motor which runs at a speed of 1,750 revolutions per minute. I wish to use this motor on a 25-cycle circuit and do not need more than two horsepower. I would be glad to know through the columns of your paper how I could wind this motor to gain this result. What would be its speed and would its efficiency still be high? At the present time it starts under full load with a high degree of torque and I would rather not change it unless I was certain of equally satisfactory results.—F. I. R., Auburn, N. Y.

The motor in question will hardly be able to give at the reduced periodicity of 25, an output of two horsepower. Since the present rated output is three horsepower at 1,750 revolutions per minute corresponding to 60 cycles and the speed at 25 cycles will be 725, the rated output would be normally $3\times725/1{,}750=1.25$ horsepower. This would mean the motor will run constantly under 60 per cent overload. But as iron losses are materially lower at 25 cycles, the total magnetic flux at present existing could easily be increased by about 15 per cent; this would increase the available normal output to 1.45 horsepower, which means still a continuous overload of 38 per cent. It is a question whether the slots are big enough to permit a section of copper for the new stator winding which does not result in too high a temperature rise when running at two horsepower permanently. It is assumed that the motor has a squirrel-cage rotor which will not be changed.

The actual magnetic flux can be determined from the well known equation

$$\Phi=(E\times10^8)/(2.12\times Z\times C),$$

where E is the voltage per phase,
Z the number of effective wires in series per phase,
C the number of cycles.

Z can be ascertained by counting the number of wires per coil as at present existing. The voltage at 25 cycles is assumed to be again 220 volts between phases. From the above we get for the flux

$$\Phi=(1.27\times10^8)/(2.12\times Z\times60)=10^8/Z.$$

The number of wires for the new condition by admitting 15 per cent more flux will be therefore,

$$1.15\Phi=(1.27\times10^8)/(2.12\times Z_1\times25)$$
$$\Phi=2.08/Z_1.$$

This means the new number of wires is to be double that existing. The section of the wire can be taken to 65 per cent less than the actual present section, which would mean at 10 per cent continuous overload, which even under the reduced ventilation due to the reduced speed would not given rise to injurious heating. It is hardly possible, however, that the slot dimensions will permit of bringing in double the number of the present wires with the new section, as the space-factor on account of the thinner wires is worse, the insulation taking more space. The best would be to try what diameter can be placed in the slots with the new number of wires; this would indicate what output the motor under the new conditions can give, namely:

New output=old output×ratio of new section of wire to old section×1.15.

The foregoing calculation is based on the assumption that the present number of four poles is maintained. In this case the new efficiency for 1.45 horsepower will be about 5 to 7 per cent lower than before at three horsepower. The same holds for two horsepower approximately. The starting conditions are also approximately the same as before; although the electromotive force induced in the rotor is about one-half, on account of the double number of windings per phase in the stator, the flux has been increased somewhat. At this lower speed the torque would be higher for two horsepower; it is likely, however, that the shaft and bearings are strong enough for the increased rating.

Another possibility would be to run the motor with double this speed, that is 1,420 revolutions per minute, by reducing the number of poles to two. The normal output is then 2.5 horsepower, which is sufficient for the new requirement. The number of wires remains the same as calculated for four poles, but they are to be distributed in two poles instead of four; that is, the present number of slots per pole per phase is simply doubled. Such two-pole winding, of course, takes more room in the end connections which might not be available on account of the present brackets.—H. A., Pittsburgh, Pa.

A 60-cycle three-phase induction motor of 1,750 revolutions per minute is wound for four poles and when connected to a 25-cycle supply of equal voltage will develop a considerable higher starting torque than with 60 cycles. The increase in torque is due to the increase in flux in the proportion of 60 to 25; but while this increases the torque, it unfortunately also increases the current required for the generation of this magnetic flux and the current taken by the motor, when running idle on 220 volts, 25 cycles would be so high as to heat the motor unduly.

This would be obviated by reducing the

Digitized by Google

supply voltage in the proportion of the frequencies of 2 5to 60. The rating of the motor would be then 1.25 horsepower, 25 cycles, 92 volts, 720 revolutions per minute. In order to obtain this odd voltage a three-phase autotransformer could be used. The cost of this arrangement would be lower than rewinding the motor; the efficiency would be scarcely 2 per cent lower than that of the motor after rewinding.

If, however, rewinding is preferred the number of wires per slot required is 60/25=2.4 times that at present in the slot. The starting torque of the motor would be good, but not so abnormally high as at present, its efficiency naturally 1.5 to 3 per cent smaller than that of the three-horsepower motor.

If this output and speed is not satisfactory then the number of poles will have to be changed. This is only practicable if the end bells of the bearing brackets have still sufficient room to hold the somewhat larger coil ends of the two-pole motor. The coil ends would be about 40 to 50 per cent larger, measured from the stator core in the axial direction. In order to keep the coil ends as short as possible and also for electrical reasons it would be advisable to make the throw not half the circumference, but somewhat less; with 36 slots about 1 to 16, or with 48 slots total 1 to 21. This, however, can only be done conveniently if a two-layer winding (two sides of a coil per slot) can be put into the slot. The output of the two-pole motor is about double that of the four-pole motor, so that the motor would be wound for 2.5 horsepower. In order to go safely, however, as the full data of the motor are not available, and as to the induction at the back of the stator teeth is doubled by the widening of the poles to double width, we will reduce the magnetic flux corresponding to the output of two horsepower, as required.

The rating of this motor would be two horsepower, 220 volts, 25 cycles, 1,450 revolutions per minute. The number of wires per slot would have to be $60/25\times 2/4\times\sqrt{2.5/2}=1.34$ times the number of wires wound in the existing motor.

The efficiency of this motor would be equal to that of the three-horsepower, 60-cycle motor and its starting torque in percentage of full-load torque superior, as the rating of the motor is not limited by the overload capacity, but by heating in this case. Provided that the dimensions of the motor brackets will allow of the longer coils, the rewinding would prove thoroughly satisfactory.—J. J. W., Pittsburgh, Pa.

No. 305.—Test of Ground Plates.—What is the best way to test the effectiveness of ground plates?—F. A. H., Chicago, Ill.

The usual way of determining the effectiveness of an earth or ground is to measure the resistance between it and an extremely good ground, such as a water main, penstock, etc. A better way is to have two additonal earths beside the one whose resistance it is desired to determine. The resistance is then measured between each pair of earths, from which the resistance of each is calculated as follows:

(1) $R_1+R_2=A$,

(2) $R_1+R_3=B$,

(3) $R_2+R_3=C$,

where A, B, C are the resistances found by measurement, and R_1, R_2 and R_3 the individual resistance of the earths. Strictly speaking, an earth connection has not a definite value of resistance, but it has one that is approximately so if the earths are isolated from each other. The reason for this is on account of the major portion of the resistance occurring at the contact surface of the ground plate or pipe. To prevent large errors, and even ridiculous results, it is best to have the three earths about ten or fifteen feet apart.

There are two methods in common use for measuring the resistance of an earth or ground, namely the ammeter-voltmeter method and the oscillating-current bridge method. When using the ammeter-voltmeter method alternating current should be used where possible, because it eliminates the effect of electrolysis and counter-electromotive forces. In those cases where direct current only is available the chance of error due to polarization may be largely reduced by using a higher voltage than would otherwise have been employed. At 110 volts and about 25 to 50 amperes satisfactory results can generally be obtained, whether the current be alternating or direct. A rheostat should be installed in circuit because it saves the ammeter from damage in case the earth is of lower resistance than estimated, or should an accident occur. The resistance of the rheostat should, of course, be deducted from the values obtained.

The oscillating-current Wheatstone-bridge method is generally used when no other source of current is available. It consists of the ordinary Wheatstone bridge, only a telephone receiver takes the place of the galvanometer, and a transformer or induction coil, and a buzzer or some other form of make-and-break is used in the battery circuit.

The results obtained with both methods should correspond, although they frequently do not. The bridge method is probably the more accurate of the two when the earths are close together. It is of little use, however, where currents may be induced from neighboring alternating-current circuits, and where the interconnecting wires have appreciable capacity and inductance; for such cases the ammeter-voltmeter method is indicated. One great advantage of the ammeter-voltmeter method is that it gives some indication of the stability of a ground, which the bridge method, on account of the small currents used, does not do. It is a good thing to leave the current on for some time after taking the measurements, and then take them again, as this may be instrumental in showing up trouble, or the drying up of the soil surrounding the earth or ground.—K. R., Chicago, Ill.

No. 306.—Cleaning Transformer Cooling Coils.—What is the best way to remove the deposit which has accumulated in transformer cooling coils without removing the coils?—F. A. H., Chicago, Ill.

It is rather an uncommon occurrence for the cooling coils of transformers to become clogged to any serious extent. It shows that the cooling water carries a particularly large amount of foreign matter in suspension or solution. Further, it might indicate that the operating temperature of the oil is exceptionally high, which would tend to hasten and increase the precipitation. The most obvious way of cleaning the coils would be by chemical action. And the safest way, and probably the quickest and cheapest in the end, would be to obtain a sample of the water and of the precipitate and submit them for chemical analysis, from which the proper solvent to use may be decided upon.

Knowing nothing about the water, or the deposit, nor even the material used for the coils—whether brass or iron—it is impossible to offer more than a very general mode of procedure. If chemical analysis is not feasible, the next best thing is to take some of the deposit and try the action of different solvents upon it. Ammonia, sodium chloride or vinegar might be effective, and they are comparatively harmless, so far as the coils are concerned. Hydrochloric or muriatic acid are sometimes used, but if the coils are of brass there is considerable danger of damage. Muriatic acid has been used on more than one occasion with good results, but great care must be exercised, and the operation carried out as quickly as possible. Use a liberal amount of acid, somewhat diluted. Fill the coils from bottom up, as this will eliminate water traps. After allowing the acid to stand in the coils for about five minutes, empty and flush thoroughly with water.

It is not enough to have cleaned the coils, but the repetition of a similar occurrence should be guarded against. It can be realized that the use of an acid solvent at frequent intervals may be liable to eat through the coils, allowing the water to enter the case, which would immediately result in a burnout. The cause of the trouble will show up by chemical analysis, from which the remedy will be indicated. Substitution of brass for iron coils, or vice versa, may be worth while.

If it is found that the trouble is due to dirt rather than chemical action, etc., it might be worth while to blow out the coils with compressed air at regular intervals.—K. R., Chicago, Ill.

Digitized by Google

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Panama-Pacific Convention Held at San Francisco, September 16-18.

The Panama-Pacific convention of the American Institute of Electrical Engineers was held at San Francisco, Cal., September 16 to 18. Headquarters were at the St. Francis Hotel. Sessions for the reading of papers were held in the building of the Native Sons of the Golden West. The total registration at the convention was close to 350. Parallel sessions were held on Thursday morning and afternoon and on Friday morning and afternoon. Two of these sessions were joint sessions with the Institute of Radio Engineers. A report of these will be given in a later issue. One session was a joint session with the American Electrochemical Society, which was holding a convention at the same time.

On Saturday morning, a commemorative medal was presented to the Institute at the Exposition grounds by the president of the Panama-Pacific International Exposition. This was received by President J. J. Carty, of the Institute. The presentation took place in the Court of Abundance. The remainder of the day was devoted to seeing the Exposition grounds and exhibits and a demonstration of high-voltage phenomena by C. H. Thordarson, of Chicago, using a transformer of new design, which he has recently constructed.

A dinner-dance was held at the St. Francis Hotel on Thursday evening. An automobile trip was provided for the visiting ladies on Thursday morning, winding up at the Old Faithful Inn on the Exposition grounds, where luncheon was served.

The opening session of the convention was called to order at 10:15 a. m., Thursday, by President J. J. Carty, who made a few fitting remarks relative to the opening of the Panama Canal and the opportunity which the convention afforded for a meeting of electrical engineers from all parts of the country. He then called upon Honorary Vice-President Harris J. Ryan, who welcomed the members and pointed out the significance of the meeting. Secretary F. L. Hutchinson then made a brief address and announcements were made by W. W. Briggs, chairman of the Convention Committee, and by H. A. Lardner for one of the sub-committees. The convention then broke up into parallel sessions.

President Carty occupied the chair at the main session. The first paper was one by B. G. Lamme, entitled "Physical Limitations in Direct-Current Commutating Machinery." In the absence of the author, this was presented by F. D. Newbury.

Physical Limitations in Commutating Machinery.

In direct-current machines, there are a number of apparently distinct limitations, such as sparking at brushes, flashing at the commutator, burning and blackening of the commutator face, picking up of copper, etc., which, in reality, are very intimately related to each other. The principal object of the paper is to bring out such relationships and to show that all these actions are special cases of well known phenomena. The theory of commutation is considered only in its relation to the electromotive forces generated in the coils short-circuited by the brush; and the limiting electromotive forces per commutator bar and per brush are shown to be fixed principally by brush-contact resistance. The effect of the negative coefficient of the contact resistance is also referred to briefly. Flashing due to various causes is next taken up, and the relations between the maximum volts per bar and flashing conditions are indicated, both from test and general experience. Flashing due to various other causes, such as interrupting the circuit, is also considered. Burning and blackening of commutators, high mica, picking up of copper, etc., are treated in detail, and these actions are shown to be very closely related to the commutation limits derived in the earlier part of the paper. Noise, vibration, etc., are also considered as limitations in design. In approaching the ultimate design, these limitations become increasingly prominent. Flickering of voltage and winking of lights are two well known actions in direct-current practice. A simple explanation of the winking of lights (not original with the author) is given, with the results of tests on a generator with well proportioned compensating windings in the pole faces. Apparently the difficulty is a fundamental one, and is liable to occur in all types. In conclusion, a brief chapter is given on design limitations as fixed by commutator peripheral speed. This applies particularly to large-capacity high-voltage machines. An appendix is added covering a method for determining the maximum capacity of direct-current machines in terms of the short-circuit volts per commutator bar when the various constants in the machine are given certain limiting values. The results show that in large high-speed machines, the maximum capacity is considerably above present practice.

The discussion was opened by E. H. Martindale, who pointed out that hardness and abrasiveness are distinct qualities of carbon brushes. With undercut commutators, it is not necessary that brushes should be soft, but they should be non-abrasive. The contact drop of potential may either increase or decrease with temperature. He had never found a change of more than 15 per cent except in brushes previously impregnated.

H. R. Summerhayes referred to the importance of flickering in isolated plants. The smaller the plant the more noticeable this will be when any sudden load, such as an elevator motor, is thrown on the line.

Gano Dunn explained an important principle of commutation, not referred to in the paper. It consists in using one or more auxiliary brushes in juxtaposition to the main brush, but insulated from it. This will prevent sparking, but a practical difficulty has been the unequal wear of the brushes.

D. B. Rushmore emphasized the fact that problems of commutation involve mainly empirical solutions.

In closing the discussion, Mr. Newbury said the important point with regard to brushes is their current-carrying ability. This is usually greater in a graphitic brush, which is non-abrasive. Commutators are undercut so that this type of brush may be used.

A paper by E. W. Allen and Edward Taylor entitled "Automatically Controlled Substations," was then presented, in the absence of the authors, by C. W. Place.

Automatically Controlled Substations.

The paper gives a definition of an automatically controlled as distinguished from a remotely controlled substation, and also analyzes the duties of the attendant in the starting, loading, and shutting down, of appratus in hand-operated stations. It states that the changes in the conditions of the electric circuit which the attendant observes may also be utilized to operate control relays, and as reliable devices are already available to protect the machines against overload and runaway, his assistance in these matters is no longer necessary. The paper then proceeds on the assumption that converting apparatus should be automatically controlled and that the conditions which have heretofore governed both the design and location of substations can be modified to advantage in many cases. It advocates a reduction in size and an increase in the number of stations and endeavors by example to show the large saving in feeder copper which the proposed arrangement permits. Finally, a description is given of the automatically controlled substations installed on the lines of the Elgin & Belvidere Electric Railway.

Mr. Place pointed out that there might be an application for such substations in congested cities for street railways and for certain lighting districts.

A. H. Babcock saw a big field for them on long interurban railways. He considered it a big step in advance to secure automatic control of machines of such size.

R. F. Schuchardt said that such methods might be applicable to lighting systems, but not so readily as to railways, since the conditions are more complex; voltage must be held more steady and various regulating devices are used. This complexity and the cost of maintenance may outweigh the saving in attendance. Where space is expensive, large units must be used, and here the advantages would not be so great. Nevertheless, he expects the Commonwealth Edison Company to try out such an installation in Chicago.

Digitized by Google

H. R. Summerhayes said there was a wide difference in the requirements for such stations as to time of operation, demand, etc. It is often preferred to have control wires from a central station. It may be desirable to apply semi-automatic principles to large machines, even where there are attendants. He did not agree with the authors that the natural outcome of this development would be an increase in the number of substations.

Marine and Lighting Session.

This session was held on Thursday morning, with Harris J. Ryan in the chair. A paper by H. A. Hornor entitled "Standard Marine Electrical Installation," was, in the absence of the author, presented by John H. Finney.

Marine Electrical Installations.

The requirements of merchant and naval installations are cited in brief. The rules of the classification societies are reviewed and present practice is fully discussed. Then follow specific applications to a number of different types of ships including both merchant and naval vessels. The reasons for the application of electric propulsion to a battleship are briefly given.

The discussion was opened by S. H. Blake, who contrasted present conditions with those a dozen years back when electrical apparatus on battleships frequently got out of order and much trouble was experienced with lamp breakages. The usual voltage then was 80 volts, whereas now it is 120.

John H. Finney emphasized the important part that electricity is playing in modern battleships, which contain power plants corresponding to a good sized central station.

A paper by R. C. Lanphier entitled "Recent Improvements in Electric Lighting of Steam Railroad Cars," was then presented by A. J. Anderson.

Electric Lighting of Railroad Cars.

This paper deals with the axle-generator system of electric lighting for steam railroad cars, and describes recent improvements in control systems for obtaining proper voltage from the generator under all conditions and proper regulation of battery charge to conserve the life of the storage battery. Methods of control depending upon voltage of the battery have not been wholly successful. Since the beginning of 1914 extensive use has been made of systems of control of the battery charge based upon actual input and output in ampere-hours, and one such system, which has proved successful, is described. In the development of the system of control by ampere-hour meter, tests were made by means of a special graphic recording ampere-hour meter which gives a complete record of the treatment received by a storage battery with any axle-generator system. Actual records from long runs are reproduced, to show the results obtained in the operation of the system of control of charging by ampere-hour meter. With this system the battery has minimum work to do, in most cases operating between points of 75 or 80 per cent of full load and full charge, and the lighting load is put on the generator as much as possible.

This paper was discussed by George R. Murphy, who said that the method described by the author had been satisfactory in electric-vehicle service and other situations involving daily cycles of battery charge and discharge. But train-lighting service is of a different character; there is no uniformity in the work, which may be light one day and heavy the next. Battery control by the ampere-hour meter is based upon giving the battery a predetermined percentage of overcharge. This method is not theorectically correct and in practice is approximately so only under certain conditions. Overcharge is required (1) because all of the current does not produce the desired chemical change, as is evidenced by gassing, which varies as the charge progresses and with the rate, temperature, age of plates, etc.; (2) because of local chemical action, which also varies with conditions, but is principally a function of time. The constant-voltage system of control was introduced to meet these conditions and the operating results are nearly ideal, the control being automatic. The battery requires no charging, but what it receives in regular service and is at no time charged excessively. It is probable that as the conditions secured by control by the ampere-hour meter approximate a constant voltage across battery terminals, the results become more nearly ideal. Mr. Murphy then gave a description of a generator of the Rosenberg type, which gives constant voltage for different speeds, and illustrated it with lantern slides.

Session on Valuation of Public Utilities.

On Thursday afternoon the main session was a symposium on inventories and appraisals of electric utility properties. Three papers on this subject were presented. The first by C. L. Cory, the second by W. G. Vincent, Jr., and the third by William J. Norton.

Professor Cory also presented supplementary papers by Philander Betts on "Overhead Charges," by C. W. Wilder on "Rules for Collecting, Computing and Compiling Data in Connection with Appraisals", also one by Hermann Spoehrer on "The Value to Operating Companies of Well Planned and Executed Inventories," and one by Henry Floy on "Working Capital."

Inventories and Appraisals of Properties.

Professor Cory's paper deals with the chief factors that must be taken into account in making an inventory and appraisal of an electric lighting and power property. The paper points out the factors that are usually or practically universally recognized, the factors that are quite generally recognized, and the factors regarding which there is still serious controversy. The paper concludes by a discussion of the differences in inventories and appraisals when these are to be used for different purposes.

Mr. Vincent's paper discusses the procedure that is necessary to obtain reliable inventories and reasonable appraisals of properties that can be defended both from the standpoint of the public and the companies. The paper continues with a discussion of the extent to which detailed inventories and appraisals should be kept up to date by companies, and makes some suggestions on the best way in which detailed inventories and appraisals may be kept up to date.

Mr. Norton's paper deals with working capital, pointing out that the common method of determining this by examination of current assets and liabilities is erroneous. The method first publicly pointed out by Messrs. Palmer, King and Willard is then discussed. Most rate-making cases require a valuation by the reproduction-new method. To this value must be added the working capital in order to obtain the complete valuation of the plant, because with the plant reproduced and ready to operate a considerable amount of working capital is necessary to provide service before any revenue from operation is received. The main items in the working capital are based upon the customers' individual responsibilities for the cash investment required by utility; these three items are: (1) Service received by the customers in advance of payment therefor. (2) Demand of the customers for merchandise and supplies and receipt of same before payment. (3) Demand of customers for uninterrupted service, which requires reserve supply of fuel. To these items is added another of a general character, which is the general cash balance required by the utility irrespective of the customers' direct responsibility. The paper discusses these four items in detail, and shows how the total working capacity can be accurately ascertained.

Overhead Charges.

It is customary in valuations to add a certain percentage, ranging from 10 to 30, to the physical cost to cover such items as engineering, interest and taxes during construction, etc. Regulating bodies have shown a tendency to fix a minimum figure, while corporations sometimes make extravagant claims for such allowances. The author analysed the different elements of a utility property with regard to figures actually found in practice and arrived at the following: land, 20 per cent; buildings and similar works, 35 per cent; general equipment, 5 per cent; plant machinery, 31 per cent; transmission mains, 23 per cent; distribution mains, 10 per cent; services, 5 per cent; tools and appliances, 5 per cent; laboratory equipment, 5 per cent. In the case of one large gas company these averaged up to 17 per cent. A list of allowances is given for a large number of cases. In conclusion the author states that justice to both company and customer requires a reasonable allowance for overhead charges, which should be determined by careful analysis.

Rules for Collecting, Computing and Compiling Data.

A complete system for recording and compiling data, making computations

Digitized by Google

and preparing summaries should be adopted in any inventory and appraisal of a large utility property. The author has evolved a method as a result of a number of appraisals of properties ranging from $1,000,000 to $25,000,000. Only four standard forms are used, samples of which were shown. Information is classified as "field information" and "office information"; the latter including all results of computation and compilation. All work of the latter kind is checked by a second person, who is equally responsible for same. Twenty-five rules are given by the author covering the details of the work.

Values to Operating Companies of Well Planned and Executed Inventories.

The author gives eight reasons why inventories are of value. (1) In rate cases the rate is dependent upon the investment, which can only be fixed by an accurate knowledge of the physical property. Inventories taken only when necessity demands are more expensive and less accurate than a running inventory. (2) Numerous occasions arise where detailed knowledge of physical property is of great advantage. The need for detailed information is never realized until it is found unavailable. It is of assistance in disposing of securities to have an inventory available for inspection. Small properties frequently change hands and an inventory may facilitate a prompt sale. (3) Construction estimates are facilitated. (4) Extensions and replacements are planned more accurately and in planning, unit costs are an invaluable assistance. (5) The valuation shown on the property account of the company cannot be depended upon unless based upon an inventory. (6) The proper amount of depreciation reserve can be more readily determined. (7) Agitations for municipal ownership require a preparedness to refute fallacious statements. (8) In submitting bids for city lighting, the cost of service must usually be developed.

Working Capital.

This term is usually taken to include that part of the capital represented by cash on hand and material in stock. This limited use of the term does not properly cover everything which should be recognized in making a fair allowance, such as accounts receivable and payable. Assets and liabilities are divided as follows: Assets: cash, stores and supplies, manufactured products on hand, manufactured products delivered to customers but not billed, accounts receivable, prepayments of insurance, taxes, etc. Liabilities: accounts payable, interest accrued, wages accrued, taxes and insurance accrued. For most economical operation credit and cash must be available. The value of products delivered but not billed has frequently been overlooked or ignored since the books do not show it. Holding companies frequently control utilities. It is common practice to turn revenues over to the holding company monthly and the bills are paid by it, the subsidiary corporation merely keeping small amounts of cash on hand to pay local current bills. In this case the holding company requires the bulk of the working capital and the cash on hand by the utility does not indicate the actual working capital required. The combined assets of both companies really constitute the working capital. The amount of working capital varies with the character of the business. On street railways, the fare is paid in advance and hence less capital is required. The allowance for working capital is sometimes based upon annual gross revenue and amounts to 5 to 25 per cent. The actual cash balances of a large number of utilities average 12.5 per cent. A second method is to allow a percentage of the operating expenses, usually sufficient to cover two months. A third basis is a percentage of the appraised value, varying from 3 to 7 per cent. Tables are given showing typical allowances in actual court and commission cases.

In opening the discussion, which was participated in by many speakers, President Carty said that engineers whose minds are trained to deal with problems of the utmost perplexity are peculiarly well fitted to deal with the subjects under discussion.

J. T. Ryan said that the principal matters of disagreement arose from the difficulty of properly applying an undisputed principle. This is illustrated by four valuations in a recent condemnation suit, which varied through a range in the ratio of 4 to 9. Points of issue rarely arise over inventories. He then gave a few instances to illustrate the difficulty of application of the various suggested theories in actual cases. A valuation should be a measure of the utility's capacity to serve. Its object should be the determination of the basis for compensation for the service rendered, with justice to both sides. All other purposes are relatively unimportant. The cost of labor and material involved in building the property, or that would replace it, are not a measure of its value. An injudicious investment, if made in good faith, should be afforded every opportunity to work its way out to stability, but when this cannot be done there must be a readjustment. Intelligent expenditure of money should result in values in excess of cost. If the maximum return is limited by the actual investment, managerial ability and capital cannot be attracted to an industry. To follow any theory of original cost or reproduction cost rigidly to its logical end often results in conclusions absurdly high or low.

F. E. Hoar pointed out the great confusion of the terms, cost and valuation. Present-day prices should only be applied to a substitute plant or one which would reproduce the service at the present time. If the property is to be reproduced on the historical method it is necessary to use historical prices. There is no difference of opinion as to the equity of the problem that a company investing its money reasonably and honestly is entitled to a fair return; an estimate of the cost to reproduce should be based upon the time and the manner in which it was actually produced, using the prices which obtain at that time. This assumes that a utility is entitled to earn interest on each dollar invested.

J. B. Fisken said that working capital to take care of a jobbing business should not be considered in a valuation as it is a non-operative part of the business and should make what profit it can on the jobbing business. Similarly all non-operating property should be eliminated. He considered the value of the service an important item. In place of a valuation it should be sufficient to establish whether or not a company has watered its stock; if the investment has been carefully made, that should be sufficient.

John H. Finney said that an eight-per-cent return on invested capital is not sufficient to encourage hydroelectric development.

David B. Rushmore said the time was coming when manufacturing companies will have the same regulation as public utilities have now. The first thing to do in such work is to decide on general principles which are fundamental, and then it should be a simple matter to apply them.

L. B. Ready raised the point that bond discount should not be included as capital in a valuation, but should be considered in fixing the rate of return.

Professor Cory then closed the discussion. He claimed that the bond discount was an actual outlay of the utility and formed a part of the cost and hence should be included in the capitalization. He said that the entire public is interested in having the best possible service supplied at the least possible cost not only in the present but in the future, and no restriction should be put by official bodies in attaining this end.

Electrophysics Session.

Vice-president J. F. Stevens occupied the chair at the Electrophysics Session which was held in the afternoon. The first paper to be presented was one by F. W. Peek, Jr., entitled "The Effects of Transient Voltages on Dielectrics."

Effect of Transient Voltages on Dielectrics.

In practice, failures of dielectrics are generally caused by transient voltages. It is, therefore, of great practical importance to determine the various phenomena affecting the strength of dielectrics and means of protecting them when they are subjected to known transient voltages. An impulse generator from which impulse voltages of any given wave front, length of tail, etc., can be obtained, is described. Energy is required to rupture gaseous, liquid and solid dielectrics; this introduces a time element. On account of this time lag, when voltage is applied at a very rapid rate, as by an impulse, spark-over does not occur when the continuously applied break-down voltage is reached. The voltage rises above this value during the time rupture is taking place. This rise in voltage above the continuously applied break-down value is greater, the greater the rate of application. The time depends upon the nature of the dielectric, the dielectric field, the shape and spacing of the electrodes, initial ionization, etc. The strength of air between spheres and needles for impulses of

Digitized by Google

different front, length of tail, etc., is given, as well as the time in micro-seconds and the voltage required to rupture air between spheres and needles on the front of waves rising at various rates. Transient spark-over and corona voltages for wires, surface spark-over, insulator spark-over, effects of polarity, air density, practical application, etc., are given. Transient spark-over voltage and time are recorded for oil and various solid dielectrics. The general laws of breakdown of dielectrics by transient voltages are summarized.

The discussion was opened by J. C. Clark, who described an experiment recently performed by Professor Ryan in which a circuit containing a condenser and a helix was placed in juxtaposition to another coil; an air gap was placed in parallel with the helix. The circuit could be tuned to resonance. A discharge across the spark gap was dependent upon the rapidity with which the point of resonance was passed when tuning.

E. E. F. Creighton said that this paper explained why lightning discharges sometimes pass by an air gap and injure apparatus intended to be protected by the air gap. The vacuum lightning arrester shows the same effect, the time required for a discharge depending upon the voltage applied. A high frequency can sometimes be applied to an insulator containing a crack, without puncturing it, when a low frequency would be sure to puncture.

F. F. Brand said that the paper also explained why time and energy are required for flashover when an insulator has corrugated surfaces. The time lag is longer at low air densities. At high altitudes, consequently, flashover does not occur so readily.

P. H. Thomas, R. W. Sorenson and J. M. Weed also joined in the discussion, which was then closed by Mr. Peek. The latter stated that with transient voltages insulators flash over at about the same voltage, whether wet or dry.

A paper by A. G. Collis entitled "Arc Phenomena," was then presented, in the absence of the author, by W. D. Peaslee.

Arc Phenomena.

Increasing developments in electric transmission systems impose correspondingly increased duties upon switchgear, and therefore a study of the arc phenomena accompanying the rupture of circuits in oil switches becomes of growing importance. The paper describes a number of experiments made to determine the influence of differently shaped arcing contacts upon the disturbances following rupture of an alternating-current circuit, and various theoretical considerations are discussed with a view to modifying the design of oil switches so as to increase their rupturing capacity and thereby eliminate auxiliary devices with their added complications and expense. The use of reactors is also considered in connection with the rating of oil switches.

E. B. Merriam, in a written discussion, gave the results of tests upon oil switches up to 9,000 volts and 25,000 amperes. These were illustrated with lantern slides. The shape of the contact has little influence upon the action. The dielectric medium affects the shape of the arc, oil, water and carbon tetrachloride giving different results. The position of the side walls also affects it. Pressures of 5,000 or 6,000 pounds have been observed near the arc, whereas near the walls of the inclosure it is more nearly 500 pounds. The bottom, as well as the sides of the inclosure, are distended by the explosion, indicating that the pressure is the same in all directions. Rectangular vessels are usually used. Different effects are observed in different switches on account of a difference in the reinforcing. The author does not give any evidence in favor of a multiplicity of breaks, which he advocates. In considering time of operation, a distinction should be made between the time for the mechanical beginning of the break, and the time of the elctrical operation or completion of the rupture. If the electrical time is not more than one-half cycle, there will be no serious abnormal voltages.

Chester Lichtenberg also presented written discussion in which he disagreed with the author. He presented oscillograph records for direct-current magnetic blowouts, in which there was an interval of but 0.2 second between the maximum current and break. For oil switches, there is a sudden rupture, with high-voltage rise.

Ford W. Harris also presented written discussion taking issue with the author upon a number of points. The results given do not agree with those obtained by him. He described a number of his own results and the conclusions drawn from them.

In closing the discussion, Mr. Peaslee thought the differences brought out were due to the point of view and the conditions of experiment.

The last paper to be presented at this session was one by A. E. Kennelly, F. A. Laws and T. H. Pierce, entitled "Experimental Researches on Skin Effect in Conductors." In the absence of the authors this was presented by C. L. Cory.

Skin Effect in Conductors.

The results are given of about one hundred series of tests, each covering a range in frequency up to about 5,000 cycles per second, on the impedance of long loops of parallel conductors of different metals, sizes, and cross-sectional forms. The measuring apparatus is detailed. The theory of the skin effect in solid rods and in indefinitely wide flat strips is appended in a new and simplified form. The experimental results agree with those computed on theoretical grounds. At high frequencies the proximity of the two wires of a circuit has a marked effect. Stranding has slight effect. Tubes have the least skin effect. The theory, involving Bessel functions, is given in an appendix.

This paper was discussed by C. L. Cory, H. B. Dwight and L. P. Ferris, and the session then adjourned.

Telephony and Telegraphy Session

The main session on Friday morning was devoted to papers on telephony and telegraphy, with President Carty as chairman. The first paper, by Bela Gati, entitled "Submarine Cable Rapid Telegraphy: Ocean and Intercontinental Telephony," was in absence of the author presented by D. I. Cone.

Rapid Cable Telegraphy and Intercontinental Telephony.

The speed of the cable telegraph is not satisfactory; slow work makes cabling very expensive. The direct-current impulses are lengthened on a long cable, because the long cable vibrates with its own natural frequency, which is very low. The impulses of the direct current overflow over a certain limit. Alternating currents do not suffer such overflowing. The oldest form of the alternating-current application is the inverse current. Especially Picard and Gott attained good results with their inverse-current systems. Another direction for increasing the speed of cabling is worked out by various cable-relays; Gulstad's, Muirhead's, Heurtley's and S. G. Brown's relays are discussed. Their use has not doubled the speed. The attempts with the high-frequency system on ordinary cables are discussed. The theory of the resistance of the cable is given, and different cables are taken into the computation. The cable rapid telegraphy is solved by the inductive shunts with little resistance. The problem is nearly the same also for ocean telephony; the difference is, that for common telephony various frequencies must be transmitted without distortion. The ocean telephony with aid of high-frequency currents on improved cables is already a solved possibility. For connecting continental circuits, strong-current microphones, more sensitive receivers, improved single-wire loaded circuits and telephone relays can be applied, which remove every limit of ocean and transcontinental telephony.

There was no discussion on this paper. The next paper was entitled "Automatic Switchboard Telephone System of Los Angeles," by W. Lee Campbell.

Automatic Telephone System of Los Angeles.

This paper narrates some of the history and describes the present automatic switchboard telephone system in Los Angeles. It describes how the system, which began to give service with one manual switchboard in 1902, has gradually been extended and transformed through several interesting stages of combined automatic and manual operation, until it now comprises 15 automatic offices and a traffic distributor switchboard which serves a total of 60,000 subscribers' stations—the largest automatic switchboard system in the world. The layout of central offices in the present plant is shown in contrast with the layout of offices in the Bell telephone plant of approxi-

Digitized by Google

mately the same size, operating in the same city. The traffic distributor switchboard used for handling the outgoing calls from a large number of private-branch-exchange switchboards is the largest board of the kind in operation, includes thirty operators' positions, and handles a heavy traffic. A general explanation is given of the equipment of the board, methods used in operating it and of the economies realized by means of it. Specially interesting and important features in handling the telephone business of a large metropolitan area like Los Angeles are the methods used in caring for calls for time and for information concerning subscribers' numbers, addresses, etc., and for answering subscribers' complaints and calls for long-distance connections. All of these methods are discussed at some length. The paper closes with a concise statement of the practice of using standards of adjustment and performance for securing uniformly good service from the automatic apparatus scattered over this area of about two hundred square miles and handling from 500,000 to 600,000 calls a day.

Written discussion ot this paper was submitted by Leo Keller, Fred L. Baer and John Wicks. Mr. Keller described the process of cutting over subscribers from the manual to the automatic system without changing numbers. Mr. Baer pointed out that depreciation of automatic equipment is small, due to either wear or obsolescence. He also described the operation of a combined manual and automatic system. Mr. Wicks pointed out that when subscribers had the option of calling by the automatic dial or through an operator, ninety per cent prefer the former, thus proving its efficiency.

Then followed a discussion on inductive inteference, which was introduced by a report giving the progress of investigation being made by the California Joint Committee on Inductive Interference. This report outlined the work which has been accomplished by the committee during the past year. Experiments have been made upon a 37-mile power circuit and private telephone circuit at San Fernando. The chief points investigated were the unbalances to ground of a power circuit isolated from ground; the relationship of triple-harmonic residuals to the magnetic density in grounded star-connected transformers; the magnitude of triple-harmonic residuals as affected by transformer connections; and the induction between power and telephone circuits. Tests on unbalances were made without transposition, with two transpositions or one barrel, and with five transpositions or two barrels. At 50 cycles, one barrel was as effective as two. At high frequencies two barrels were more effective and the non-transposed line gave better balance than at low frequency. Tests of induction at low frequency were made with balanced voltages, balanced currents, residual voltages, and residual currents. Induction at high frequencies was measured with a single-phase source of energy. Computed and measured inductances were found in close agreement. The effect of the ground on one phase of a normally isolated system was studied both experimentally and theoretically. In addition to the San Fernando work, a study of residuals under operating conditions was made on grounded-neutral networks.

Much work has been done by telephone companies at the request of the committee. The American Telephone & Telegraph Company has undertaken the redesign of its standard telephone transposition system. The Pacific Telephone & Telegraph Company has submitted a report on the development of balance of telephone circuits.

The future work of the committee was outlined, and will continue along the lines previously announced. The problem offered by parallelism between power and communication circuits involves line configuration and co-ordinated transposition systems, and also the control of residuals and their restriction to frequencies and magnitudes which do not cause material interference. As to the former, the problem is identical for both isolated and grounded-neutral types of power systems. The latter differs entirely in the two types. It is proposed to investigate one parallel involving the isolated type of power system and several parallels involving the grounded-neutral type. It is proposed also to study the effect of circuit configuration on the induction between power and communication circuits. Upon the completion of the work, the committee expects to draft a supplementary report to the Railroad Commission, giving its conclusions and such recommendations as it feels necessary to make the rules recommended in its former report more complete and explicit.

August J. Bowie, Jr., of San Francisco, referred to experiments by George W. Linke which appeared in the *Elektrotechnische Zeitschrift* in 1914. The result of the experiments described was that the oil switch caused the most serious harmonics, that the air switch without horns was gentler in its action, and that the air switch with horns was ideal in its action in suppressing the harmonics and gradually reducing the current before the opening of final break. The speaker said that it was supposed that the arcs which occurred in air caused destructive rises of voltage on short-circuits. This had been disproved by recent experiments, which showed definitely that the rise of voltage which occurred from opening a horn type of switch was less than in the case of an oil switch.

J. B. Fisken said that some of the rules were a little hard on the power companies, possibly arising through a misunderstanding. Such a rule was that with reference to parallelism—the rules provided that every reasonable effort should be made to avoid parallelism—the power companies try to carry that instruction out, but are not told what parallelism is. He requested information as to what a parallelism is. As to the question of air-break switches versus oil-break switches, he had had occasion to use air-break switches. High frequencies were not present to as great an extent with the air-break switch as with the oil switch. He thought the committee should make some investigation as to the effect of killing the charging current on a tower line. The reason for the request was that something like ten years ago they built two lines for 60,000 volts, 60 cycles, that paralleled main telephone lines. They were operated for many years without trouble. What is technically known as "bats" had recently put in an appearance and it puzzled them to know where they had come from. The methods of operation had not been changed in the slightest. They found in taking the load off the line there was no result, but when they came to break the charging current, there was a result. The connection between that line and the tower line was this: Several years ago in order to get rid of the burning of the pole tops they grounded the pins on both of these lines. It had occurred to him that possibly the ill effects they got on the line were due to the discharging of these condensers, and possibly the rush to ground through the ground wires might have caused the trouble. They had avoided the trouble by doing the switching on the low-tension side, but that in many cases is not a practicable proposition.

J. E. Woodbridge stated they had some trouble with "bats" and had found the trouble to be due to the fact that the three individual single-pole oil switches in the three phases of the 100,000-volt line did not open at exactly the same instant. These switches were not mechanically connected to open as closely as possible at the same instant, and it was partially on account of that difficulty that the ruling was made for mechanical interconnection between the phases. That slight difference in the time of operation of the three phases is a small measure of what is to be found in the operation of air-break switches.

J. P. Jollyman pointed out that the things which cause the most trouble with the parallel circuits are not essential to the operation of the power circuits. It is the things that creep into the power circuits and have nothing to do with the actual business of transmitting power that cause most of the trouble with the parallel communication circuits. The power companies

Digitized by Google

should do what they can to eliminate these. The desirable frequency for the transmission of power represents a frequency very materially below the average frequency of voice currents. Certain harmonics are introduced into the power system which are of no importance to the power line, and serve no useful purpose. The reduction of the harmonics and switching effects is, with respect to the telephone lines, the principal problem before the committee.

E. E. F. Creighton said that oscillograms show that the operation of both oil and air-break switches depends upon conditions, and they cannot be compared without knowing the conditions. If there is capacitance in the line, the break under oil is sharper. But if transformers are left connected to balance the capacitance the break takes a different character. A sharp break causes oscillations. The oil switch opens a loaded line very quietly. He then discussed the transients arising from lightning. If these cause a single-phase ground, the case is hopeless. Amelioration depends upon obtaining insulators which will flash over rather than puncture, and extinguish the flash as quickly as possible. Even then there will be a surge on the telephone line, requiring a vacuum type of lightning arrester to limit the induced current and reduce the noise.

P. M. Downing, a member of the committee, said that the original report was not entirely satisfactory to either the power or telephone interests, but was a compromise. In the final report it was hoped to clear up some of the indefinite points, such as the definition of parallelism. It is not true, as sometimes stated, that the telephone company has power to decide what is a parallel.

A. H. Griswold and J. E. Woodbridge also joined in the discussion, which was then closed by A. H. Babcock.

Mining Session.

A parallel session was devoted to papers dealing mainly with mine work. This session was presided over by Vice-president Harris J. Ryan. The first paper was one by Charles Lagrand entitled "Diesel Engines for Generator Drive." In the absence of the author, this was presented by W. D. Peaslee.

This paper described some investigations made in Europe of Diesel engines of large capacity with a view to their suitability for driving generators under conditions prevailing in mining camps in Arizona. The advantages of the four-cycle engine are known maintenance and repair cost, smaller fuel consumption and greater simplicity. The advantages of the two-cycle engine are less lubricating cost, steadier running, less liability of trouble from sulphur in fuel oil, greater output per cylinder, and less cost per horsepower. Two of the latter, rated at 1,250 horsepower, were installed, direct-connected to three-phase generators; the latter operated in parallel without difficulty. California crude oil was used as fuel.

The paper was discussed by Wilfred Sykes, E. W. Belden, J. C. Clark, W. D. Peaslee, A. H. Babcock, M. H. Gerry, Jr., William H. Rost, G. N. Eaton, H. S. Jones, T. R. Landsborough and R. Tschentscher.

Mr. Sykes pointed out that Diesel engines require more attention in operation than other types of prime mover and attendants must be more highly paid. As the size of cylinders is increased, difficulties in manufacture and operation also increase. Mr. Belden stated that the plant described by the author had operated satisfactorily, as was indicated by the ordering of a duplicate. Mr. Peaslee thought the cost of maintenance after the first two years would probably be high. Mr. Babcock told of the excellent results in using oil engines, but said that the fixed charges on the high initial cost were sufficient to counterbalance the economy in fuel. Mr. Gerry thought the high cost would diminish with time. Mr. Rost said it was easy to get men to operate Diesel engines and little trouble was had in existing plants. Mr. Jones pointed out that the author of the paper had had experience in running this type of engine since 1908 in Arizona and still favored it. Mr. Tschentscher said the best operators are those who have not had any experience with steam engines.

A paper by Wilfred Sykes entitled "A Large Electric Hoist" was then presented, in the absence of the author, by G. B. Rosenblatt.

The paper described an electric hoist recently installed in a mine at Butte, Mont., having a depth of shaft of 4,000 feet, net weight of load 14,000 pounds, weight of skip and cage, 9,000 pounds and maximum hoisting speed 3,000 feet per minute. Some results of operations were given. This hoist is of special interest as being the largest electric hoist in the United States and containing some important departures from previous practice.

Graham Bright in a written discussion pointed out that the close agreement between operation and guarantees indicated that performance of such machines can be precisely predetermined.

Selby Haar said he gathered statistics of electric hoists from all over the world and knew of 700 with a capacity over 200 horsepower. The largest hoist in the world is an electric one built in the United States and now operating in South Africa. He favored placing the flywheel on the end of the set instead of at the center, as this simplifies the design and permits uncoupling when the load is light.

F. D. Newbury, M. H. Gerry, Jr., and G. N. Eaton also joined in the discussion, which was then closed by Mr. Rosenblatt. The latter stated that flywheels placed at the end of the sets were usually of less weight and this practice is not desirable for a flywheel of 50 tons. In the present case a supplementary hoist is used at times when the load is very light, as on holidays. The first consideration in adopting the electric hoist was reliability, the second was safety, and the third was efficiency. The efficiency of an electric hoist as determined by comparing the input of energy with the tonnage lifted was 46 per cent as against 32 per cent with the previous air installation. The latter had been adopted to supplant steam at an earlier date before the owners had confidence in the electric hoist.

A paper entitled "The Modern Electric Mine Locomotive," by Graham Bright, was then presented in the absence of the author by G. N. Eaton.

Electric Mine Locomotive.

The day of the small mine with small equipment is passing, and in the future most of the bituminous coal mining will be accomplished in larger mines using heavy equipment. The demand for larger capacity in equipment has been increasing rapidly of late, and owing to the restricted space available for the equipment on a mine locomotive, difficulty is being experienced in designing equipment to meet the conditions. A possible solution of the problem is in providing forced ventilation for the motors which are of a type that require very little ventilation to produce a large increase in the continuous rating. This scheme has been tried out on a large locomotive and the results indicate that forced ventilation will play a prominent part in meeting the extreme severe conditions that are frequently arising in the mine locomotive field.

This paper was discussed by Wilfred Sykes, M. H. Gerry, Jr., and E. H. Martindale. Mr. Sykes pointed out that an air blast cannot be applied to all motors effectively, as ducts are necessary for the air to reach the hot spots. Its application is also limited by the fact that after a velocity of 2,000 feet per minute is reached, added velocity does not increase the cooling effect.

In closing the discussion, Mr. Eaton said that undercutting mica had been tried on the commutators of mine motors, but had been abandoned, as the combination of oil and coal dust led to short-circuits.

Transmission Session.

At the Transmission Session on Friday afternoon, Vice-president J. S. Stevens occupied the chair. The first paper was one by G. P. Roux, entitled "Delta-Cross Connection of Transformers." In the absence of the author, this was presented by E. E. F. Creighton.

Delta-Cross Connections of Transformers.

Two methods of transformer connections, the tee-cross and the delta-cross, are described, with their application for parallel operation of two-phase and three-phase systems. An attempt is made to explain as clearly as possible the voltage, current and phase relation, and the dephasing action which takes place in each case. The delta-cross system of connections lends itself to a great number of applications, either for

Digitized by Google

the parallel operation of two-phase and three-phase systems or for the simultaneous supply of two-phase and three-phase power from one bank of transformers. It is to be noted that in this system of connections no special taps are required, except a 50-per-cent tap on one transformer (usually easily obtainable), the compensation of one phase of the system being done externally by means of a small booster transformer. The simplicity of connections, the feature that no special transformers are required, and no special taps necessary, give the electrical engineer facilities to meet promptly and economically the requirements inherent to two-phase and three-phase simultaneous distribution from only one transformer bank.

This paper was discussed by Selby Haar, W. A. Hillebrand and L. F. Blume. Mr. Hillebrand said that the connections suggested by the author had been used by the Pacific Gas & Electric Company for ten years. With a core-type transformer, the leakage flux may be large and cause unbalancing. The author has omitted any consideration of the regulation due to leaking and lagging currents. Mr. Blume said that the delta-cross connection is not desirable for transformation from three-phase to two-phase, which has some disadvantages not mentioned by the author.

A paper by F. J. Peters entitled "Harmonics in Transformer Magnetizing Currents" was, in the absence of the author, presented by F. D. Newbury.

Harmonics in Transformer Magnetizing Currents.

The purpose of this paper is to show in a concise manner the cause and effects of higher harmonic currents in magnetizing currents of transformers. A hypothetical case is analyzed to show the cause of the harmonics; then the schemes of connecting transformers that are commonly used for polyphase transformation are taken up and the effects of the harmonics on each case pointed out. The author also shows the reason why third-harmonic voltages are not developed in the three-phase core-type transformer when connected star-star.

This paper was discussed by D. I. Cone, H. S. Osborne and L. P. Ferris. On a line with delta-star connections at one end and star-delta at the other, Mr. Cone said that the harmonics in the two banks of transformers will be opposed to each other and the only flow along the line will be a differential one. The result of this opposition is to raise the potential of the line above the ground by an amount equal to the voltage of the third harmonic. Mr. Osborne gave an analytical treatment of the problem, with figures and examples.

L. N. Robinson then presented a paper entitled "Phenomena Accompanying Transmission with Some Types of Star Transformer Connections."

Transmission With Star Transformer Connections.

The purpose of this paper is to demonstrate the phenomena attending the operation of star-star transformers with grounded neutral on the line side. Contrary to current opinions, the author believes the abnormal voltages and destructive effects, which often accompany star-star operation, are due to even harmonics, at least in a large number of cases. As high magnetic densities, the third harmonic voltage may be appreciable, but the indications are that the even harmonics will cause damage at nominal magnetic densities lower than those which require appreciable third-harmonic exciting current. The data on which the conclusions are based, include approximately 150 oscillogram waves and a correspondingly large number of meter readings. The data are omitted from the text to a large extent, because the details could not add materially to the discussion. The tests are simple and can easily be made with an oscillograph in any laboratory or substation. One precaution must be kept in mind, namely, that the observations should start at low voltages, which may be increased gradually until the various phenomena are observed. Unless this is done, the equipment may be wrecked.

This paper was discussed by Harris J. Ryan, J. C. Clark, H. O. Stevens, W. A. Hillebrand, J. B. Jollyman and F. F. Brand.

Objections were made to the author's method of presentation, as the conclusions given could not be accepted without data to support them. Some of the conclusions may be misleading by lacking generality.

Mr. Stevens described an experiment in which alternating and direct excitations were superposed upon one transformer, with the result that the exciting current had an even harmonic, as was shown by the oscillograph. A similar condition will sometimes be found in a rotary converter and in the circuit of an arc furnace.

Mr. Brand said that where an auxiliary delta winding is used to obviate the triple harmonic, it should have the same capacity as the other windings.

J. Murray Weed then presented a paper entitled "Abnormal Voltages in Transformers."

Abnormal Voltages in Transformers.

This paper deals with the electrical behavior of transformer windings when subjected to steep wave fronts and high-frequency wave trains. The dependance of the internal voltages produced, upon the distribution of capacity, with the inductance of the winding, is discussed. Practical windings are divided into two general classes, one in which inductance and capacity are practically uniformly distributed, and the other in which the capacity is more or less concentrated at certain points, with relatively concentrated portions of inductance intervening. Neglecting the effects of the high-frequency dielectric losses in the insulation at high frequency, distinct mathematical analysis is given to these two classes of winding to determine the ratios of the internal voltages to the voltage of the external wave or wave train. The resulting internal voltage distributions are plotted for various frequencies, and curves are plotted for the relations of maximum internal voltages to frequency. These curves show that some frequencies are dangerous, while others are not, but it cannot be said that one of these types of winding is better than the other from the standpoint of the possibility of excessive internal voltages. The analysis is by no means complete, but an examination is made of the facts and fundamental principles involved which will enable us to insulate for and guard against excessive internal voltages in a more scientific manner.

This paper was discussed by R. W. Sorensen, F. F. Brand and P. H. Thomas. Professor Sorensen described an experience with a 150,000-volt line transforming down to 60,000 and 15,000 volts at various points. The low-voltage secondaries were connected in a network. Trouble from steep wave fronts was experienced all over the network whenever a surge was caused at any point. To obviate this, a transformer with primary in star was connected on the 15,000-volt network and the neutral point grounded. The 60,000-volt terminals were delta-connected, but not connected to any line. Since then the trouble has been entirely of a local nature.

N. S. Diamant then presented a paper, entitled "Calculation of Short-Circuit Phenomena of Alternators."

Short-Circuit Phenomena of Alternators.

The theory and explanation of the electromagnetic phenomena involved in the sudden short-circuit of alternators, as given by Berg and Boucherot, is first briefly considered. It is shown how complex the different resistances and reactances are that enter the equations of sudden short-circuits. New methods are developed for the experimental determination of these quantities by simply determining the rise of direct current in the field and armature circuits. Also new simple methods are given, based on theoretical equations, for the calculation of short-circuits directly from oscillographic records. Data relating to the short-circuit of a 45-kilovolt-ampere alternator are given; also an electrical device, designed by the writer and used in most of the tests, for short-circuiting a machine at any given point of the electromotive force wave, is described.

This paper was discussed by F. D. Newbury and C. J. Fechheimer. The latter said that it is almost impossible to estimate the constants which determine the rate of dying down of the short-circuit current, on account of eddy currents in the solid rotor, etc. This, however, is not important, as the maximum value is what counts. To be on the safe side, the maximum possible current, with any arrangement of short-circuit, should be assumed. He corroborated the author's statement that the reaction of a star-connected alternator is the same with one phase short-circuited as with three. In order to withstand short-circuit, he favored large armature reaction, to be obtained by using deep slots in the stator. He then discussed the field distribution with the short-circuit current, and explained why the harmonics are suppressed. He disagreed with the author as to the insertion of resistance to keep down the current and the use of iron in series reactance coils.

Digitized by Google

ILLUMINATING ENGINEERING CONVENTION OPENS IN WASHINGTON.

Record Attendance and Papers of Unusual Interest Mark Ninth Annual Meeting.

What is considered the greatest impetus to industrial lighting since the advent of electricity has been given by the Illuminating Engineering Society in its "Code on Lighting Factories, Mills and other Work Places," presented at the opening session of the ninth annual convention of this organization at Washington, D. C., September 20. In all likelihood the recommendations made will be more or less criticized and amended but a foundation has been laid which will undoubtedly form the basis of standard practice in the future and greatly increase the efficiency of industrial illumination.

Of equal importance was the presidential address by Dr. A. S. McAllister, presented after a cordial address of welcome had been extended to the delegates by Conrad Syme, corporation counsel of the District of Columbia, and a suitable response made on behalf of the Society by Preston S. Millar.

Dr. McAllister selected as his text "Simplification of Illumination Calculations." So far as numerical results are concerned, he said, it is absolutely safe to ignore the direction of travel and mode of propagation of radiant energy from the source of light to the surface of which this energy is absorbed. Total energy absorbed equals the total energy produced.

When methods of calculation give results not in conformity with this relation it is safe to state that the methods are wrong either in principle or application. Thus for checking results obtained by more laborious methods the absorption of light method is highly advantageous. In many instances it is permissible to abandon the more complicated methods and rely upon the simplest and absolutely correct energy-ratio method, with merely an occasional reference to some more indirect method for determining the space distribution of the illumination where this is of importance.

"Almost all of the solutions offered for problems in illumination," said Dr. McAllister, "have been based on the tacit assumption of point sources rather than surface sources. Even when dealing with plane surface sources the authors have usually treated them as made up of an infinite number of point sources arranged in one plane, and have based their solutions on the 'inverse square' law and other relations developed from the fundamental point-source conception. In order to obtain results consistent with the known facts in this case, it has been necessary to assign to each infinitesimal point source in the plane certain physical characteristics not possessed by ideal point sources—that is, the ability to produce light in only one hemisphere which is the fundamental attribute of an infinitesimal plane surface source.

"It needs no argument to show that all calculations are immensely simplified by adopting initially the surface source conception and utilizing at once the well-known relations developed for surface sources.

"Instead of determining the illumination produced by the source on a chosen plane by reference to the 'inverse square' law and the integrated 'candlepower,' the identical value can be derived more conveniently by means of the fundamental ratio existing between the 'apparent luminous density' of the source and the lumen density on the surface illuminated, which ratio depends solely upon the solid angle subtended by the source when viewed from the chosen plane.

"When dealing with the surface sources it is necessary to take into consideration the fact that not all surfaces obey the so-called 'cosine law' of emission in accordance with which a surface would appear uniformly bright when viewed from all possible locations. However, it is equally necessary to take into consideration the fact that the candlepower from a so-called point source or the 'apparent candlepower per unit area' from a surface source is not uniform in all directions in space. The fact of the matter is that all practical sources emit light in such a way as to appear non-uniform in brightness over the surface when viewed from any one locality, and any one point on the surface apparently varies in brightness when viewed from different locations in space. It is impossible so to express the brightness that its value will not be subjected to the changes here referred to.

"If the surface were ideally perfect in its emission, its brightness would be everywhere equal and uniform, and its apparent candlepower would vary with the cosine of the angle of deviation of the surface from normal to the line of vision; that is, the surface would obey Lambert's 'cosine law of emission.' A surface which is not ideally perfect in emission can be compared directly with one following the cosine law of emission irrespective of the units in which the outputs or appearances are expressed.

"For convenience in calculation and purpose of comparison, it is advantageous to express the outputs in terms of the lumens, and the output density in terms of the lumens per unit area. It is equally as convenient and logical to express the appearance in terms of the luminous output density, selecting for the unit the appearance of a surface emitting in accordance with Lambert's cosine law. For this unit of appearance there has happily been suggested the term 'lambert,' which is applied to the appearance of a surface emitting one lumen per square centimeter in accordance with Lambert's cosine law of distribution; it is equivalent in appearance to that of a perfect matt surface of 100 per cent reflecting power illuminated with a density of one lumen per square centimeter.

"Problems relating to both the output and the appearance of practical lighting sources are greatly simplified when use is made of the real surface-source conception rather than the fictitious point source conception."

A committee was appointed, composed of Messrs. Sharp, Millar, Ives and Hyde to consider the points brought out by the president and report at a later session.

L. B. Marks presented the "Code on Lighting Factories, Mills and Other Work Places." This comprises, in effect, complete specifications for the lighting of industrial establishments based upon accepted practice. The requirements of various classes of work are set forth and recommendations made as to the most suitable types of installation. The code also takes natural lighting into consideration and makes recommendations as to sizes and locations of windows, skylights, etc.

The report of the Committee on Progress was presented by F. E. Cady. This report views the features of lighting progress during the past year, for the most part being a summary of published matter. The report points out that there have occurred during the year two events of striking significance which have affected illuminating engineering. The European War has afforded grim and hitherto undreamt of possibilities in the use of light, while on the other hand, the Panama-Pacific International Exposition at San Francisco stands as a magnificent example of the art of applied illumination.

Dr. E. B. Rosa presented the report of the Committee on Research. This Committee during the past year has, under the auspices of the Bureau of Standards of Washington, been engaged in research work looking to the determination of accurate comparisons of light of different color values. Dr. Rosa pointed out that the measurements of quality of brightness for different colors has previously been accepted as a common basis for comparison. Flicker photometers have been satisfactory also except that differences in readings are obtained by different groups of observers depending upon

Digitized by Google

their eye sensitiveness to various colors. The work done by the Committee represented over 60,000 different settings of a flicker photometer and 114 inexperienced observers were employed to make the measurements. The results indicated that the latter instrument affords a means of precise comparisons between light of different colors. Care, however, must be taken in the selection of observers. Dr. Rosa said that where color differences are not too great the equality of brightness measurements give reliable results.

The report was discussed briefly by E. C. Crittenden, of Washington, Dr. H. E. Ives, Philadelphia, and Dr. E. P. Hyde, Cleveland. Mr. Crittenden elaborated somewhat upon the methods of conducting the research works, stating that the principal idea was to obtain average results from a large number of observers.

Dr. Hyde questioned the advisability of using the contrast photometer for measuring equality of brightness, as measurements are more easily made using the contrast principle.

Dr. Ives complimented the Association on the work done by this Committee and urged its continuance.

At the session on Monday afternoon Dr. C. H. Sharp presented the report of the Committee on Nomenclature and Standards. This report contains new terms for illuminating engineering practice, definitions, and a list of photometric units with their abbreviations. The most important new term is the Lambert, the C. G. S. unit of brightness, defined as the brightness of a perfectly diffusing surface radiating or reflecting one lumen per square centimeter. This is equivalent to the brightness of a perfectly diffusing surface having a coefficient of reflection equal to unity and illuminated by one phot.

J. R. Cravath, of Chicago, opened the discussion urging that illuminating engineers use the term Lambert wherever possible, as it was originated by the Society.

Mr. Pierce of the Welsbach Company questioned the advisability of stating the specific output of illuminants depending upon combustion in lumens per British thermal unit per hour. The output of light is independent of the calorific value of gas.

A paper entitled "Illumination Efficiencies as Obtained in an Experimental Room," by Ward Harrison and Earl A. Anderson was presented by the former. This paper describes a series of illumination tests performed in a portable room designed for this purpose. The room dimensions and the arrangements of outlets were varied to approximate the diverse conditions met in practice. Wall, ceiling and floor combinations of white, black and intermediate colors were tested with units of three general types of light distribution. The authors state that using the data in this paper as a basis additional tests with other reflectors are planned to obtain a more complete comparison of the efficiencies of the various types of lighting equipment now in common use.

In the discussion J. R. Cravath of Chicago emphasized the marked effect of wall absorption on efficiency. Regardless of efficiency the lighter the walls the better the conditions from the standpoint of high comfort.

The paper on "Semi-Direct Office Lighting in the Chicago Edison Building," was presented by William A. Durgin. The equipment of a typical office test room and comparative tests on five lighting systems to show relative eye fatigue, glare, shadows, uniformity of intensity on desk plane, utilization efficiency and effective flux color, are described. The test results, leading to the development of a particular semi-direct unit for lighting the offices of the Commonwealth Edison Company, are discussed and the details of the adopted fixture structure and glass bowl characteristics presented. Data are given on the illumination effectiveness, arrangement, appearance, and dust factor of the completed installation, special emphasis being placed upon the importance of the use of higher intensities and filtered flux.

F. A. Vaughn of Milwaukee opened the discussion on this paper. He thought that the fixtures used in this building mark a step in advance and should stimulate manufacturers to produce a greater variety and a greater density in glassware for semi-indirect use.

J. R. Cravath, of Chicago, stated that in designing the lighting for the Edison Building sharp contrasts had been eliminated in order to avoid glare.

Mr. Pierce, of New York, said that there is a difference in a company designing glassware for its own use and a manufacturer designing glassware that must necessarily be approved by the public. He thought the greatest obstacle to raising the standard of illuminating glassware is that the public demands a higher degree of brightness than necessary.

A. L. Burroughs, of Newark, thought that from the standpoint of the central station greater density glassware was desirable because it has the additional feature of increasing wattage consumption for a given area.

H. T. Owens, of New York, held that the industry is unconsciously reverting back to direct lighting because of the present tendency to adopt small units.

C. L. Law, of the New York Edison company, at this point, presented some data on the use of nitrogen-filled lamps during the past year by his company. Of all type C lamps sold during the year covered by the data 55 per cent were of the 200-watt size. The 100-watt size ranked first in popularity. It was shown that 33 per cent of all lamps sold from August, 1914, to July, 1915, were disposed of during the month of March, this, however, being due to a special campaign carried on during the month. It was shown further that 93 per cent of all lamps sold were for interior use and of the remaining 7 per cent fully ⅞ were of the 750-watt size. As to burnouts 23 per cent occurred among 1,000-watt lamps and 14.49 per cent of the 750-watt size. The distribution of sales was given as follows: 39 per cent to stores; 12 per cent to offices; 9 per cent for exterior lighting; 7.5 per cent for show window lighting; 3.5 per cent auditorium; 1.5 per cent for churches; 0.5 per cent for schools.

Two sessions were held on Tuesday, one in the morning and a street lighting session at night. A reception at the White House by President Wilson was the distinguishing feature of the afternoon, which included also a trip to Fort Meyer, where special drills by the United States cavalry were witnessed.

The morning session opened with a paper entitled "Practical Hints on the Use of Portable Photometers," which was abstracted by the author, W. F. Little.

This paper outlines a desirable procedure in the conduct of photometric tests with portable apparatus. It discusses the planning of a survey; a description of the condition of the installation and precautions which should be taken to make the results useful; a method of testing candlepower, illumination intensity and brightness; good practise in the maintenance of photometric apparatus; photometric errors inhering in photometers and accessories, together with means of avoiding them; photometric accuracy and test results.

W. A. Durgin, Chicago, opened the discussion, predicting that the standard of portable photometric readings would be raised if the advice and suggestion set forth in the paper were carried out. Supplementing the list of accessories mentioned by the author he suggested the use of a portable truck upon which the photometer should be mounted. He added that absorption screens having definite coefficients are available which should be more generally used. Greater consideration should also be given to a means for checking brightness coefficients in portable photometers.

L. C. Porter, of Harrison, N. J., held that one of the greatest possibili-

Digitized by Google

ties for error in portable photometer use lies in variations in the impressed voltage of the test lamp which are not taken into consideration. In this connection the miliampere meter has been found very satisfactory.

E. A. Anderson, Cleveland, thought that the standardizing of the test lamp is of the greatest importance in photometric work. He also referred to the increasing use of portable photometers to measure beam candlepower of searchlights and projectors.

C. E. Rowe, Washington, considers the data book for observers of extreme importance. Printed blanks calling for exactly the information desired should be furnished observers. He thought it also essential to select representative locations for taking readings. It is frequently desirable to take photographs of the installation for reference purposes.

Norman Macbeth, New York, thought that the greatest field for portable photometric work is for determining average brightness of installations.

H. G. Stickney, Harrison, N. J., said that one source of error in determining intensity of a lighting installation is due to the shadow cast by the observer. Errors will also be found in the cosine values of most of th plates used. He added that observers not experienced in taking measurements frequently neglect to take into account burned out lamps, or effect of different lighting in different sections of an installation.

Norman Macbeth added that in taking measurements in industrial plants, schools, etc., the observer should take the position of the workmen or pupil so as to give consideration to the shadows encountered in actual use of the lighted area.

P. S. Millar, New York, stated that because of the apparent simplicity of the portable photometer inexperienced observers are frequently intrusted with making measurements. The paper contains invaluable advice and instructions for the inexperienced and should be carefully studied. Mr. Millar did not agree with Mr. Macbeth that the observer should occupy the position of the occupant of the room when making measurements. He thought that an entirely separate study should be made of shadows.

The paper entitled "Compensated Test-Plate for Illumination Photometers," by Clayton H. Sharp and W. F. Little was read by Dr. Sharp.

The errors of illumination test-plates due to their deviation from the theoretical cosine law have been studied experimentally. The most important cause for the deviation of test-plates from the cosine law is shown to be the increasing reflection with increasing incidence according to Fresnel's law. Test-plates may be compensated for the deficiency in brightness with light at large angles of incidence by admitting light to the posterior side of the plate in sufficient quantities. Transmitting test-plates are mounted on flashed opal rings of suitable width and light at 90 degrees is cut off by a metal screen. The results of this method of compensating plates are shown. The results of a test of illumination with compensated and uncompensated test-plates are given. The possible application to the integrating sphere is noted.

Ward Harrison, Cleveland, mentioned some experiences with various types of test-plates. He suggested that in making measurements lamps in various locations be turned off to determine the effect of burnouts on the installation. He thought the use of the polished test-plate referred to in paper will make far greater accuracy in photometric work.

Norman Macbeth, New York, pointed out that the setting of test-plate has an important bearing on the results that are obtained. He held that the reflecting test-plate when properly used is less liable to produce errors than the transmitting test-plate.

G. H. Stickney, Harrison, called attention to the test-plate brought out some time ago by W. D'A. Ryan which was intended to obviate the cosine errors.

The papers entitled "The Lighting of Ships," by H. A. Horner, and "The Lighting of a Passenger Steamer," by H. T. Spaulding, were read.

Mr. Horner states that, as in land practice, certain rules are laid down for marine installation, the requirements being contained in the code of the underwriting society under whose classification the entire vessel is constructed, in the regulations of the government under whose flag the vessel receives its protection, and in the specifications of the owner prepared for the purpose of guarding the builder in the specific details appertaining to the practice or trade of the ship. The two-wire system of distribution is usually adopted in merchant vessel practice in this country. Our navy has adopted the three-wire generator but not the three-wire distribution. A high grade of rubber for the wires, usually in excess of requirements, is specified. All appliances in any way subject to the effect of hydroscopic changes or exposures to salt air are made thoroughly water-tight. The paper discusses intimately the equipment of the generating plant, the searchlights, running lights and night signaling and fixtures. The conclusion is that the illuminating engineer has a large, varied and interesting field opened up to him in ship lighting. The work has hardly begun and will probably never end.

Mr. Spaulding introduces the subject of the lighting of a passenger steamer with a brief historical sketch of past and present practice in marine lighting. The lighting requirements of a passenger boat are discussed and compared with similar installations ashore. To illustrate how these requirements can be satisfied the author describes the lighting system designed by him, in co-operation with the architects, for the S. S. Noronic, a lake passenger boat, and gives the results of illumination tests in some of the more important portions of the vessel. In conclusion it is recommended that a departure be made from the ordinary boat lighting systems so common at present, and it is urged that a closer relationship between marine architects and illuminating engineers be established.

L. C. Porter discussed the papers at some length, pointing out that it has been particularly difficult for illuminating engineers to co-operate with ship architects and builders in designing scientific lighting. The consideration of lighting is usually left until the frame work is completed and consequently conduit and fixtures must be located wherever space is available, without regard to efficiency or esthetic conditions. He added that incandescent searchlights which now have a range of over one-half mile should find favor in merchant marine service. Flood lighting will also find favor for illumination of docks when loading and unloading ships and for illuminating barges and machinery when coaling ships.

At the street-lighting session, Preston S. Millar, chairman, an interesting paper by G. S. Barrows reviewed "Street-Lighting with Gas Lamps."

A paper entitled "Arc Lamps for Street Illumination" was read.

This paper, prepared as the joint effort of C. A. B. Halvorson, Jr., S. C. Rogers and R. B. Hussey, covers a brief history of the open carbon arc lamp, the enclosed carbon arc lamp, the open flame carbon arc lamp, the enclosed flame carbon arc lamp and the magnetite luminous arc lamp. The titanium carbide arc lamp is referred to incidentally. Principles of street lighting are discussed, and a brief reference is made to street arc lighting accessories. This portion of the paper is similar to a considerable extent to the article by two of the authors of the present paper which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 4, 1915. Street-lighting practice is discussed briefly, and a reference is made to the use of flame arc lamps at the Panama-Pacific International Exposition. A valuable feature of the paper is the ap-

Digitized by Google

pendix, tabulating street-lighting practice with direct-current, series, luminous arc lamps, and adjustments, mean spherical candle-power and efficiencies of series arc lamps.

W. H. Robinson's paper entitled "New Types of Incandescent Lamps and Their Relation to the Street Lighting Problem," was read, followed by the paper entitled "A Practical Application of the Principles of Scientific Street Lighting," by F. A. Vaughn.

Dr. C. P. Steinmetz opened the discussion on these papers. He stated that the first application of electric lighting was for street lighting. The three principle factors in street lighting are source of light, distribution of illumination and color of light. With the development of nitrogen filled lamps the incandescent lamps became a formidable competitor of the arc and many believe that the arc will be superseded but Dr. Steinmetz said each has its field. The type C lamp has found an extensive field for street lighting where low cost is the principle item but magnetite arc lamps will always be used in high-class installations. The efficiency of the incandescent may be said to have nearly reached its limit while there is no limit to the efficiency that can be obtained in the arc. The incandescent lamp is much more flexible, ranging as it does from 40 candlepower to many thousand and any size can be used without a material falling off in efficiency. The arc lamp, on the other hand, is more rugged and less liable to be affected by extreme momentary variation in voltage. Problems of light distribution are becoming more and more complex and consideration is also being given color of light and its relation to surroundings.

At the close of the session a trip of inspection was made to the Capitol, Congressional Library and new Post Office building, arrangements having been made to keep the buildings open so that the interior illumination could be inspected. Street lighting installations in various parts of the city were then visited.

The report of the later sessions will be published in the next issue.

Low Fire Losses in Berlin.

United States Consul General Robert P. Skinner, recently stationed in Berlin, Germany, states that fire losses in Berlin are strikingly low. This is due, among other things, to the small quantity of wood used for structural purposes, the limitations of the height of building to 72 feet, and, no doubt, principally to the temperament of the people. All real (immovable) property in Berlin is required by law to be insured in the so-called Municipal Fire Society (Städtische Feuersozietät). The report of this institution for a recent fiscal year announced fire losses in the course of the year amounting to $260,529 on policies aggregating $1,314,367,233.

CONVENTION OF NEW ENGLAND SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION.

Splendid Meeting at Kineo, Me., September 14 to 17.

The seventh annual convention of the New England Section, National Electric Light Association, was held September 14 to 17 at the Mt. Kineo House, Kineo, Maine. About 400 were in attendance, including an unusually large number of ladies. Delegates arrived from Boston, Portland and New Haven, Conn., by a special train and special cars.

The reception on the evening of arrival, Tuesday, was remarkable for the mutual cordiality of all present. Those in the receiving line were President L. D. Gibbs and Mrs. Gibbs, Vice-President Walter S. Wyman and Mrs. Wyman, Miss O. A. Bursiel, secretary; Mr. and Mrs. Charles A. Mixer, Rumford, Me., and Mr. and Mrs. B. H. Gardner, Waterbury, Conn.

The technical sessions began on Wednesday morning. The annual report of Treasurer Robert W. Rollins was read in his absence by Howard T. Sands. It showed that expenditures for the year had been about $3,300 and that $793 remained in hand on September 1.

The report of the secretary was read by William Gould. It reviewed the Section work of the year, which included, besides the routine duties of the permanent office in Boston, the arrangements for monthly electrical luncheons and the valuable Question Box Convention of last spring, the promotion of joint relations with contracting interests, and of electric vehicle interests. An assistant to the secretary has been regularly employed. The Section membership is now 1,100, 246 members having been added since January 1, 1915. It was pointed out that the Section's helpfulness to various electrical interests is more than ever recognized at this time of business uncertainty. The various classes of membership are as follows: Class A, 124; B, 718; C, 13; D, 52; E, 193. An employment bureau, by which electrical workers would receive assistance in being advantageously placed was a suggestion in connection with the secretary's office.

President Gibbs, in his address, said, the Section had come to a point where there is no question of its permanence, and its value to the industry. He urged that certain permanent committees, consisting in each case of one member from each of the six New England states, be appointed, three of them for one year and three for two-year terms, with bi-yearly appointment of successors, each committee to meet four times a year and carry forward a continuous working policy. The eight committees suggested are: Membership, publicity and advertising, rates, co-operation with kindred organizations, commercial problems, discussion of papers, entertainment, and transportation. Mr. Gibbs pointed out with satisfaction that no Class D members in New England have withdrawn on account of the recent increase in dues for that class.

Isolated Plant Versus Central-Station Power.

The topic for the day was the subject of power, and concerned itself chiefly with the question why the central station does not get all the big power business.

The first paper was by John J. Gillespie, of the United Shoe Machinery Company, Boston, and its tenor was to the effect that in shoe-factory operation the central station is at a disadvantage as compared with the isolated plant, in that the latter can advantageously supply heat for warming the factory and for processes of manufacture, by the utilization of exhaust steam or steam from turbines, a pressure of about 35 pounds being needed in melting wax, heating the machines and drying the shoes. Mr. Gillespie argued that the manufacturer is concerned almost solely with costs, and is not interested in the technicalities in which power salesmen from the central station sometimes enshroud their propositions. If the latter could offer light, power and heat all at definite unit prices, their path would be clear of obstacles, he said. The central station might consider operating a heating plant at the customer's factory, serving electricity supply from the central station. In the case of a New York shoe factory in whose shoe-machinery installation the speaker was the advisor, this course was suggested, when the subject of factory motorization was being considered.

The paper was the source of an animated discussion, which, however, was reserved until after all the papers for the day had been read.

Another treatise on the same subject applied to various industrial plants, by H. B. Emerson, of the Arlington Mills, Lawrence, Mass., was read by John West, of C. H. Tenney & Company, Boston. This paper pointed out certain advantages of isolated-plant operation, viz., the utilization of steam for heating, shorter transmission, and closer control over the power plant. Figures were presented which tended to show that energy could be produced by a private plant requiring ten million kilowatt-hours a year, at less than one cent a

Digitized by Google

kilowatt-hour. The writer conceded that many industrial firms do not know what their power cost actually is, believing it to be much less than it really is. Fixed charges and incidentals often bring the figure well within the competition of central stations.

The same general topic, elaborated from specific experiences, was further presented, from the central-station standpoint, by K. P. Applegate, of the Hartford (Conn.) Electric Light Company. He held that if the central station charges a fair rate for power, gives reliable service and makes use of a business policy, there is no reason why at least 70 per cent of the power business should not be connected to its lines. There are only three reasons for the existence of a source of power other than the central station: (1) where the central station is at fault in not going after large power business; (2) where the isolated plant has other reasons aside from cost for making its own power, and (3) where the isolated plant must supply much steam for heating, the power used being a small percentage. Several instances were cited of manufacturing plants which were solicited for their power business but which failed to change over to central-station power, because of reluctance to yield their independence, because steam was required for heating, because of lack of checking between the factory's and station's engineers, or for other reasons. In cases of small manufacturing plants, using under 100 horsepower, the costs of changing over are sometimes a barrier which can be removed by the central station carrying a part of the expense. Some factories requiring steam heat operate their engines during the cold season and buy central-station power the rest of the year.

In conclusion, Mr. Applegate said: "If all the isolated plants are to be displaced, it must be accomplished by the education of the men in control of them. Some of the important items in which they should be versed are the following: How the extra money that an isolated plant costs could be made to produce larger earnings if placed in their business; how each manufacturer should keep to his own particular product and not go into the production of power; and what load-factor is, and how it affects costs. The central station must educate its prospects so that they can figure their own costs and thus make a fair comparison with the kilowatt-hour costs to be billed them by the central station."

Application of Station Power to Large Mills.

James E. Arthur, of the Boston Edison Company, said that the most favorable time to approach a factory manager is when a change of his equipment is necessary. At this time he will readily discuss the cost of production. "The value of central-station service to the manufacturer depends directly upon his own cost of production, which in turn is dependent on the size of his plant. Money invested in a power plant has no real earning capacity beyond that of producing power, and this item is a very small percentage of the total cost of manufacture," said Mr. Arthur. "The same amount of money invested in stock and machinery would bring far greater returns."

The speaker pointed out that money tied up in fixed plant investment that is non-productive and not quickly negotiable tends to weaken a manufacturer's credit, while the same amount of liquid capital is very advantageous. Showing the small percentage that light and power costs bear to the whole cost in the manufacture of shoes, Mr. Arthur stated that for shoes costing $2 a pair materials represent 40 per cent, heating and overhead 39 per cent, labor 20 per cent and power and light 1 per cent. The money invested in his isolated plant if available as working capital, would render the manufacturer larger returns in the reduction of overhead and materials costs than any slight economy in the cost of power. Mr. Arthur therefore held that the application of central-station service to large factories is a financial rather than an engineering problem.

Jesse E. Gray, of the Narragansett Electric Lighting Company, Providence, R. I., presented some practical suggestions on the best methods of interesting factory owners in station power. He said: "Competition between the central station and the factory is usually between an outside source of electricity and electric energy generated on the premises, so that the advantages of electric drive are no longer a factor. We must convince the prospective customer that the cost of operation will be less with central-station service.

"The best way to do this is to make a thorough test and inspection of the plant, obtain the various items of cost entailed in plant operation and incorporate the data in a report, together with the cost of installing and operating the plant with station service. The report should be clear and concise and free from technical terms."

The report might well be divided into four sections: description of present plant, present cost of operation, proposed changes; cost with central-station service. The Narragansett Company submits detailed reports of 20 to 30 pages, bound in black Morocco and lettered with the prospective customer's name. They are of such a size and shape as to preclude being pigeonholed.

James E. Spike, of the Cambridge (Mass.) Electric Light Company, which has 521 power customers connected to its lines, said that many of its prospects are connected as the result of a careful investigation of installations already in operation, believing that central-station energy supply is the most reliable and economical power for the operation of most industrial establishments. The central station of the University City has a power load which includes such diverse establishments as Harvard College; John P. Squire & Company, pork packers, with 1,945 horsepower; Gray & Davis, automobile accessories, 485 horsepower; Blake & Knowles Pump Works, 464 horsepower; University Press, 200 horsepower; Davis Ice Cream Company, 225 horsepower. The installations of Gray & Davis, the University Press, Davis Ice Cream Company, and of the Widener Library at Harvard, have been described in detail in previous issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

The next paper, on the same general topic, was by John West, of C. H. Tenney & Company, Boston. He dismissed the proposition of the central station acquiring *all* the big power business as being impracticable, owing to the geographic, legal and financial problems, such a condition requiring a combination of all central stations so that maximum use could be made of all investment, and the utmost economy of operation effected. This would mean a virtual monopoly. "How to get all the *profitable* power business in our territory at rates consistent with reliable economical service is a practical consideration," said Mr. West. He indicated how central stations could take advantage of situations where quality of power service rather than cheapness is the important consideration. Often central stations have been called upon to supply a product of better quality than their competitors at the same or lower costs. This is unfair; the remedy lies in constantly emphasizing, in advertising and soliciting, the true value of the service—its reliability, flexibility, the larger returns on capital of manufacturing companies that may be invested in stock rather than plant.

"True power economy is a ratio as represented by the total cost of power, heat and light and the gross valuation of the product manufactured. The manufacturer may be interested in saving money, but he is far more interested if a method can be shown him for making a larger amount of money without in-

Digitized by Google

creasing his costs," said Mr. West. He claimed that in New England the rates for electric service are sufficiently low to get the business in competition with isolated plants. The diversity of rates is often a puzzling problem with manufacturers, and the power salesman should be able to explain the reasons for their diversity. The manufacturer is not especially interested in any rate schedule, but he is vitally concerned about the total cost of his power, heat and light.

Mr. West suggested the establishment by the Section of a central-station-power bureau, to distribute information relating to power business obtained and the mode of meeting competition, to obtain data on the cost of operating private plants and to render estimates on the cost of central-station-power service for central-station members of the Association. Such an arrangement would enable smaller companies, at small cost, to have expert selling advice, which would diminish the chance of erroneous estimates and more than compensate for small expense entailed on the Section.

The Subject from the Hydroelectric Standpoint.

The first paper of the afternoon session was by H. W. Eells, of the Central Maine Power Company, Augusta. Mr. Eells believed the central station had not gone after the power business vigorously enough, and that it is bound to fall to the central station in course of time. Companies advantageously situated for such business are those which generate by water power, those having steam plants of large capacity and highest efficiency and those enjoying the advantage of water-borne coal. Such plants readily dominate the situation with respect to manufacturing establishments not enjoying these advantages. The difficulty of interesting paper manufacturers, saw mills, laundries and other plants demanding steam for heating or process work, was recognized by the speaker, who pointed out the recent introduction of electric heating devices which, as perfected, will meet the heating argument. Even the problem of waste products used for fuel in factory steam plants is being solved by the more profitable disposal of these wastes, such as sawdust and shavings.

Even the well planned mechanical drive can be displaced as it becomes obsolete and new or additional power requirements are imperative. It is often possible to sell power for motors installed to take care of additional work at a mill, later gradually substitute central-station electric for the original mechanical drive. Practically any difficulties in the way of securing business must be met with enough other benefits to offset them. Time and patience are the remedies for individual difficulties.

Mr. Eells said that the Maine central stations have little of the difficulty in securing big power business such as is found in communities which depend entirely on steam power or on hydroelectric power transmitted a long distance. In that state it is rarely necessary to send current more than 30 miles, and the type of line construction being relatively inexpensive, there is small chance for steam power to compete directly with electricity. It has been possible to secure practically all industries, except sawmills, which have no water power of their own. The hydroelectric development of Maine has been in close touch with its industrial growth. Privileges have been acquired where the power has been in use by a prosperous mill which continued to do business, taking electric in place of the water power. Beneficent results to both parties are the more efficient equipment of the central station and the superior reliability of the power used by the factory. Often the mills and the electric companies have common interests, and in some cases the manufacturing interest has secured the central station, instead of the reverse.

Sometimes in practice the central-station service is connected to the individual or group-drive motors and to a motor which is belted to the main water-wheel drive. The result is maximum efficiency for the water power, since the gate can be set to pass only as much water as is available and the central station takes the rest. This gives the consumer all the flexibility of control which is possible with electric drive and at the same time makes advantageous use of the water power. Speed control comes from the central-station service, and the flywheel effect of the customer's turbines helps to prevent sudden speed changes in the central-station service. To prevent inaccurate meter readings through current feeding back at times of light demand, the service meter is equipped with a ratchet dial.

An interesting situation exists at Dexter, Me. Here several mills are located on a stream emptying from a pond. Except during extremely high water, the flow is entirely shut off at night. In the morning the first mill on the stream is able to start with water, without delay, but the mills downstream have to wait for the flow to reach them, causing delay. Before electric service was introduced they were obliged to start on steam, for which they had little use after a short time. Now they start with electric power and later take over a part of the load on water as it comes to them, but continuing to float in with the electric power all day. These mills are not large enough to affect the system's peak, and since they start between 6 and 6:30 a. m., the effect is to fill in the early morning valley of the load curve. The water power is in full use later in the morning, when the power peak comes, and thus the arrangement has the double tendency to straighten out the load curve.

It is found in Maine that water-power supply is not apt to follow power demand, there being times when little power is available and the demand great, and vice versa. If it were possible to combine the power supply of a group of industries, and their power demand were taken from a common source, Mr. Eells pointed out that all the advantages of diversity-factor would unite to give a more uniform power supply with little increase of capacity. Under these circumstances it is logical that all power business in a given territory should be handled by the central station either through purchase or lease; under this arrangement specialists could work out economies of operation by operating such plants as are necessary and taking full advantage of the available stream flow.

The practice of lighting companies in renting motors for mills and factories was the topic of a paper by G. F. Parsons, of C. D. Parker & Company, Boston. This will be summarized in the next issue.

Standardizing Motor Voltages.

The standardization of motor voltages was the subject of a paper, also by Mr. Parsons of the Parker Companies. There are in New England 23 central stations serving two-phase, 220-volt energy; 6 with two-phase, 440-volt; 102 with three-phase, 220-volt; 6 with three-prase, 440-volt, and 36 serving three-phase, 550-volt energy. Direct-current power is now little used. The comparative populations in territories of central stations serving the various types of power are:

2-phase,	220-volt,	60	cycle	360,997
2-phase,	440-volt,	60	cycle	165,358
3-phase,	220-volt,	60	cycle	3,247,165
3-phase,	440-volt,	60	cycle	174,981
3-phase,	550-volt,	60	cycle	1,568,788

It was pointed out that the reason for the great predominance of stations supplying 220-volt service may be due to the small central stations so located as to have a limited field for procuring power business. They supply the voltage which does not require a special investment, furnishing 220 volts by using lighting transformers.

Charts were presented showing graphically the ratio of central stations supplying a given voltage to the whole number, and the relation of motor sales at certain voltages to all voltages. The predominance of the 220-volt motor is marked. In the sale of 220-volt motors 3 and 5 horsepower form the larger

Digitized by Google

portion of the sales. In the 440 and 550-volt sales the larger-sized motors predominate. Motors of 110-volts are not found above 15 horsepower capacity; 25 horsepower is the dividing line between motors of 220 volts and units of 440 and 550 volts.

Motors of 5 horsepower and under show a value of 62 per cent of the total number of motor sales. More than 10 times as many 220-volt motors were put in service as of 110 volts, and 2.9 time of 440 volts and 5.4 times those of 550 volts.

The history of the power business indicates that with the growth of demand there was a response with voltages of 440 and 550 where the business warranted. Efficiency and practical operation, balanced with first cost, were the determining factors. For the same power delivery the circuits for 440 volts would have to be 56 per cent larger than for 550 volts, while 220 volts require 6.25 times the copper required for 550 volts. The saving in copper cost is a large item. In general, 550-volt service gives the lowest first cost of installation on large motors.

The results of a study of large mills in New England which are electrically equipped, but manufacture their own power show:

Voltage	No. of Installations	Capacity H. P.	Per cent of total No.	Per cent of total H. P.
220	6	9,675	12.8	8.0
440	12	23,050	25.6	18.9
550	29	89,825	61.6	73.1
	47	122,550		

Data compiled on textile mills to the number of 1,000 installations all over the United States indicate that 550-volt installations predominate, both in number and capacity. The speaker pointed out that the predominance of the lower voltage in central-station service was due to the fact that this pressure was established when their power business was small, while the large factory installations have been determined by engineers mainly on the basis of copper cost. It was argued that it would not be just for a central station to supply 550 volts for a three-phase installation of 5 horsepower or smaller motors, nor reasonable to demand 220 volts for 50 to 100-horsepower installations. The purchaser of current would gain nothing in either case, while the lighting company would have to provide transformers that would not be changeable with the rest of the service. A central station should not be required to furnish 220 volts for power when the capacity of the transformer required would be larger than those used for supplying its lighting service.

Mr. Parsons advocated the standardizing of 220 and 550 volts for motor services. The 440-volt service was termed a relic of the past, as well as the two-phase system, both of which were developments of the pioneer state.

In most of the Parker Companies the following is the rule for power services:

Installations Aggregating	
1 to 2 horsepower	110 volts, 1-phase
2 to 7.5 horsepower	220 volts, 1-phase
7.5 to 25 horsepower	220 volts, 3-phase
25 and over	550 volts, 3-phase

"This practice gives both purchaser and central station a fair deal," said Mr. Parsons.

Advantages of standardization were held to be as follows: The small consumer can move to new locations and find conditions adapted to the use of his motors; all motors would have a greater resale value and quicker deliveries would be possible; eventually the cost of motors might be lowered, due to larger production of fewer types; manufacturers would welcome a standardization, as it would simplify the parts necessary for adapting motor drive to their machines; the large motor manufacturers would reduce capital tied up in stocks; machines and storage space in manufacturing motors would be reduced, it would permit uniformity of meters and transformers.

Most central stations have a 2,200-volt distribution system. These are in favor of a 550-volt standard. The suggestion was made that if a transformer can so easily be made for 110, 220 and 440-volt taps, why not for 550 volts?

Discussion on Power Papers.

Henry I. Harriman, of the Connecticut River Transmission Company, led the discussion, which included views on the general topic of power from central-station sources. Mr. Harriman said the output of central stations in New England is 200 kilowatts per capita, while that of the Western states is 400 to 500 kilowatts and that of the Pacific states reaches as high as 740 kilowatts in California. New England has the largest demand for power of any section of the country except the Pittsburgh and Gary districts. He cited the greater reliability of central station power over that of the private plant, mentioning two textile mills in which both turbines broke down inside a month. Had there been no breakdown connection, great loss would have been suffered, as war orders were being executed. Another advantage of central-station service is its flexibility, allowing factories to add motors here and there and to run overtime. It also frees the manufacturer from anxiety as to his plant. In a plant valued at $100,000, in which the power station's cost would be about $20,000, 6.75 per cent would have to be earned to equal 6 per cent were the factory taking central-station power.

The one central-station problem, said the speaker, is salesmanship. Engineers' language is generally too technical; it is not understood by the mill proprietor. It is better to select a naturally endowed salesman and add technical knowledge in sufficient quantity than to pursue the reverse course. Manufacturers should be approached from their own basis. Contracts should be simple, showing what net costs will be. Each mill of a type may be depended on to use power on about the same terms; consequently it is up to the central station to make a clear-cut offer. As in furnishing lighting, adopt a standard rate for power, the speaker urged. On the question of heating, Mr. Harriman said perfect frankness should be the rule in dealing with situations where steam is rquired ordinarily for heating or processes, and if electrical supply is not advantageous no contract should be urged, but rather discouraged, until conditions changed.

To show the diversity of rates charged for supplying 20 horsepower motors, the speaker said one New England Company charged as low as $42 per month, while another, the highest, charged $119. For 100 horsepower, the lowest is $87 and the highest $414. The Committee on Rates might properly see if uniform power rates for the same service cannot be made in territories of similar characteristics.

If the question comes to public regulating commissions it will be shown that somebody is too high and others perhaps too low, said Mr. Harriman.

Howard T. Sands, of the Tenney Company, agreed with Mr. Harriman that power salesmanship should not savor too much of engineering. Salesmen do not often realize how good a proposition is theirs. A mill doing a $2,000,000 business a year paid $6,500 for its power. A block plant securing the contract saved the concern $650 a year,—an infinitesimal per cent on the business; negligible, considering the risk. Mr. Sands did not believe lighting companies should undertake the heating of buildings. He referred to a manufacturing company that has contracted for 4,500 kilowatts, resulting from the destruction of its original plant, which was steam-driven.

James E. Arthur, of the Boston Edison Company, said that steam is not so important a factor in shoe manufacturing as was claimed. In the Brockton and Boston districts many shoe factories are motor-driven with central-station service.

D. M. De Bard, of the Brockton Edison Company, said that in that city 4,500 kilowatts are used by shoe factories. Seventy per cent of the energy is furnished by the central station.

Mr. De Bard related the company's practice in renting motors. The plan

Digitized by Google

was inaugurated in 1906 and has been the deciding factor in landing a large number of good, permanent power customers. Motors are furnished for new factories on a lease or easy-payment plan. The customer signs a lease and makes a 10-per-cent cash payment, after 5 per cent has been added to list price of the motor to cover interest. The remaining 90 per cent is divided into 11 monthly payments. At the end of the year the plate which the motor carried, stating that it was the property of the Brockton Edison Company, is removed, all payments having been met.

The readiness with which shoe factories are enjoying central-station power has been greatly facilitated since the announcement last July by the United Shoe Machinery Company that it was prepared to furnish electrically-heated Goodyear welt and shoe-sewing machines and bobbin-winding machines. These new devices cut the ground from under the argument that steam is necessary in shoe-making processes, as has been the case hitherto. The record of three weeks' operation of the electrically-heated welting machine installed in a Brockton shoe factory is as follows: Demand, 5.3 amperes, 110 volts; 48,384 pairs men's shoes welted, requiring 1,082 kilowatt-hours for heating wax pots. The electric consumption was 2.23 kilowatt-hours per 100 pairs of shoes. The average rate charged was 2.45 cents a kilowatt hour. On this basis, the heating cost was 5.46 cents per 100 pairs of shoes, where with steam it would be close to 50 cents per 100 pairs. "With the introduction of these machines," said Mr. De Bard, "the shoe-factory steam requirements are reduced to a low-pressure heating proposition with the safety valve set for 15 pounds and operated by any laborer working part time."

Under the motor trial proposition of the Brockton company, it furnishes and installs at its own expense all motors and other electrical equipment necessary to the economical operation of the factory and allows the use of this equipment for one year. Plans and specifications for the wiring and hanging of motors are submitted to two or more local contractors, and the job is awarded to the lowest bidder. The customer pays in monthly installments, as a rental, 15 per cent a year on the total cost of the installation. At the end of the year the customer is the judge as to whether the installation is satisfactory, and if so, buys the equipment at cost, less 60 per cent of the amount paid as rental. If not satisfactory, the company will remove all its electrical equipment in 60 days.

The result has been, that out of trial propositions amounting to 2,500 horsepower, the company has lost only one proposition, of 115 horsepower. The cost of installing was $42,400, an average of $16.96 per horsepower, all of which was returned to the company with 6 per cent interest, except the loss, of about $1,000. The yearly average gross income from the 2,500 horsepower has been $65,200, or $26 per motor-rated horsepower a year.

The Abington & Rockland Company in Massachusetts, another Stone & Webster company, has worked the trial proposition with good results. Its connected load is 2,810 horsepower, about 20 per cent of which has been secured by the trial plan. The connected motor load of the Brockton company has grown from 892 horsepower in 1906 to 7,641 horsepower in 1915, and about 37 per cent of this load has been secured through trial propositions.

C. A. Mixer, Rumford, Me., remarked that mill men often know as little on what a horsepower is as what a kilowatt is. He pointed out that with steam generation a station is capable of indefinite increase of capacity, while a hydroelectric station is limited by the stream flow. In addition to the two higher proposed standard voltages for motor service—220 and 550—there should be one of 2,200. Formerly motors of this voltage were forbidden in mills by insurance companies, having to be located outside factory walls. This rule has been rescinded. A company in Rumford has 450-horsepower motors of 2,200 volts installed in its mill. Motors of this voltage as small as 100 horsepower are connected to the Rumford Power Company's services.

In connection with the question of standardizing voltages for factory motor service, R. E. Simpson, engineer for the Travelers Insurance and Indemnity Company, Hartford, Conn., sent the following communication: "Many reasons have been advanced in the past for the use of high voltages for mill and factory motor service, the greatest emphasis being laid on the reduction in the cost of installation and the higher efficiency of power transmission made possible by voltages of 200 to 550, as compared with lower potentials. If the reduction in the cost of installation and the increase in efficiency by means of high voltages could be obtained without any disadvantages, these potentials would be very desirable. It is necessary, however, to remember that very few mill workers are acquainted with the dangers of electricity except in a superficial way. The records of accidents from electrical causes in mills indicate that employees will do careless and unexpected things around electrical apparatus. The unavoidable accidents from electrical causes are not great in number when compared with those brought about by thoughtless or careless acts of the employees. Other things being equal, the chances for accidents are greater in the mill equipped with a high-voltage installation than in the mill where low voltages are used, and this will have an important influence on the mill owner, especially in those states where workmen's compensation laws have been enacted. The observant mill owner will not permit the introduction of high-voltage drive if the gain thereby may be offset by damage claims paid to injured workmen. If a voltage of between 200 and 550 is standardized, it would seem that the interests of the central-station industry as well as that of the workers in mills and factories would demand definite provisions for safety."

Frederick Cutts, of the General Electric Company, New Haven, Conn., stated that the use of 2,200-volt motors in the South is not unusual, and has not been attended with casualties. Many units of 550 and 440 volts are now in service, but the latter voltage is likely to be eliminated in time. It is of advantage to manufacturer and user alike that voltages be standardized at the three suggested pressures, 220, 550 and 2,200.

Jesse E. Gray, Providence, R. I., said a plan for heating had been worked out in that city. The Providence Steam Company, a subsidiary of the Narragansett Electric Lighting Company, contracts to furnish heat, light and power at a fixed price for one year. The steam company contracts with the lighting company for its electricity at standard rates.

C. B. Burleigh, General Electric Company, pointed out the wide diversity of power rates as a severe handicap to the industry. Continuing along lines suggested by Mr. Harriman, he stated that for a 500-horsepower motor installation operating at 50 per cent load-factor, and using 43,600 kilowatt-hours a month, rates range from $481 to $1,267. For 1,000 horsepower, at 75 per cent load-factor, using 130,923 units a month, rates range from $1,309 to $3,273. Rates per month for a 20-horsepower installation at 80 per cent load-factor, under varying operating conditions, are as follows:

	Highest	Lowest
Water power and overhead distribution	$42.54	$104.38
Efficient steam plant, tide-water coal, overhead distribution	66.00	90.00
Steam plant, over and underground distribution	58.00	119.00
Inefficient steam plant, railroad coal	62.00	111.68
Fuel engine plant	81.00	106.00
Purchased current (Mass.)	79.00	88.00
Steam and water power plant	55.00	94.00

Digitized by Google

It was remarked that the lowest figures were not from water-power stations, but from a plant having a non-condensing steam engine, railroad coal and operating in a sparse territory. Mr. Burleigh urged that the Section take up the matter before the authorities get a chance to do so.

K. P. Applegate, Hartford, Conn., said that his company charges $5 per month minimum for an installation of 5 horsepower or less. Over that, $1 per horsepower a month. It leases motors for a term of one year, 25 per cent of the cost down, the balance on easy payments, with interest at 6 per cent on the 75 per cent of cost remaining unpaid.

J. J. Gillespie, of the United Shoe Machinery Company, closed the discussion. He cited a case of a manufacturer using a 100-kilowatt turbine, who produced his power, light and heat at $41.50 per kilowatt. The central-station offer was $60 per kilowatt. He agreed with Mr. Harriman on the advantages due to flexibility, reliability, etc., in favor of central-station power, and conceded that for less than 100 horsepower this source is to be preferred. He recognized the great desirability of emergency connection with the central station, but urged that it should not be made a basis for penalizing the factory for its non-acceptance of full service.

Addresses at the Banquet.

Attendance on the banquet by President E. W. Lloyd of the National Electric Light Association and three New England public service commissioners lent interest and importance to the occasion. Mr. Lloyd came all the distance from Portland, Ore., to attend. Toastmaster Louis D. Gibbs introduced him as "one who has spent many years of hard work in national and section activities."

President Lloyd said that he proposes this year to visit all sections of the country and point out the educational benefits to be derived from association with the N. E. L. A. The organization now has about 10 geographical and state sections, and many company sections. Thirteen hundred company members and 14,000 Class B members are enrolled. More than 500 men are devoting their time freely to reports, technical papers, etc., giving to the companies information unequalled in any technical organization in the world.

Ten or 15 years ago, said Mr. Lloyd, most of the papers were technical in character. The recent trend is toward the commercial side of the industry. In the reorganization four divisions of work have been developed—commercial, accounting, technical and hydro-electric, and a manufacturing section, to be formed soon. Each division conducts its own affairs through its own officers, devoting its energies to its special field.

The dearth of salesmen with sufficient technical training, and of college-bred men in the commercial departments, especially in the West and South, is to be remedied if possible, the former condition by means of correspondence courses, and the latter through the work of a committee to interest college men in the electrical business.

Of the public service commissioners of the six New England states, all of whom were invited to the convention, the chairman and another member of the Connecticut Commission, and the chairman of the Maine Commission were present. Judge B. F. Cleaves, of the Maine board, voiced the "layman's" view of the electrical industry in the state, he having but recently been inducted in office. "If public service commissions are to live and be of use," he said, "they must be regarded by the public and by the public service companies as the third member of a close and somewhat intimate copartnership." He remarked that the public anticipation that the Commission would uncover frauds had been disappointed. The public, however, wants consolation for its disappointment. He advised the companies to enlighten the Commission on all matters to be passed on. "Don't force us to drag out information," he said. "Let the public not only receive fair treatment, but also believe they are receiving fair treatment."

Chairman R. T. Higgins, of the Connecticut Commission, said that state regulation has come to be an established principle. He remarked that it is easier and better to do business with people one knows. "What is for your good is for the good of the public," he assured his audience.

Vice-President Walter S. Wyman said that a new era had arrived in the central-station industry. Systems are coming in closer relations. The central station is in business to make money, and to save the public money. No man cares what his neighbor pays, he said, providing he can get a product as cheaply as other men get it. Maine lighting companies are doing scarcely 10 per cent of what they ought to do; when they are developed to that point they will be able to reduce their rates one-half.

Public Service Commission Session.

The morning session on September 16 opened with a stereopticon lecture by D. M. DeBard, of the Edison Company of Brockton, Mass., on the manufacture of war shoes by a firm in that city which had built and equipped with motored machinery a large addition to its factory, in the brief time of two weeks and two days. The factory already had 117 horsepower in motors, using 15,000 kilowatt-hours a month, and now has 245 horsepower, which consume about 60,000 units a month, the factory being operated 24 hours a day. Processes formerly requiring steam heat are now performed with electric heat, and the finished product is shipped by electric freight, making the entire cycle of operations electric.

President Lloyd spoke on Association work as directed to the question of rates. Lighting companies have not discriminated in rates with any motive other than to secure a large volume of business, which results in the lowering of all rates. He pointed out that the cost of delivering energy is a large per cent of the cost of service. Artificial ice manufacture in Chicago was referred to as a desirable load, having no peak demand, the process being suspended from 4 to 8 p. m. There are in that city about 20 ice plants, each calling for about 300 kilowatts. The rate having been based on the Hopkinson schedule, the company found that it could halve the demand charge of about $20 a year, with the result that the net rate is about one cent a kilowatt-hour. The maximum power rate of 10 cents is not out of proportion, owing to the cost of getting the service to the small consumers, Mr. Lloyd said. The cost of handling accounts, including meter depreciation, was given as 46 cents a month. The Commonwealth Edison Company has a minimum of trouble over rates, because of its practice in setting them forth clearly. This facilitates the solicitor's task in interesting factory managers in the power business.

C. A. Carpenter, of the Martha's Vineyard and Buzzard's Bay Companies in Massachusetts, pointed out the desirability of central-station men knowing the public service commissioners of their state. It is well to drop in at their office for a friendly chat, and if in doubt as to the best policy as to rates, to ask their advice. Mr. Carpenter alluded to Tesla's prediction that electrical energy will ultimately be sold by the outlet, rather than by measure.

Bowen Tufts, of the Parker companies, Boston, called attention to the large number of small shareholders of electric lighting securities. In Massachusetts there are 30,000, with holdings averaging $1,500. Just as the Savings Bank Commissioners closely guard the interests of the depositors, so the regulating commissions should safeguard the small investor in public utilities.

B. H. Gardner, Waterbury, Conn., said that there should be no difficulty in explaining demand rates, these being readily transmitted to horsepower.

Digitized by Google

The customer that costs 50 cents a month to carry is not yielding a profit on his summer business. Attention should be given to the matter of recouping the company for fixed charges, in all cases.

Eugene Carpenter, of the Martha's Vineyard and Buzzards Bay Companies, explained the difficulties of summer-resort business on a meter basis. His companies have recently abandoned metering of energy and established flat rates. Meters and connections at $25 each would represent an investment of $50,000 for the companies' 2,000 customers. The cost of reading, testing, etc., would involve an expense of almost $5,000 a year.

Under the new plan, bills can be made out by the office force at any time and mailed the first of the month. Small customers will ultimately be on a three-ampere limiting fuse to prevent the attachment of domestic appliances where only lighting is provided for by agreement.

Commissioner Elwell of Connecticut spoke humorously of his early experiences as a Maine boy. During his career as engineer for the Connecticut Commission, which office he held until recently, his policy was to enlist the interest and services of railway men in formulating and putting in effect safety rules rather than asking the Commission to impose them on the companies.

Chairman Higgins of the Connecticut Commission said the duties of a Commission are not to solve operating problems, but to see that a company gives good service at reasonable rates. Safety in station operation and transmission is also in their province. "Honest capital in electric companies should be sufficiently rewarded to induce the investment of new capital," said the commissioner. A commission never establishes a minimum return on capital; hence it should not set too limited a maximum. A regulating body owes it to the corporations to see that it is getting justice.

Mr. Higgins believed the system of reporting to commissions should be simple and readily understood by the public. For his own part, he said, he will be glad to co-operate with the companies. The result of commission work will be a better feeling between the public and the corporation, he maintained.

Chairman Cleaves, of the Maine Commission, said the American public is inclined to be fair, even generous. If he is sure he is not being discriminated against, a man will spend $2, where he will kick at being robbed of two cents. Referring to the rate difficulty, Judge Cleaves recalled that under early conditions electric plants were started and operated by local men, and their friends were given preferential rates. The companies having special agreements were urged to abolish them. The Maine Commission, the most recently created, proposes to proceed slowly and safely, he promised.

Howard T. Sands said that public utility companies are coming to realize that they are public servants. Broadly speaking, he said, there is no reason why municipalities could not apply the same efficiency and economy as is the rule in private enterprise, but politics and the lack of personal incentive prevent. Competition failed to adjust, and monopoly was repugnant. Hence Massachusetts instituted its regulating commission—the first of the kind in the country—in 1885, as a corrective of possible abuses. The public is inclined to be fair, said Mr. Sands, but people are too much prone to accept newspaper reports that reflect on corporations. He believed in control and regulation, and urged frankness and co-operation with regulating bodies.

N. J. Neall, consulting engineer, Boston, urged the Association's support of the plan for standardizing modes of accounting and returns to the public service commissioners of the various states. He pointed out the diversity of requirements now imposed by the several states.

Recommendations of a joint committee of central-station men and electrical contractors of Massachusetts was the subject of a report read by Walter L. Mulligan, of the United Electric Light Company, Springfield, Mass. This will be given in a following issue.

J. M. Wakeman, general manager of the Society for Electrical Development, explained plans for Electrical Prosperity Week.

The Electric Vehicle Committee of the Section rendered a report through E. S. Mansfield, chairman. This will be summarized in the next issue.

High-Efficiency Lamps.

The final subject was the high-efficiency incandescent lamp, the technical aspects being presented by Henry Schroeder, Edison Lamp Works, Harrison, N. J., and the commercial end by C. A. Dean, Cambridge (Mass.) Electric Light Company.

Mr. Schroeder outlined the new principles of lamp construction, and said that experience gained during the past year, and new gases used, have permitted the manufacture of lamps as low as 100 watts, in the 110-volt range. On account of the cooling effect of the anchors, the larger sizes are made with the bottom anchors omitted, so the lamp can be burned tip-down only, but special lamps, of slightly inferior quality, can be supplied for tip-up burning. Owing to fire underwriters' rules, the 300-watt lamp, formerly fitted with medium screw base, is now standard with mogul screw base; at the same time the change was made the light center length was increased slightly, so that it can now be used in fixtures and reflectors designed for 400 and 500-watt lamps. Mazada type C lamps of 200 to 1,000 watts, in voltage range of 220 to 250, are now available, made in the same bulbs as 105-125-volt units.

Standard street series lamps of 60 candlepower and over for standard circuits of 5.5 amperes and upward are now of the Mazda C type. The efficiency of the 15 and 20-ampere lamps has been steadily increased, the 1,000-candlepower unit now operating at 0.45 watt per candle. Though giving satisfactory lives, series Mazda C lamps are not at present recommended for direct or rectified-current series circuits, because when the filament breaks the arc formed is liable to work up into the base and burn up the socket. Practical methods for short-circuiting the lamp before such damage can occur are being developed.

The use of the new lamps for locomotive headlights, stereopticons and flood lighting were referred to. In all these fields the gas-filled tungsten is preeminent. To meet the demand for low-wattage lamps with concentrated filament and a white light, a line of 25, 40 and 60-watt Mazda coil lamps has been developed, for spectacular lighting. These are vacuum lamps; if gas were introduced, in the present stage, they would not be so efficient, said Mr. Schroeder, because the cooling effect of the gas would be so great that an excessive amount of current would be required to keep the filament up to temperature. Up to the end of July about 1,500,000 Mazda C lamps have been sold in the United States, representing an increased income of over $25,000,000 to central stations within a year. A 7.5-watt, 110-volt Mazda sign lamp, not of the Type C, has been developed recently, which gives about 5 candlepower and will probably increase the sign lighting business greatly. Its rated average life is 2,000 hours.

Mr. Dean's paper will be summarized in a later issue.

Election of Officers.

At the end of the session officers of the Section for 1915-1916 were elected as follows:

President, Walter S. Wyman, Augusta, Me.

Vice-president, R. W. Rollins, Worcester, Mass.

Treasurer, Bowen Tufts, Boston, Mass.

Executive Committee: A. H. Ford, Maine; R. D. Smith, New Hampshire; W. H. Vorce, Vermont; C. R. Hayes, Massachusetts; A. B. Lisle, Rhode Island; G. B. Leland, Connecticut.

Miss O. A. Bursiel will continue her efficient work as secretary.

Digitized by Google

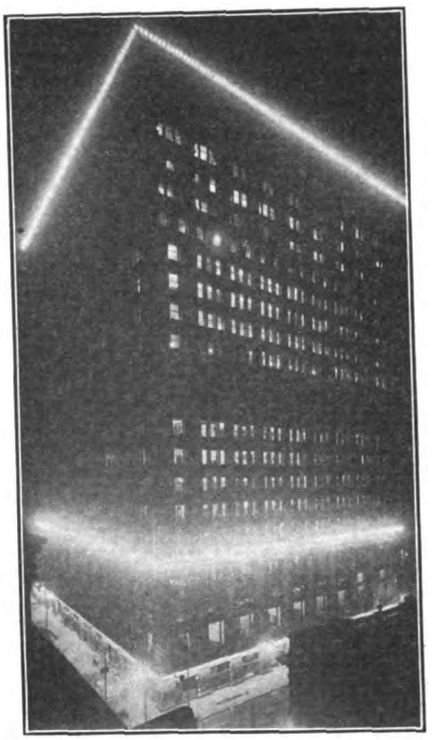
Central-Station Rules for Service Connections, Wiring, Etc.

A very interesting book with many illustrations and comprising a total of 86 pages has been published by the Commonwealth Edison Company, of Chicago, giving "Rules and Information Pertaining to Electrical Service, Meters, Wiring and Motors." This book has been drawn up for the guidance of contractors, architects, engineers and the company's customers in general in regard to what are standard methods of wiring where central-station service is to be supplied. These rules have been established as the result of many years of experience and give what are believed to be necessary requirements in order that this large central-station company may be able to give the best service to the greatest number.

This book explains the systems of distribution used; then follow rules for connecting service, for general wiring, and for installation of motors, meters and lamps; inspection rules are given and a number of valuable tables.

Formal Opening of Commonwealth Edison Company's New Office Building.

The spacious new quarters of the Commonwealth Edison Company, Chicago, embodying every possible facility for rendering prompt, courteous and efficient service to the customer were formally opened to the public during the week of September 20 to 25. Invitations were sent to all of the company's customers and arrangements made to provide demonstrations and entertainment in keeping with the importance of the occasion. The Commonwealth Edison orchestra furnished music during the afternoon and evening and motion-pictures, pertaining particularly to matters of electrical interest, were shown each day. Specially detailed employees were on hand to conduct the visitors to the various points of interest and answer queries relative to Edison service or electrical appliances.

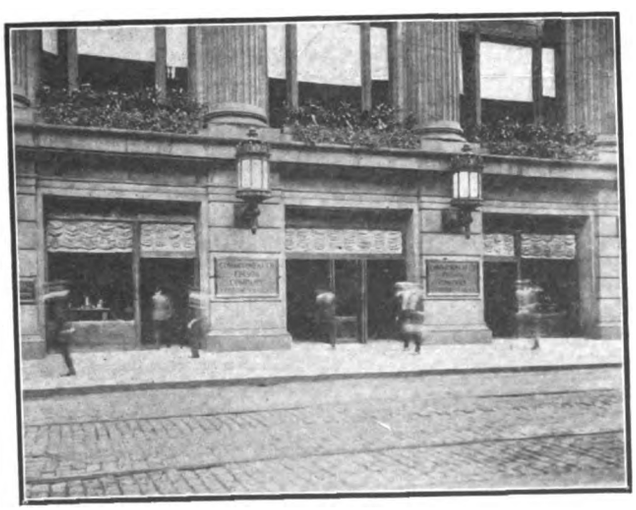


New Edison Building, Chicago, Illuminated for Grand Opening.
(Dark offices are those of non-electrical tenants.)

While the new building has been in service since about May 1, the opening week marked the completion of the new electric shop, on the main floor, which is undoubtedly one of the largest and most complete displays of electrical devices in the country. Every appliance known to the industry, from the smallest pocket flashlight to the electric passenger vehicle, is shown here, in surroundings which set each device off to its best advantage.

The electric shop is located on the main or street floor of the building and occupies approximately 11,000 square feet of floor space. It is reached from either the Adams or Clark Street entrances of the building and attractive show windows line the passageway from each entrance. The interior trim is of American walnut and all of the furnishings harmonize with this. Special fixture and lamp-display rooms and a ladies' rest room form a part of the electric shop facilities.

During opening week the attention of the visitors was centered largely on the new service bureau of the company which has recently been inaugurated for the convenience of customers who transact business with the company over the telephone. All telephone calls to the Edison company are received at the company's 20-position private-branch exchange switchboard and unless for an individual are classified into one of three main divisions. All calls for information from connected customers relative to bills, discounts, etc., are immediately transferred to a special switchboard in the accounting department where the requested information can be given without delay. All calls from customers for information regarding rates, cost of appliances, repairs, etc., or orders for material, lamps, appliances, repair work, etc., are transferred to a special switchboard in the service bureau. This board is manned by male operators who are provided with price lists, order blanks, etc., and are in a position to complete a transaction without referring to any other department. The third division is of calls originating from either company salesmen in the field, or applicants, regarding new business. Such calls are transferred to a special switchboard in the contract department where are stationed experienced men who on learning the address of the location where work is to be or is being done can immediately connect over a separate wire with a



Edison Building, Main Entrance at 72 West Adams Street.

Adams Street Corridor Entrance to New Electric Shop.

Digitized by Google

file clerk having jurisdiction of status reports in the particular district involved. Upon gleaning the information from the file clerk the operator then transmits it to the party calling, the entire transaction taking but a few seconds. The rapidity with which the file clerks can report the status of a job is due to an elaborate follow-up system of reports involving almost every department of the company. This system will be described in greater detail in a subsequent issue.

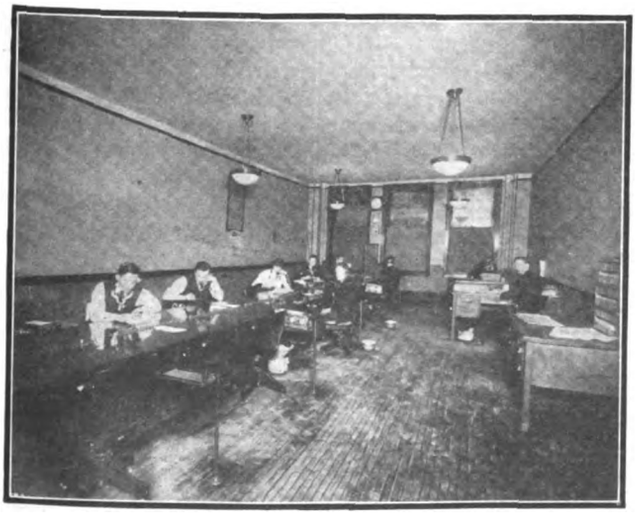
In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for June 5, 1915, there appeared a detailed description of the other features of the new Edison Building. The accompanying illustrations are supplementary to those already published but can give only a meager idea of the beauty and spaciousness of the quarters. It is the aim of the company to provide in the new building every means possible to aid its customers to secure the unequivocal fulfillment of its slogan, "Service First."

A View in New Electric Shop in Edison Building.

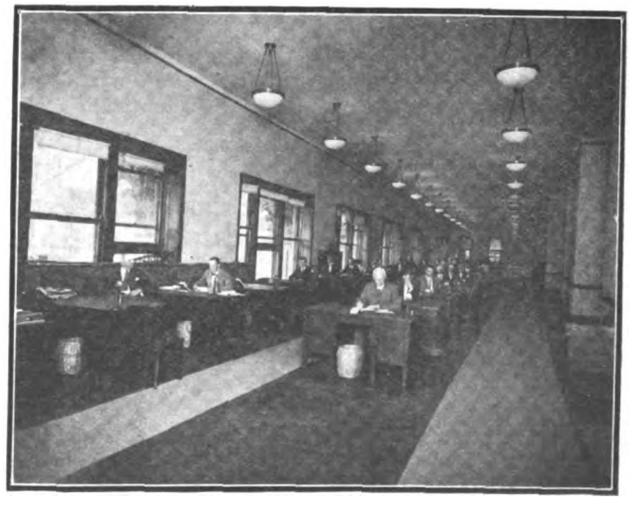
Another View in Electric Shop.

Information Desk in Central Public Hall of Edison Building.

Private Telephone Exchange of Commonwealth Edison Company.



Service Bureau for Distributing Customers' Telephone Requests to Proper Departments.



Lighting Division of the Contract Department and Some of its Salesmen.

Digitized by Google

ADVANTAGES OF STANDARD MOTOR SPEEDS.

By Harry N. Gilbert.

In the beginning of the electrical apparatus business, as in probably all other manufacturinig industries, there was very little in common between the apparatus manufactured by different companies. Sizes of machines were very different for the same outputs, the voltages were different and in alternating-current lines the frequencies were different. Even now there are frequencies of 25, 30, 40, 55, 60 and 133 cycles in use on the North American continent which is far from uniformity. The greater majority of apparatus, however, is for 60 and 25 cycles.

It early became evident that some of these things ought to be standardized and the direct-current voltages 115, 230 and 550, gradually became more predominant. There is now a tendency to make fractional horsepower direct-current motors for 115 volts and larger ones for 230 volts, unless they are to operate on railway circuits when they are wound for 550 volts.

Going over to the mechanical side, things were in a much worse condition. If a five-horsepower direct-current motor of any particular speed was wanted it could almost certainly be found on some manufacturer's list of standard ratings, no matter what the speed was. Since the advent of the alternating-current motor and the almost universal adoption in this country of 60 and 25 cycles, the speeds of direct-current motors have had a tendency to group around the alternating-current motor speeds, such as 1,750, 1,500, 1,150, 850, etc. There is still a great deal of room for improvement, however.

There are many reasons why the manufacturers of motors should standardize on ceratin speeds; some of these reasons are given below:

(First). If certain speeds are standard and the motor-buying public comes to know them there will not be so many calls for odd speeds. This will enable the manufacturers to carry stock motors and stock parts, as not so many will be required to meet demands.

(Second). The consumer will be benefited, as he will be better able to compare prices of motors made by different companies, if quotations are received on motors that are all of the same speed.

(Third). If a manufacturer of a machine designs it for direct connection to an electric motor of a certain speed and, if there are certain standard speeds from which he can choose, he is not limited to one or two manufacturers' motors.

The question of pulley diameters and faces taken in connection with standard motor speeds is a vital one for both the motor manufacturer and the pulley manufacturer. If all motor manufacturers will agree to use certain diameters and faces of pulleys for certain motor ratings, and if they will agree on certain standard lengths and diameters of pulley-end shaft extensions, the pulley manufacturers can reduce their stock of pulley sizes by several thousand. This will result in cheaper pulleys and will help the pulley manufacturers to make better deliveries.

It is interesting to note that there is an organization of motor manufacturers, the Electric Power Club, which has adopted some standardization rules along these lines. When motor manufacturers are able to put these adopted standards into effect matters will be very materially bettered. They have adopted the following ratings, speeds and pulley sizes for direct-current and alternating-current motors:

Horse-power.	Speed R.P.M.	Horse-power.	Speed R.P.M.	Pulley Size, Diam. Face, Inches.
2	1,750	1	1,150	4 by 3
3	1,750	2	1,150	4 by 3
5	1,750	3	1,150	5 by 4
7.5	1,750	5	1,150	6 by 4
10	1,750	7.5	1,150	7 by 5
15	1,750	10	1,150	8 by 6
20	1,750	15	1,150	9 by 7
30	1,750	20	1,150	10 by 8
40	1,700	30	1,150	11 by 10
50	1,700	40	1,150	12 by 11
..	..	50	1,150	13 by 12
..	..	75	1,150	14 by 12
..	..	100	1,150	16 by 13
5	800	..	..	7 by 5
7.5	850	..	..	8 by 6
10	800	..	..	9 by 7
15	850	..	..	10 by 8
20	800	15	600	11 by 10
30	850	20	600	12 by 11
40	800	30	675	13 by 12
50	750	40	600	14 by 12
75	850	50	570	16 by 13

This standardization will assist very materially. When the motor manufacturers adopt and put into effect standard pulley-end shaft extensions, the pulley manufacturers will be benefited. The manufacturers of machinery that is to be belt-driven by electric motors can now do some standardization work which will be of benefit to themselves, to the consumer, and to the motor manufacturer. They should design their machines to use the speeds given in the above table and use pulleys which will permit the use of the above standard pulleys. If this is done, the number of special pulleys needed will be, in time, very much reduced.

Edison Rents Vehicle Batteries on Monthly Charge Basis.

At a private visit of inspection to the Edison laboratory and factories on Monday, September 20, Thomas A. Edison explained his plan to facilitate the use of electric-vehicle delivery equipment. It consists, essentially, in the merchant purchasing his electric delivery vehicle on the installment plan and hiring the battery to run it at a nominal monthly rental.

Representatives of the New York Edison Company, the United Electric Light and Power Company, the Edison Electric Illuminating Company of Brooklyn, the electrical department of the Flatbush Gas Company, the New York & Queens Electric Light and Power Company and the Public Service Electric Company of New Jersey, gave the new plan their hearty endorsement and have promised their cooperation and support to a specific sales campaign proposed by the Ward Motor Vehicle Company.

Charles A. Ward, secretary and treasurer of the vehicle company, told the guests how he was going to make the plan an assured success by offering the "Ward Special," a 750-pound delivery wagon, for $875 on easy monthly payments, with one year's rental of the Edison battery included. This offer will be open only until October 31.

Electrical Supply Jobbers' Quarterly Meeting.

A goodly number of electrical supply jobbers, with as many manufacturers' representatives, attended an interesting three-day session of the Electrical Supply Jobbers' Association of the United States, at the Hotel Clifton, Niagara Falls, Canada, on September 14, 15 and 16. Considerable attention was given during the business sessions to a discussion of the more efficient preparation and distribution of the Association catalog. William Gloeckner, secretary and sales manager of the V. V. Fittings Company, Philadelphia, contributed an interesting feature to the meeting in an address entitled "The Selection of Jobbers as Viewed by the Manufacturer." George W. Hill, representing the Society for Electrical Development, described the propaganda under way in connection with Electrical Prosperity Week.

Jobbing conditions on the Pacific Coast were discussed by H. V. Carter, of the Pacific States Electric Company, San Francisco. The recent decision of Judge Hough, of the United States Circuit Court, in connection with the Cream of Wheat case, and the Stevens Bill were discussed by Thomas M. Debevoise, general counsel of the Association.

The Executive Committee action in voting to hold three meetings in 1916 instead of the usual four, was approved by the general meeting. The next session will probably be held at Hot Springs, Va., early in December, and next year meetings will be held in February, June and October.

A telegram to W. W. Low, president of the Electric Appliance Company, of Chicago, who recently underwent an operation for appendicitis, expressed the gratitude of the Association over Mr. Low's splendid recovery and tendered cordial wishes for his continued improvement in health.

Digitized by Google

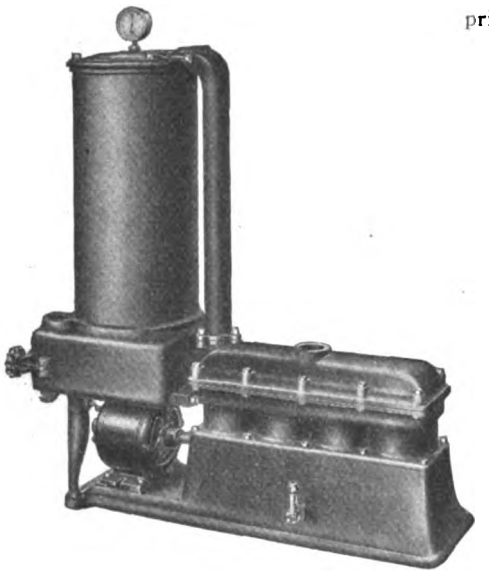
New Electrical and Mechanical Appliances

New Stationary Vacuum Cleaner.

The new vacuum cleaner illustrated herewith is made exclusively for residence service by the Palm Vacuum Cleaner Company, Detroit, Mich. Instead of the rotating fan commonly used to provide the vacuum, this outfit is equipped with a four-cylinder vertical-plunger vacuum pump which is direct-connected to the motor. On a closed system the pump will show a vacuum of seven inches of mercury, and the air displacement at the end of the hose is 50 cubic feet per minute.

The outfit is equipped with an automatic lubricating system and needs attention but once or twice yearly. It has a collapsible self-cleaning bag and removable dust pan. The set is very compact and all moving parts are inclosed. One pipe connection only is required, and it is not necessary to bolt the machine to the floor.

This cleaner is equipped with a one-half horsepower direct or alternating-current motor, made by the Robbins & Myers Company, Springfield, O.



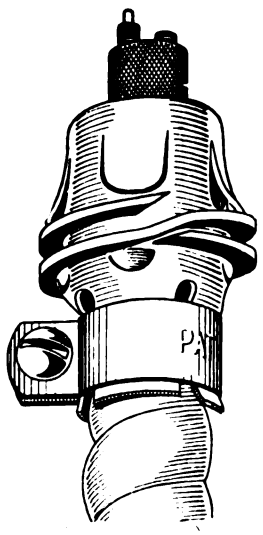
Palm Electric Vacuum Cleaner.

Snap Self-Locking Bushing for Armored Conduit or Cable.

In wiring with flexible steel-armored conduit or cable, which is becoming more and more general, a serious problem presents itself in making secure connection between the cable sheath and the outlet boxes or plates. This connection must be reliable not only mechanically, but also electrically, which necessitates that there be provided a bushing which at the same time will serve to clamp the sheath securely.

A very simple and unique type of bushing for accomplishing this is being placed on the market by the Self Locking Bushing Company, whose headquarters are in the Washington Loan & Trust Building, Washington, D. C. This bushing is appropriately called the "Snap"; to put the bushing in place requires merely a push and snap and the entire operation is really a "snap" in the common slang use of the term. The illustration gives a fair idea of the principle of this device. The bushing has punched spring leaves which, after it has been pushed into the knockout, hold it in place so it cannot slip backwards. A strong pressed-steel spring surrounding the body of the bushing acts as a buffer between the outer surface of the outlet box and the supporting shoulders of the bushing. The strong compression of this spring makes a secure and permanent contact between the bushing and box which no jarring or shaking can dislodge. The armor of the cable is grasped by the clamp, which fits around the extended split sleeve of the device. In tests this device was subjected to a pull of over 200 pounds between the cable and box without any loosening or disturbance to either box or cable.

The entire device is galvanized and comes complete without loose parts. Its cost is no higher than that of similar devices and its installation is the work of but a moment, since it is necessary merely to clamp the device to the end of the armor and push it in place in the knockout. Electricians and contractors who have seen the device have expressed pleasure at its simplicity and convenience.



Self-Locking Bushing.

New Hubbell Shade-Holder.

To meet the increasing demand for spring locking shade-holders there has been placed on the market by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., a new type of locking spring holder of the 2.25-inch size. The operating wings on this holder are set vertically, thus providing a more convenient grip. The slots from which these operating wings protrude are cut eccentric,. thus eliminating practically all friction as the spring wires pass each other, and also greatly prolonging the life of the holder. To minimize the possibility of unintentional release, it is necessary to force both wings to the center before the shade or reflector can be withdrawn.

This new holder can readily be attached to any standard brass-shell socket by means of the Hubbell contractile collar. This distinctive method of attaching assures an absolutely rigid unit and eliminates any possibility of the holder working loose from the socket. Upon insertion of the shade or reflector it is automatically centered by the spring wire and this insures obtaining the maximum efficiency of the unit by having the reflector always in proper position.

New Shade-Holder.

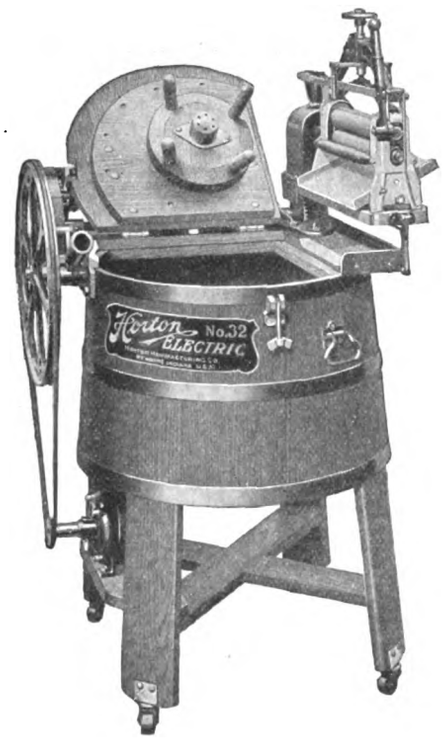
New Horton Electric Washer.

Ever since the year 1871 the Horton Manufacturing Company, Fort Wayne, Ind., has been studying the problem of making every possible improvement in washing machines. The result of this effort has been the production of a new Horton electric washer, with the

Digitized by Google

new three-way-wringer feature, which the company is now offering to the trade.

This machine also embodies all the important features that have made Horton machines so well and favorably known in the past. Driving gears are all machine-cut, reducing noise and friction to a minimum. The five-year roll, reversible, ball-bearing wringer is equipped with a patented automatic safety device to prevent injury. All gears are covered. The dolly is guarded so clothes cannot tear. The motor is a special Fort Wayne make of ample power to operate the washer and wringer at the same time. A hand operating attachment eliminates the possibility of the machine or wringer being put out of commission in case of temporary



New Horton Washer.

power trouble. A simple movement of the hand swings the wringer from one position to another over any make of stationary tubs.

All Horton dealers are liberally supplied with high-class advertising matter, and sales helps of every description. The factory maintains a department for this purpose exclusively.

Benjamin Outlet-Box Fittings and Fixtures.

For some time there has existed a demand for a system providing for reflector and fixture changes without disturbing the interior wiring. To meet this need there has been placed on the market by the Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill., a line of special outlet-box fittings and fixtures. The outlet-box fittings consist of an

Outlet-Box Fitting for Deep Boxes.

appropriate lamp receptacle interior inclosed by a finished brass cover, in several sizes and designs, and provided with means for attachment to the outlet box. The cover terminates in a threaded portion adapted to receive a

Outlet-Box Fitting for Shallow Boxes.

variety of threaded holders and threaded metal reflectors, as well as certain connecting devices, which facilitate fixture installation and interchange.

In the creation of these appliances the Benjamin company found it possible to construct the base fittings, so

Ceiling Fixture.

that once installed they would be established as permanent parts of the interior wiring system. They preclude the necessity of deranging the wiring when new lighting demands arise, because of the provision made for making changes through the threaded counterparts on fittings, holders, reflectors and connecting pieces. Thus a succession or exchange of fixture types is made possible without the necessity of disturbing the wiring connections. Once in place, the base fittings remain indefinitely, while accessories are changed at will.

Fixture Connector.

Should, at any time after the original ceiling-type fixture installation, it be deemed advisable to substitute for this a stem fixture, that change is made possible through the use of the Benjamin fixture connector. This device is a mechanical and electrical coupling. Attached to a fixture, the latter becomes a complete wired lighting unit ready for attachment to the outlet-box fitting. A few turns of the thread, at a minimum expense for labor, installs the fixture.

Chain-Supporting Ring.

The Benjamin chain-supporting ring performs a similar office in connection with fixtures having chain suspensions. The threaded ring is readily attached to any Benjamin threaded socket, as well as to the fittings and fixtures illustrated herewith.

An Electric Hot-Water Radiator.

The use of electricity for heating rooms is gradually increasing, especially in those parts of the country where comparatively cheap rates are obtainable. Practically all such electric heating is done by means of various luminous or non-luminous radiators or air warmers; in all such cases the heat generated by the current passing through the resistance elements is utilized directly. Such radiators or heaters are efficient and satisfactory, but do not possess any great heat storage; consequently, as soon as the current is switched off, the radiator rapidly cools.

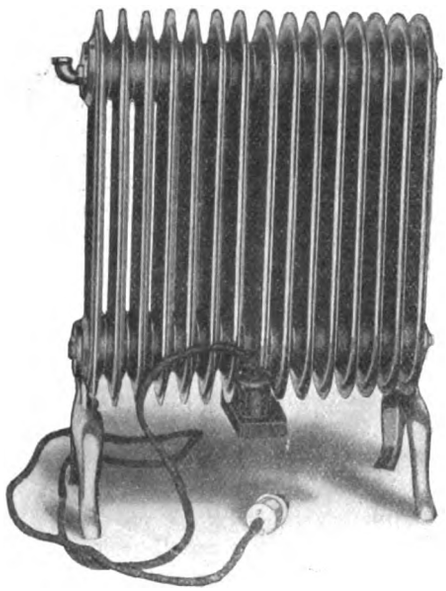
A new type of electric radiator in which this last disadvantage is overcome has been placed on the market by the Rathbone Manufacturing Company, Grand Rapids, Mich. This appliance is a combination electric and hot-water radiator and is illustrated herewith. The outfit resembles very closely a hot-water radiator of the standard type, except that the coils are somewhat more slim. This radiator is an entirely self-contained semi-portable unit. In the lower portion is an electric heating element, which is connected by a substantial flexible cord to the circuit. In the case of the smaller radiators, such as the one shown, it can be connected to an ordinary lighting socket, since the maximum load is only 660 watts. When the current is turned on a very effective circulation of hot water is obtained through all of the coils of the radiator. As soon as the water has attained the degree of heat desired, the current can be reduced to an amount sufficient to maintain the hot water at that temperature.

In the radiator shown there are 15 coil sections with a total heating surface of 22.5 square feet. This large radiating surface produces a very effective means for heating small or moderate-sized rooms. Such a radiator can be used for heating a room with a volume of about 1,000 cubic feet to a

Digitized by Google

temperature of 70 degrees Fahrenheit. A larger-size radiator is also made, which has 21 sections and takes 990 watts at full heat and 660 at low heat; this larger size has a radiating surface of 31.5 square feet; on account of its exceeding the circuit limitations, it must be connected to a special outlet. Its heating capacity is proportionately greater than that of the size illustrated.

The sections of the radiator are made of steel carefully assembled and neatly finished. The radiator requires one filling of water before being put in service and an occasional addition of a small amount to make up for any evaporation. The total weight of the smaller radiator when full is 65 pounds. It is provided with polished smooth feet so that it can be readily pushed about on a tile or other smooth floor without lifting. In operation no pressure is developed, nor is there any liability for the production of steam. The heating elements are of such rating as to insure operation of the appliance as a hot-water radiator. Ample provision is made for evaporation and for expansion of the water when heated.



Rathbone Electric Hot-Water Radiator.

Among places where it is particularly suitable are buildings or rooms not equipped with a permanent heating system and in rooms where extra heat is desired for either temporary or permanent use. It can also be used in stores where any other form of fuel, gas or steam heating would cause damage to stocks of delicate goods.

Many advantages are possessed by this appliance. It is absolutely safe, since no flame or very-high-temperature surface is present; the liability of children burning themselves on a very hot surface is eliminated. It does not consume oxygen of the air, nor give off gaseous products, but is entirely odorless and, of course, free from smoke, soot and ashes. It is very readily installed and can be placed wherever desired to give its heat effectively. Probably the most important advantage of this device is in its heat-storage capacity. If it is desired to operate on an off-peak plan, to get the advantage of special off-peak rates, the radiator can be kept connected at low heat and entirely disconnected during the period of peak load. The heat stored in the radiator will keep it warm for a long time. Again, if it is desired to utilize the house circuits without exceeding a definite maximum demand or allowed capacity, the radiator may be kept connected until other load is to be used, when it may be temporarily disconnected without immediately losing all of its heat-giving property; thus, the radiator may be disconnected during the time that electric cooking, ironing or much lighting throws a heavy load on the house circuits. Use of this radiator, therefore, should greatly improve the load-factor of residence service.

Sterling Outlet Plate and Connector for Armored Cables.

The increasing use of flexible steel-armored cable and conduit is bringing about a greater need for reliable means for clamping the armor of the cable to outlet plates and to conduit boxes. In this line there have recently been placed on the market two devices to meet these requirements. The first of these is known as the Sterling Biplex outlet plate. The device is very simple in construction. The distinctive feature is that it has an adjustable set-screw that clamps the cable armor securely in place, thus it can be very quickly applied, and when the screw is tightened properly it has a secure grip on the corrugated outer surface of the armor. Use of this device thus entirely eliminates the need of clamps. It can be used for either one or two cable ends. This outlet plate is given an electro-galvanized finish to prevent rusting. The illustrations herewith show the simplicity of the entire device, and the absence of loose pieces for clamping, which avoids the difficulty usually met in entering the cable in the outlet plate. The device is made for either straight electric or combination gas and electric outlets. The combination plate is made to fit on drop elbows without reaming.

Outlet-Box Bushing and Connector for Armored Cable.

The new armored-cable connector is known as the Hexcel Connector, and is built for use with standard outlet boxes with knockouts for one-half-inch conduit. It is of simple construction, consisting of a cast-iron sleeve or bushing with thread and locknut for attaching to the box and a clamping screw for securing the cable in place. This device is made with electro-galvanized finish. It can be very easily and quickly applied and securely grips the cable in place. These devices are manufactured by the Sterling Foundry & Machine Company, Newark, N. J.

Two Views of Sterling Biplex Outlet Plate.

Frantz-Premier Spreads Out.

The Frantz-Premier Company, of Cleveland, O., heretofore known only as a vacuum cleaner manufacturer, is about to place on the market a comprehensive line of electrically-operated household utensils, including washing machines, wringers (which will be sold separate from the washing machines as well as in conjunction therewith), dish-washing machines, and an exceedingly unique electric fan for household and office use.

The new factory at Ivanhoe Road and Euclid Avenue, Cleveland, providing greatly increased accommodations, is nearing completion. This new factory will be of four stories, built of concrete and fitted with every modern convenience and equipment. The company expects to move from its present quarters in the Whitney Power Block to the new building about November 1.

Among recent enterprises undertaken in Spain by foreign capital is the hydroelectric development of Catalonian water powers for the benefit of Barcelona and vicinity.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

CAMDEN, N. J.—A three-story brick and concrete addition to the plant of the Taylor-White Extracting Company will be erected here. Ballinger & Perrot, Philadelphia, are the architects.

WILMINGTON, DEL.—The William Freihofer Baking Company will erect a large baking plant, stable and power plant here to be constructed of concrete and steel, brick and stone. Peucket & Wunder, 310 Chestnut street, Philadelphia, Pa., are the architects.

ALLENTOWN, PA.—A six story addition to the Young Men's Christian Association building will shortly be constructed here. The total cost will be about $140,000. Louis E. Jallade, 37 Liberty street, New York City, is the architect.

PHILADELPHIA, PA.—A $350,000 10-story concrete and steel office building will be erected for William L. McLean here. E. V. Seeley is the architect.

PHILADELPHIA, PA.—The United Electric Construction Company of this city has been awarded the contract for the electrical equipment of the six-story building to be erected at Eleventh and Race streets, here. Ballinger & Perrot, Philadelphia, are the architects.

SCRANTON, PA.—Contracts for the erection of three new buildings to cost $300,000 at the State Hospital for the Criminal Insane, at Fairview, Wayne county, have been awarded as follows: General contract to P. J. Hurley, Bayside, L. I.; heating, ventilating and plumbing to Faith Company, Philadelphia, Pa.; electrical construction to Francis Buchanan, Philadelphia, Pa.

COLUMBUS, GA.—A municipal lighting plant may be installed. Address mayor.

GREER, S. C.—Bonds amounting to $18,000 have been voted for a municipal electric light plant. Address mayor.

NORTH CENTRAL STATES.

BELLEFONTAINE, O.—A $10,000 light system may be installed by the City Council. Address W. T. Haviland.

ELYRIA, O.—The Lorain County engineer is preparing plans for a city municipal light plant. Address city clerk.

BONDVILLE, ILL.—Plans are under way here for the organization of an electric light company to provide a lighting system for the town. Z.

LERNA, ILL.—The Council is planning ways and means to secure electric lighting. Address village clerk.

NORMAL, ILL.—Members of the Business Men's Association plan the installation of cluster lights on a number of streets. Z.

SPRINGFIELD, ILL.—Bids will be received by the State Board of Administration until 3 p. m. October 18, for wiring of four new buildings to be erected on the site of the State Colony for Epileptics near Dixon, Ill. The buildings are a power house, a laundry, a cold storage building and a bakery. Plans and specifications are on file at the office of the state architect, J. B. Dibelka, 130 North Fifth Avenue, Chicago. Z.

STREATOR, ILL.—A resolution has been passed by the Board of Local Improvements providing for the installation of a boulevard lighting system on two streets. One is to be on Main Street from Water to Illinois Street and the other on Vermillion Street from Hickory to Bridge Street.

WEST SALEM, ILL.—The City Council has voted to grant a franchise to the West Sales Light & Ice Company. It is planned to erect a light plant at West Salem.

HAUGEN, WIS.—The Wisconsin-Minnesota Light & Power Company has obtained a franchise from the town board to install and operate a light and power plant at Haugen. The company, which has a dam on Bear Creek at this place, has commenced rebuilding and enlarging the same, and will put in a large and modern electric light and power plant and have the same in operation within a few months, when the village will be wired for electric lights. The Haugen Commercial Club is in communication with some industrial plants who are looking for new locations, where they can secure cheap power, and it is expected they will get some of these factories located at Haugen within the coming year.

MILWAUKEE, WIS.—It is reported that John I. Beggs and associated capitalists have obtained possession of the Southern Wisconsin Power Company, representing an investment of $2,500,000.

KEOKUK, IOWA.—The Keokuk Electric Metals Company will erect a plant to cost about $90,000. Address G. E. Weissenberger, president.

KEOKUK, IOWA.—The Johnson Smelting Company (Electric) will erect a plant for electric smelting of ores; estimated cost $75,000. Address Byron E. Eldred, president.

MARATHON, IOWA.—The town has voted bonds to the amount of $12,000 for the construction of a municipal electric lighting plant.

HUNTER, N. D.—The Hunter Light & Power Company plans to purchase, within the next year, an engine-driven generating unit, pumping equipment, switchboard, conduit, meters and various equipments for street-lighting system; company also plans to purchase within two months 10 washing machines, two dozen heating and cooking devices, and a number of wiring supplies. Address R. D. Hockridge, secretary and general manager.

TOWER, N. D.—The Council is considering plans for an electric light plant. Address city clerk.

DUBOIS, NEB.—Bonds have been voted for electric lighting. A transmission line is to be built from the Pawnee City plant. Address town clerk.

CENTRALIA, KAN.—A transmission line will be built to Goff, which has just voted, at a bond election, for a lighting system.

SOUTH CENTRAL STATES.

DECATUR, ALA.—The Alabama Power Company will build a transmission line from Decatur to Hartselle. The company recently bought the electric light plant at Hartselle, where at present only night service is available. With the completion of the transmission line day and night service will be offered.

BARTLETT, TEX.—The Texas Light and Power Company will extend its long-distance transmission system to this place and provide the town with light and power. D.

CORSICANA, TEX.—The Corsicana Electric Light and Power Company has been organized here. Capital, $1,000. Incorporators: F. N. Drane, J. W. Carpenter and S. M. Kerr. D.

LULING, TEX.—The Luling Electric Light and Power Company plans to install a street-lighting system here.

MEXIA, TEX.—The Central Texas Ice Company has changed its name to the Central Texas Ice, Light, Power and Water Company and increased its capital stock from $60,000 to $100,000. D.

WESTERN STATES.

ANACONDA, MONT.—Electric lights will be placed in the city parks. Address city engineer.

GREAT FALLS, MONT.—W. H. Harrison, city clerk, reports that the City Council has passed a resolution of intention to create a special improvement district for the installation of a street-lighting system. Council proposes to erect and construct 10 lamp posts in each block, with one 100-candle-power lamp upon each post, and two lamps of like candlepower in the alleys of each block embraced in the district. Cost estimated at $8,280. The final resolution will be passed at the Council meeting September 28. O.

PHOENIX, ARIZ.—The Board of Supervisors has granted the application of L. G. Wilson for a franchise to build light and power lines connecting the townsite of Gilbert and adjoining lands with the government line to Sacaton.

TUCSON, ARIZ.—City Manager C. K. Clarke has recommended to the City Council an improvement bond issue of $100,000, the sum of $50,374 to be used to complete the ornamental lighting system.

Digitized by Google

CHEHALIS, WASH.—The sale of the property of the Washington-Oregon Corporation has again been announced for October 16, at the courthouse in this city. This sale was to have been held July 3, but was postponed on account of the Centralia city commission accepting a contract from H. G. Fleischhauer, which action annulled that city's contract with the Washington-Oregon Corporation. O.

COLFAX, WASH.—The Steptoe Light and Power Company recently incorporated by E. M. Woodin, of Colfax, and Ollie Cooper and Maude Cooper of Steptoe, has been granted a franchise for 50 years by the county commissioners of Whitman County to construct, operate and maintain power transmission lines for light and power in Steptoe, an unincorporated town 12 miles north of Colfax. It is reported the company will make immediate installations and connections. O.

ELLENSBURG, WASH.—Reported the City Council has passed a resolution awarding the contract for the lighting plant to Kraner Construction Company, of Portland, Ore., work to start after election of September 23, to legalize $60,000 bond issue. O.

SEATTLE, WASH.—The Commissioners of King County have granted the Puget Sound Traction, Light & Power Company a light and power franchise extending over the entire southern portion of the county.

SEATTLE, WASH.—The School Board has decided to install an electric heating plant in a portable school at the Walla Walla school building as an experiment without cost to the district. This will be the first electrically heated school building in the city. O.

BAKER, ORE.—It is reported the W. H. Eccles Lumber Company, here, whose plant recently sustained a $100.000 loss by fire, and which is being rebuilt, will install electric motors for the large woodworking machines in the plant, until arrangements necessary for installing steam power can be made. The company is in the market for motors and electrical equipment, according to reports. O.

PILOT ROCK, ORE.—J. B. Sparks and L. L. Harland, of Heppner, Ore., have submitted a proposition to local business men for installing an electric light system here.

LOS ANGELES, CAL.—The City Council has prepared an ordinance providing for the ornamental lighting of Hobart Boulevard between Washington and Sixteenth Streets.

MANHATTAN BEACH, CAL.—A resolution has been adopted by the city trustees ordering lighting posts on Fourteenth and Fifteenth Streets maintained and electric current furnished for two years.

PASADENA, CAL.—At an election on October 16 a bond issue in the sum of $25,000 will be voted upon for ornamental lights, extending over an area of 18 miles at Lamanda Park.

RED BLUFF, CAL.—The Board of Trustees is considering plans for a cheaper lighting system, either by purchasing the present system or by installing a new system.

TROPICO, CAL.—The City Engineer has been instructed to prepare plans and specifications for lighting San Fernando Boulevard from Brand Boulevard to Tropico Avenue.

PROPOSALS.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until October 27, for lighting fixtures for the United States postoffice at Monongahela, Pa. Drawings and specifications may be obtained from the custodian of site at Monongahela, or at the office of the Supervising Architect, Washington, D. C.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on October 5 for the following material, delivery to be made at the Brooklyn Navy Yard. Intending bidders should write for the schedule numbers mentioned: 22' alternating-current, 110-volt, 60-cycle fans; miscellaneous rubber-covered, solid, single wire; 35,000 feet duplex lighting and power wire; 45,000 feet ship-lighting cable, schedule No. 8800; miscellaneous intercommunication cable; 57,200 feet galvanized steel conduit; miscellaneous telephone cable; 6,500 feet plain, single-conductor wire; 10,000 feet double-conductor wire; miscellaneous plain, twin-conductor wire; miscellaneous leaded and armored twin-conductor wire, schedule No. 8801.

NEW INCORPORATIONS.

JEFFERSON CITY, MO.—The Campbell Electric Light & Power Plant has been incorporated with a capital of $30,000, by R. C. Jones and others.

IOWA FALLS, IOWA.—The Commonwealth Light & Power Company has been incorporated with a capital of $250,000. Frank Tichenor is president.

BROOKLYN, N. Y.—United Battery Corporation; to manufacture batteries and other electrical supplies. Capital, $100,000. Incorporators: David Burr Luckey, A. M. Sullivan and A. E. Moloney.

WRIGHTSVILLE, S. C.—The Warren Electric Company has been commissioned, with a capital stock of $10,000, to build and operate electric light plants and telephone exchanges, and to handle electric and telephone supplies. Address W. M. Warren.

DOVER, DEL.—The Middle Georgia Power Company, with a capitalization of $700,000, has been incorporated by Herbert E. Latter and William J. Maloney, of Wilmington, and Clement M. Egner, of Elkton, to manufacture and distribute electric current for light, heat and power.

FINANCIAL NOTES.

Westinghouse Electric & Manufacturing Company will redeem on January 1, next, the old convertible five per cent bonds at 105 and interest. Holders desiring to anticipate this debt of redemption may surrender their bonds after September 16, receiving 105 and interest from July 1, last, to date of surrender. Bonds may be presented at the Guaranty Trust Company, New York City, for redemption.

At a meeting of managers of the various gas and electric properties operated by H. M. Byllesby & Company, J. J. O'Brien, vice-president and treasurer, stated that the success of the refinancing plan for Standard Gas & Electric Company by the sale of $3,750,000 six-per-cent 20-year debentures to stockholders of the company is already assured. In case the refinancing plan is successfully carried out, cash dividends on the eight-per-cent preferred stock of Standard Gas & Electric will be resumed at the rate of one per cent quarterly beginning with the new year.

Dividends.

	Term	Rate	Payable
Am. Pr. & Lt., pf	Q	1.5 %	Oct. 1
Am. Pub. Util., pf	Q	1.5 %	Oct. 1
Bangor Ry. & Elec., pf.	Q	1.75%	Oct. 1
Buffalo Gen. Elec.	Q	1.5 %	Sept. 30
Cin. & Sub. Bell Tel.	Q	2.5 %	Oct. 1
Cin., H. & D. Trac.	Q	1 %	Oct. 1
Cin., H. & D. Trac., pf.	Q	1.25%	Oct. 1
Col. Ry., Pr. & Lt., prior pref.	Q	1 %	Oct. 1
Col. Ry., Pr. & Lt., Ser. A pf.	Q	1.5 %	Oct. 1
Consumers' Pr. of Mich., pf.	Q	1.5 %	Oct. 1
Duquesne Lt., pf.	Q	1.75%	Nov. 1
Duluth Edison, pf.	Q	1.5 %	Oct. 1
Elec. Stor. Battery	Q	1 %	Oct. 1
National Carbon, pf.	Q	1.75%	Nov. 15
National Carbon, com.	Q	1.5 %	Oct. 15
New Orleans Ry. & Lt., pf.	Q	1.25%	Sept. 30
N. Y. State Rys.	Q	1 %	Oct. 1
N. Y. State Rys., pf.	Q	1.25%	Oct. 1
Ohio State Tel., pf.	Q	1.75%	Oct. 1
Ottawa Lt., Ht. & Pr.	Q	1.5 %	Oct. 1
Penn. Water & Pr.	Q	1 %	Oct. 1
Phila. Co.	Q	1.5 %	Nov. 1
Phila. Co., pf.	S	3 %	Nov. 1
Rep. Ry. & Lt., pf.	Q	1.5 %	Oct. 15
Shawin W. Pr.	Q	1.5 %	Oct. 9
Toronto Rys.	Q	2 %	Oct. 1
United Utilities, pf.	Q	1.75%	Oct. 1
United Lt. & Rys., first pf.	Q	1.5 %	Oct. 1
Wash. Water Pr.	Q	1.25%	Oct. 1
West India Elec.	Q	1.25%	Oct. 1
Western Ohio Ry., first pf.	Q	1.75%	Oct. 1

Reports of Earnings.

NEW ENGLAND COMPANY POWER SYSTEM.

	1915	1914
August gross	$119,829	$ 71,881
Net after taxes	77,805	41,226
Surplus after charges	30,831	12,034
Balance after preferred dividends	3,785	*8,516
Eight months' gross	909,908	648,807
Net after taxes	573,508	397,647
Bond interest	269,455	221,747
Other interest	46,781	13,994
Surplus	257,272	161,906
Preferred dividends	203,408	164,400
Balance	53,864	*2,494

*Deficit.

For August, 1915, earnings and expenses of Bellows Falls Power Company are included, but not for August, 1914. Eight months' statement included earnings and expenses of Bellows Falls Power for five months in 1915, but not for the eight months of 1914.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 20	Sept. 13
American Tel. & Tel. (New York)	123½	122¾
Commonwealth Edison (Chicago)	136	136
Edison Electric Illuminating (Boston)	—	237
Electric Storage Battery common (Philadelphia)	74	72½
Electric Storage Battery preferred (Philadelphia)	74	72½
General Electric (New York)	171½	170⅛
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	8	8
Massachusetts Electric preferred (Boston)	43¼	43
National Carbon common (Chicago)	140½	140½
National Carbon preferred (Chicago)	120¾	120
New England Telephone (Boston)	131	129½
Philadelphia Electric (Philadelphia)	25	25
Postal Telegraph and Cables common (New York)	75¼	76
Postal Telegraph and Cables preferred (New York)	66½	66½
Western Union (New York)	76½	75¾
Westinghouse common (New York)	118¼	114
Westinghouse preferred (New York)	131	134

Digitized by Google

INTERSTATE ELECTRIC CORPORATION.

	1915	1914
July gross	$ 32,177	$ 29,672
Operating expenses	18,236	17,187
Net earnings	13,941	12,435
12 months' gross	356,755	321,835
Operating expenses	212,764	194,716
Net earnings	143,990	127,119

UNITED STATES PUBLIC SERVICE.

	1915	1914
July gross	$ 68,051	$ 65,539
Net after taxes	25,416	25,467
Balance after bond interest	18,497	19,082
Surplus after note interest	12,497	13,082
12 months' gross	883,085	791,616
Net after taxes	365,164	287,761
Balance after bond interest	285,376	225,626
Surplus after note interest	213,376	153,626

SHERBROOKE RAILWAY & POWER.

Comparative report for the year ended June 30:

	1915	1914
Gross earnings	$146,769	$141,990
Net after taxes	55,920	54,020
Surplus after charges	24	*2,059

*Deficit.

AMERICAN RAILWAYS COMPANY.

Subsidiaries of American Railways Company report consolidated gross earnings as follows:

	1915	1914
August gross	$ 472,614	$ 504,253
Eight months' gross	3,536,524	3,700,227

NEVADA-CALIFORNIA POWER COMPANY.
(And Subsidiaries.)

	1915	1914
July gross	$142,591	$139,783
Net after taxes	74,285	71,625
Surplus after charges	41,956	44,502
Balance after sinking fund	37,347	39,999
Seven months' gross	945,172	851,640
Net after taxes	478,670	396,747
Surplus after charges	249,864	202,823
Balance after sinking fund	219,758	159,496

KEYSTONE TELEPHONE.
(Combined Companies.)

	1915	1914
August gross	$114,330	$112,546
Net	57,184	58,938
Surplus	30,316	32,901
Eight months' gross	899,154	880,262
Net	451,962	446,810
Surplus	239,490	238,957

PERSONAL MENTION.

MR. C. H. MASON has been appointed manager of the Dansville, N. Y., gas and electric light plant, succeeding Mr. C. G. McAvoy. The latter has been appointed superintendent of the Hornell Electric Company.

MR. W. M. TURNLEY announces his resignation as sales manager of the Northern Electric Company, of Montreal, Canada, to become manager of the Canadian Carbon Company, Limited, Toronto, Canada, manufacturers of dry cells, flashlights and other electrical specialties.

MR. ROY L. ROHRBAUGH, chief meter inspector and tester of the Sandusky (Ohio) Gas & Electric Company, has returned to his duties after a week's visit to the Fort Wayne Electric Works at Fort Wayne, Ind., where he went to study the construction and operation of the Fort Wayne meters. Mr. Rohrbaugh's work at Sandusky has attracted wide attention because of the ingenuity he has shown in making accurate tests and adjustments without the aid of much of the apparatus found in most of the larger central stations.

MR. WILLIAM E. KEILY, recently associate editor of the *Electrical World*, has opened an office in the Edison Building, 72 West Adams Street, Chicago. For nearly a year past, Mr. Keily has been engaged in literary and consulting work having to do with public-utility problems and relations, and he will continue work of this character, with improved facilities, in his new office. An experienced writing-man, Mr. Keily has done journalistc work in both daily-newspaper and technical-magazine fields. For a number of years he was managing editor of the old *Western Electrician* of Chicago, and thereafter he became associate editor (in Chicago) for the *Electrical World*. Mr. Keily has been familiar with electrical and public utility development in Chicago, and indeed throughout the country, during the last 20 years. For the years 1910-1914 he was editor of the *Convention Daily*, published at the annual conventions of the National Electric Light Association, held in St. Louis, New York, Seattle, Chicago and Philadelphia. Mr. Keily is an associate of the American Institute of Electrical Engineers, a Class B member of the National Electric Light Association,

William E. Keily.

and a member of the Jovian Order, Electric Club-Jovian League of Chicago, National Geographic Society and the City Club of Chicago. Undoubtedly one of the most popular members of the electrical fraternity in the Middle West, with a splendid reputation for good judgment and uprightness of character, Mr. Keily will enjoy the confidence and esteem of an ever increasing clientele.

MR. WALTER SCOTT WYMAN, the president-elect of the New England Section, National Electric Light Association, though named after the great Scottish novelist, has less of the historical romancer than of the up-to-the-minute business organizer and pusher about him. He is of the type of Americans who are for progress, first, last, and all the time. Recently he was appointed a member of the Boost Maine Committee, which has done much to place the agricultural and industrial advantages of that state before the people of the country. Mr. Wyman is no mere boomer, however. He has accomplished things. From the day he left college in '96 he has been actively connected with the electrical industry. Maine is far famed for its universal application of water in preference to liquids with more recoil to them. Some of the natural fluid, apart from that imbibed, goes to waste, but much has been pressed into useful service under the skillful hands of Mr. Wyman and his associates and made to produce the mysterious but powerful electrical "fluid" which is shipped by Mr. Wyman's company in the original package all over the central part of the commonwealth, lighting prosperous cities and pleasant villages, turning a myriad of spindles, lathes and street-car wheels, doing the farmers' chores, in fact, there is nothing, except rocking the summer visitors' hammocks, that Central Maine power doesn't do. Mr. Wyman has just turned 41. His birthplace was Oakland, Maine. His alma maters were, successively, the schools of his native town, the Coburn Classical Institute at Waterville, and Tufts College in Massachusetts, where he took the electrical engineering course. For three years after leaving college he was assistant superintendent of the Maine Water Company, going in 1899 to the general managership of the Waterville & Fairfield Railway & Light Company, which did double duty, as a lighting company and a common carrier. Two years later, with Harvey D. Eaton, of Waterville, Mr. Wyman organized the Messalouskee Electric Company, and furnished current to Waterville and Oakland. In 1907 the Fort Halifax Power Company was organized to transmute running water to running trolley cars between the city which boasts the fame of James G. Blaine, and the busy industrial center which is renowned for Bates' cotton fabrics. In 1909-10 a half-dozen hydro companies (giving new meaning to the expression "hydro-headed") consolidated as the Central Maine Power Company, with W. S. Wyman as general manager and treasurer, which he has been ever since. The company has 15,000 horsepower harnessed, and vast undeveloped horsepower in reserve for use as the power market develops. There are about 100,000 people in the region served, who work, eat and thrive by the power derived from the score of water-power plants on the Kennebec and its confluents. Just at present Mr. Wyman is trying to induce the Maine housewives to discard the old wood stove and to make their pumpkin pies on electric ranges fed from the roof, instead of out of the woodbox. The small boys who were expected to keep the aforesaid woodboxes full, now look upon Wyman as their hero. Aside from his N. E. L. A. membership, Mr. Wyman is also a member of the American Institute of Electrical Engineers, the New England Street Railway Association and the Augusta Board of Trade.

OBITUARY.

MR. FRANK EDWARD JOHNSON, who for the past 10 years has been Instructor in Electrical Engineering at the University of Washington, Seattle, died at Minor Hospital, that city, recently, following an operation for a complication of diseases. The deceased was 41 years of age. He was born at St. Peter, Minn., and was a graduate of the University of Minnesota. In early life, Mr. Johnson devoted his time to public school work in his native state, later affiliating himself with the electrical industry in Minnesota, Wisconsin, Nebraska and Wyoming. At the time of his appointment to the University of Washington, he was superintendent of the Douglas Electric Light Company of Douglas, Wyo.

DATES AHEAD.

American Electric Railway Association. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

New York Electrical Show. Ninth annual exposition, Grand Central Palace, New York City, October 6-16. George F. Parker, vice-president, 124 West Forty-second Street, New York City.

Digitized by Google

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Association of Railway Electrical Engineers. Annual convention, Hotel LaSalle, Chicago, Ill., October 18-22. Secretary, J. A. Andreucetti, Chicago & Northwestern Railway, Chicago, Ill.

With the Electrical Manufacturers

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is opening up a new district office at Springfield, Mo. Jack Fieber, now of the St. Louis office, will be in charge.

The Solderall Company, New York, announces the appointment of P. Vath, Auditorium Building, Chicago, as its western representative. From now on shipments will be made from Chicago as well as New York.

Philadelphia Storage Battery Company, Philadelphia, Pa., announces that on October 1 its Chicago office will be moved to larger quarters at 1621 South Michigan Boulevard, Chicago, Ill. This branch includes a battery service station.

Cooper Hewitt Electric Company, Eighth and Grand Streets, Hoboken, N. J., has issued bulletin No. 61 describing its M-shaped photographic lamps. These lamps were recently described in our columns and are meeting with much satisfaction in the photographic business.

The Hamilton-Beach Manufacturing Company, Racine, Wis., has put a campaign of national advertising behind its jobber-dealer distribution of "Sew-E-Z" sewing-machine motors and "New-Life" vibrators. Jobbers are invited to write for full details. Dealers are requested to write to their jobbers for information.

The Chelten Electric Company, Philadelphia, Pa., announces the appointment of Walter C. Rardin, 514 West Washington Boulevard, Chicago, as its representative in that city and immediate territory. Mr. Rardin has on hand a full line of consigned stock, literature, discount sheets, and is in a position to give business in this territory his attention.

The Robbins & Myers Company, Springfield, O., has been awarded the grand prize for its very attractive exhibit at the Panama-California Exposition, San Diego, Cal. This company was also awarded a gold medal for its display of electric fans and motors at the Panama-Pacific International Exposition, San Francisco, Cal.

Westinghouse, Church, Kerr & Company, 37 Wall Street, New York City, have issued bulletin No. 18 entitled "Routing". This is a folder issued as a typical example of the great care with which the question of routing materials through an industrial plant is treated by this well known firm of engineers and constructors. An illustration on the cover of the folder shows graphically the simple method of routing raw materials and products in various stages of completion that is used to facilitate operations in a large industrial plant. Such studies made before the plant is designed and constructed aid very materially in maintaining high efficiency and low production costs in large manufacturing plants.

Monarch Refillable Fuse Company, 1048 Jefferson Street, Buffalo, N. Y., has recently purchased a large plot of ground at the corner of Leslie Avenue and East Ferry, Buffalo. Upon this will be erected the new factory of the company, which will include a new experimental laboratory for the development and perfection of many electrical devices that the company will manufacture. This new factory will give the company not only more ample space to take care of its increasing refillable-fuse business, but also enough space to install new machinery and equipment to manufacture the new Monarch soldering iron, which it is placing on the market under recent patents issued to the vice-president of the company.

H. W. Johns-Manville Company, New York, N. Y., has recently moved its Chicago headquarters into a handsome new building on Michigan Boulevard and Eighteenth Street, in the heart of the automobile sales district. The main floor is divided up into various sales and showrooms for the many products handled by this company; one of these is a well equipped automobile service station. Conspicuous among the showrooms is the equipment of the lighting department, where exhibits of the company's Frink lighting system, Linolite lamps, Mitchell-Vance artistic metal fixtures and Gill-Parian glassware are displayed to the best advantage. The arrangement of the executive and general office on the second floor is well planned for efficiency and good service.

Hotpoint Electric Heating Company, Ontario, Cal., manufacturer of the well known Hotpoint electric household heating devices, has secured the grand prize for its exhibit of electrical heating appliances at the Panama-Pacific International Exposition at San Francisco. The company also secured the gold medal for its exhibit in the Home Economy Building at the Panama-California Exposition at San Diego. The award of these prizes calls attention to the phenomenal growth of this company, which only twelve years ago started as the Pacific Electric Heating Company on a very small scale at Ontario, Cal., the organization including only three persons at the time. After putting out the well known Hotpoint iron, improving it and adding from time to time the great variety of other heating devices which it now produces, the company has grown to the position where it now claims to be the largest exclusive electrical heating-appliance manufacturer in the world.

Record of Electrical Patents

Issued by the United States Patent Office, September 14, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,153,195. Electric-Lamp Socket. C. B. Clark, East Orange, N. J. Combined socket, hickey and shade-holder. (See cut on next page.)

1,153,210. Apparatus for Operating Two Mechanisms in Synchronism. G. W. Ford, Gourock, Scotland. Arrangement of tripolar motor to synchronize the camera or picture projector and sound producer or recording machine.

1,153,257. Switch. L. Reinhard, assignor to Mechanical Appliance Co., Milwaukee, Wis. Rotating centrifugally operated motor switch closed at a predetermined speed to short-circuit motor winding.

1,153,284. Lamp and Support for Same. J. T. Beechlyn, assignor to General Electric Co., Schenectady, N. Y. Luminous arc lamp having arc and inclosing globe above operating mechanisms.

1,153,286. Tool for Stripping Insulation-Covering from Electric Wires. H. D. Cahill, assignor to F. W. Whitcher Co., Boston, Mass. Hand tool having arrangement of splitting and stripping blades facilitating removal of insulation.

1,153,290. X-Ray Target. W. D. Coolidge, assignor to General Electric Co. Comprises a body of molybdenum and a body of tungsten upon which cathode rays may impinge.

1,153,330. Cash-Register. W. H. Muzzy, assignor to National Cash Register Co., Dayton, O. Has motor driving coin-actuated levers after their actuated movement.

1,153,344. Coil-Forming Apparatus. M. Sandfield, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Details of apparatus for use indicated.

1,153,349. Attachment for Telephones. H. R. Smith, Washington, Pa. Pad and pencil device lighted by battery lamp and adapted to be attached to standard of desk telephone.

1,153,352. Telephony. A. W. Steinke, assignor to Monarch Telephone Mfg. Co., Fort Dodge, Iowa. Exchange arrangements for accommodating lines from both

Digitized by Google

magneto and common-battery substations.

1,153,372. Power-Transmission Means for Operating Dynamos. A. Churchward, Boston, Mass. Tension device for dynamo drive belt comprising a yieldingly held fan pulley.

1,153,384. Electric Welding Apparatus. J. A. Heany, New York, N. Y. Resistance type; has electrodes under predetermined fluid pressure; duration of welding current is automatically regulated.

1,153,394. Outlet Box. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Has outer margin corrugated for co-operation with plastered walls. (See cut.)

1,153,400. Automatic Sprinkler Alarm and Indicator System. F. W. Milliken, assignor of one-half to C. C. Brown, Auburn, Me. Alarm is sounded when water is fed into balanced receptacle from the main and also when the supply is shut off from the main.

1,153,420. Push and Pinch Contact-Plug for Flashlights. A. Brody, New York, N. Y. For use in cigar-shaped battery flashlight.

1,153,422. Potential-Regulator. H. W. Cheney, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Drum-type controlling switch for manipulating transformer taps.

1,153,431. Instrument for Reproducing and Magnifying Sound Waves. C. H. Hulbert, Manila, Philippine Islands. Particular arrangement of coils and permanent magnets with relation to two diaphragms forming sides of thin cylindrical chamber.

1,153,438. Electrolytic Cell. E. E. Norquist, assignor of one-half to Oxygen Gas Co., Kansas City, Mo. For electrolysis of water; comprises special arrangement of cathode containing water, gas bell, flexible diaphragms, etc.

1,153,443. Reflector for Vapor Lamps. J. C. Pole, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Two similar truncated segments are arranged to reflect light past source.

1,153,445. Lamp. J. T. Roffy, assignor to Nernst Lamp Co., Pittsburgh, Pa. Projecting lamp comprises lens, tube and lamp socket with globe between socket and lens and surrounding lamp.

1,153,446. Lamp and Reflector. J. T. Roffy, assignor to Nernst Lamp Co. Arrangement of reflecting surfaces to avoid interference by lamp with reflected light.

1,153,468. Stippling Pen. J. H. Vaughn, Oakland, Cal. Comprises electromagnetic vibrator for vibrating the pen.

1,153,474. Armature. T. Abtmeyer, assignor to Westinghouse Electric & Mfg. Co. Core for dynamo armature.

1,153,497. Combination Portable Rope Hoist. S. E. Kalback, assignor to Reading Crane & Hoist Works, Reading, Pa. Either hand or motor-driven.

1,153,505. Means for Divided Control of an Electric Signal Device. M. Levison, assignor to W. P. Crockett, Chicago, Ill., and L. Hammond, Evanston, Ill. Automobile tail-light circuit closed by dash switch and opened by tail switch.

1,153,507. Combined Electrolier and Telephone-Cover. J. McIntosh, New York, N. Y. Standard of electrolier forms cabinet for receiving desk telephone.

1,153,515. Trolley-Actuated Switch. E. H. Owsley, San Jose, Cal. Arrangement for operating multiple switch by passing trolley wheel.

1,153,530. Indicator. C. F. Zinn, St. Paul, Minn. Automobile direction signal having arm and illuminating signals electromagnetically operated in synchronism.

1,153,542. Automatic Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Special arrangements for non-interference with relation to line selectors and master switches.

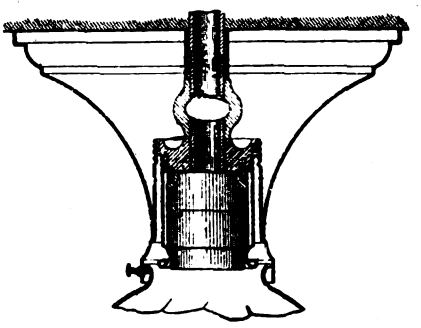
1,153,572. Telephonic Apparatus. W. Rohde, Lincoln, Neb. Battery lamp on telephone controlled by receiver hook.

1,153,573. Supervisory System for Sprinkler Valves. W. A. Rogers and M. R. Parker, assignors to W. G. Cornell Co., New York, N. Y. Electrical means for indicating whether a valve is open or closed and sounding alarm when the valve is in an intermediate position.

1,153,575. Electric-Tool Handle. F. A. Rowley, Sparta, Mich. Details.

1,153,580 and 1,153,581. Electrical Connector. C. L. Sheppy, assignor to Pierce-Arrow Motor Car Co., Buffalo, N. Y. First patent: plug connector for securing to support through which wire passes. Second patent: for making connections through support; insulating structure extends through support and receives plugs at its ends connected by spring structure.

1,153,591. Lamp Socket. W. F. Anklam, assignor to C. M. Hall Lamp Co., Detroit, Mich. Comprises two telescoping portions held in engagement by spring and released by rotation against spring.



No. 1,153,195.—Composite Socket.

1,153,593. Telephone Receiver. N. Baldwin, Mill Creek, Utah. Particular arrangement of electro and permanent magnets, the armature being mechanically connected with the diaphragm.

1,153,605. Furnace-Charging Apparatus. W. F. Clark, Coraopolis, Pa. Pieces to be charged into furnace are magnetically drawn into contact with feed rollers.

1,153,617. Lightning Rod. J. F. Goetz, Hartford, Wis. A hollow conductor is formed by twisting a flat strip and winding a number of wires about it.

1,153,653. Undertow-Warner Indicator Register. M. M. Voorhees, Oak Park, Ill. Submerged actuating element operated by undertow controls circuit of gong on shore.

1,153,655. Telephone Cable. K. W. Wagner, Berlin-Lankwitz, Germany. For self-inductive load; has insulating cover of gutta-percha-like material having small proportion of resin.

1,153,656. Electric Switch for Elevators. F. N. Wake, assignor to Specialty Development Co., New York, N. Y. Special structure for operation by door.

1,153,657. Fuse-Carrying Connecting Device for Electrical Conductors. F. N. Wake, assignor to Specialty Development Co. Has removable end contact caps for ferrule-type cartridge fuse.

1,153,658. Ice Chute. J. C. Warren, Emporia, Va. Has electric indicator controlled by cakes passing along chute.

1,153,667. Power Generating and Transmitting System. V. G. Apple, assignor to Apple Electric Co., Dayton, O. Special structure of dynamo for mounting on engine of automobile.

1,153,672. Rail-Clamp for Traveling Bridges. R. E. Brown and E. C. Gaines, assignors to Heyl & Patterson, Pittsburgh, Pa. Motor-operated weight actuates clamping device.

1,153,703. Electric Heater. S. I. Phelps, Buchanan, Mich. Integral disk of insulating material has resistor wound on it in particular way.

1,153,717. Means for Generating and Radiating Electromagnetic Waves. G. Seibt, assignor to Radio Telephone Co., New York, N. Y. Arrangement for producing weekly damped waves comprising an oscillating circuit haing a condenser, inductance and spark gap in series with an independent auxiliary quenching gap.

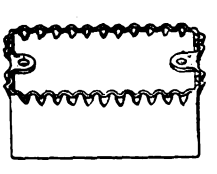
1,153,737. Bargain Indicator. L. J. J. Vanderhoorn, and S. Wouda, Utrecht, Netherlands. Electric sale apparatus comprising price indicator and signal controlled by customer with arrangement for locking out any attempted control subsequent to the first.

1,153,739. Semaphore-Operating Mechanism. C. W. Ward, Lakewood, O. Intermittently operated; electromagnetic.

1,153,755. Circuit-Closer for Fire-Alarms. F. W. Bost, China Grove, N. C. Particular contact structure.

1,153,765. Circuit-Breaker. J. Cuculic, Fiume, Austria-Hungary. Special structure of overload device with delayed opening.

1,153,767. Igniter Mechanism for Internal Combustion Engines. H. R. VanDeventer, Sumter, S. C. Unitary structure of magneto and make-and-break igniter.



No. 1,153,394.—Switch Box.

1,153,786. Reduction of Metallic Oxides and the Like. F. W. Highfield, Caversham, England. In a furnace for the recovering of zinc from its oxide carbon is electrically heated to produce an atmosphere of carbon monoxide.

1,153,794. Mercury-Vapor Rectifier and the Like. J. Jonas, assignor to Aktiengesellschaft Brown, Boveri & Cie, Baden, Switzerland. Special connections with transformer windings of a number of rectifying elements having anode and cathode circuits.

1,153,813. Conductor Support. W. M. Mordey, London, and J. W. Astley and D. B. Saunderson, Prescot, England. Support fits into undercut longitudinal slot in trolley conductor and is two-part so that it can be entered in mouth of slot.

1,153,821. High-Voltage Protection. W. Peterson, Darmstadt, Germany. Particular arrangement of resistance, inductance and condensance in relation to ground connection.

1,153,829. Take-Up for Flexible Electric Conductors. E. F. Rueckert, Providence, R. I. Special structure of reel for automatically taking slack out of conductors.

1,153,839. Electrical Therapeutic Apparatus. R. W. Chapman, Oldtown, Me. A rotatable carrier moves terminals through liquid resistance having submerged terminals, thereby progressively increasing and decreasing resistance.

Reissue 13,978. Automatic Safety Lock for Doors. J. W. Hulme, assignor to Consolidated Car Heating Co., Albany, N. Y. Original No. 990,877, dated May 2, 1911. For car doors; electromagnetic means provided for preventing other than the simultaneous operation of door-actuating device and the lock.

Patents Expired.

The following United States electrical patents expired on September 20, 1915:

610,887. Automatic Circuit-Breaking Switch. W. F. Bossert and W. D. Pomeroy, Utica, N. Y.

610,894. Electric-Railway Car Truck. G. J. Capewell, Hartford, Conn.

610,895. Controller for Electric Motors. F. E. Case, Schenectady, N. Y.

610,898. Electric Arc Lamp. M. Harris, New York, N. Y.

610,899. Electric Meter. C. D. Haskins, Newton, Mass.

610,903. Circuit-Breaker for Three-Wire Systems. E. H. Hewlett, Schenectady, N. Y.

610,904. Safety Device for Dynamo-Electric Machines. E. M. Hewlett.

610,907. Apparatus for Electroplating Articles in Bulk. G. Langbein, Leipsic, Germany.

610,908. Electric Brake. J. B. Linn, Schenectady, N. Y.

610,909. Rail Bond. J. E. Lloyd, New York, N. Y.

610,913. Boiler-Feed Regulator. C. B. Mitchell, Hays, Texas.

610,928. Electrostatic Measuring Instrument. E. Thompson, Swampscott, Mass.

610,982. Electric Locomotive. W. S. G. Baker, Baltimore, Md.

610,999. Electric Heater. J. F. McElroy, Albany, N. Y.

611,000. Electric Coupling. J. F. McElroy.

611,001. Electric Heating System. J. F. McElroy.

611,006. Combined Generator and Steam Engine. M. L. Whitfield, Memphis, Tenn.

611,012. Electric Battery. V. Jeanty, Paris, France.

611,056. Electric-Railway Construction. W. Chapman and P. W. Davies, Pittsburgh, Pa.

611,087. Contact Finger for Controllers or Electric Switches. T. von Zweigbergh, Cleveland, O.

611,088. Governing, Reversing and Braking Controller. T. von Zweigbergk.

611,089. Method of and Means for Controlling and Cutting out Electric Motors. T. von Zweigbergk.

611,090. Controller. T. von Zweigbergk.

611,100. Electroplating Apparatus. H. R. Boissier, New York, N. Y.

611,142. Electric Furnace. R. Pignotti, F. L. Scipione, Regnoli, M. Besso and M. Pantaleoni, Rome, Italy.

611,148. Apparatus for Electrically Coating Wire. W. S. Rawson, London, England.

611,151. System of Electrical Distribution. C. F. Scott, Pittsburgh, Pa.

611,162. Electric Arc Lamp. F. S. Worsley, London, England.

611,175. Galvanic Element. R. Krayn and C. Koenig, Berlin, Germany.

611,185. Rheostat. C. H. Richardson and L. McMakin, Jr., Philadelphia, Pa.

611,206. Circuit-Interrupting Device. D. M. Moore, Newark, N. J.

611,215. Electric Controller. S. Harris, Twinsburg, O.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 14. CHICAGO, SATURDAY, OCTOBER 2, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER SOCIETY FOR ELECTRICAL DEVELOPMENT DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:

Service to Lighting Customers.....595
The International Engineering Congress.....596
Illumination and Accident Prevention.....596
Again the Electric Vehicle.....597
Skin Effect.....597

DEPARTMENTS:

Commercial Practice.....603
Electrical Construction.....606
Public Service Commissions.....613
New Electrical and Mechanical Appliances.....631
Current Electrical News.....636
Record of Electrical Patents.....639
Electric Vehicle Section.....641

LEADING ARTICLES:

Electricity in Sand and Gravel Plants.....599
New England Contractors Association.....607
International Engineering Congress.....614
Illuminating Engineering Society.....619
American Electrochemical Society.....625

MISCELLANEOUS:

Chicago Electric Club-Jovian League.....598
Telephone Pioneers Meet at San Francisco.....598
World's Insurance Congress.....598
Gas-Filled Tungsten Lamps from Central-Station Standpoint 603
Effective Painted Display in Janesville.....603
Massachusetts Electric Companies Show Decided Gains..604
Fireclay Company Increases Profits by Use of Central-Station Service.....604
Central-Station Practice in Renting Motors.....605
Float-Switch Controls from Two Points for Motor-Driven Pump 606
Rules of New York City Board for Licensing Electricians..606
Should the Business of the Electrical Contractor and Dealer be Combined? 612
Association of Edison Illuminating Companies Re-elect Officers 632
Institute of Radio Engineers.....632
To Popularize Electric Lighting by Edison Day Prize Contest 629
Big Chicago Jobber's Employees Make Money.....629
New England Electric Vehicle Committee Report.....641
Chicago Electric Announces Price Reduction and Battery Rental System.....641
Edison Storage Battery Ruggedness.....646

Copyright, 1915, by Electrical Review Publishing Company, Inc.

SERVICE TO LIGHTING CUSTOMERS.

While it is generally recognized that service is the commodity now sold by utility companies rather than so many kilowatt-hours of electrical energy or so many cubic feet of gas, unfortunately there is not the same universal understanding of what service really constitutes.

It is true that the standardization of gas and electric service from the source of supply to the customer's meter has been raised to a point that leaves practically nothing to be desired, but beyond insuring of safe construction and perhaps making recommendations for a proposed installation, little is usually done to see that the suggestions or recommendations made are actually carried out, or that the customer continues to remain in the class of satisfied users.

In the lighting field particularly is there a need for greater attention to customers, as the possibility of dissatisfaction resulting from improper maintenance, use of inferior lamps, etc., is likely to exist.

The lighting salesman or specialist usually is concerned only with suggesting an installation that will meet the needs of the customer, although it should be his duty to actually supervise the installation and see that prompt service is rendered. It has often happened that a customer has accepted the advice on changes in the location of outlets, or purchased accessories from the electrician or gas fitter, which have spoiled the desired results, and the unsatisfactory conditions which have inevitably followed have been blamed on the utility representative. Nor is the work of the salesman completed when the installation has been made. In fact, the rendering of service really just begins at this point.

Maintenance of a lighting system so that it will continue to give satisfaction is a most important feature and is simply a matter of education that clearly lies within the province of the central station. The customer must be taught that lamps deteriorate with age and must be replaced, and that reflectors and glassware must be periodically cleaned, and that changes in the arrangement of a store, for instance, may mean a rearrangement of the lighting units. This educational work should preferably be done by the salesman who secured the contract, and, of course, entails frequent visits to the customer's premises. This will ultimately lead the customer to an intelligent appreciation of proper illumination and impress upon him the important fact that the company is genuinely interested in his continued satisfaction.

Digitized by Google

THE INTERNATIONAL ENGINEERING CONGRESS.

The International Engineering Congress, which was held at San Francisco last week, was occasioned by the completion of the Panama Canal which, from the standpoint of size, is one of the greatest engineering accomplishments of the century. The events of the last two weeks raise the question as to whether the canal is actually completed, since slides are likely to occur for some time to come, as was foreseen when the canal was opened to traffic.

The present condition of affairs in Europe has naturally interfered to some extent with the success of this Congress. The two great objects of such a congress are the bringing together of, so far as possible, all available information and experience upon the topics which are made the subjects of discussion, and the commingling in personal intercourse of engineers from all parts of the world for the exchange of ideas. The latter has of course been interfered with by the fact that many prominent engineers of Europe who would otherwise have participated have been kept at home by the war. A number of papers have, however, been written by foreign engineers for the Congress, even though they themselves have not been able to be present personally. The proceedings of the Congress represent a vast fund of accumulated information upon a large number of topics which will be available for future reference.

The discussion of these papers, and especially of those presented at the electrical sessions, was not as spirited nor as complete as might have been wished, and in this respect the sessions were hardly as interesting as those which characterize such conventions as are held by the American Institute of Electrical Engineers. One reason for this may have been the rather full program which was arranged and the comprehensiveness of the topics covered by some of the authors. The holding of simultaneous sessions upon different branches of engineering may also have contributed to this result in some measure by preventing the attendance of all those who might be interested in a particular paper.

The arrangements for the Congress were very complete and great credit is due to those who were responsible for carrying it out The attendance of American engineers was as large as could be expected, and a large number of additional memberships which have been enrolled guarantee the financial success of the undertaking. It is to be hoped that such gatherings may in the future be held more frequently than has been the case in the past.

It is distinctive of the electrical progress of the age that Mr. J. J. Carty, who is so largely responsible for the accomplishment of transcontinental telephony, should have made the prophecy at the closing session of the Congress that if such a one should be held in Japan in the future, it will be accompanied by the ability to carry on telephonic conversation between that country and this.

ILLUMINATION AND ACCIDENT PREVENTION.

Statistics presented before the recent convention of the Illuminating Engineering Society by Mr. R. E. Simpson, in a paper dealing with accidents and illumination, indicate that an astonishingly large number of accidents occuring in or about industrial plants are due directly or indirectly to a lack of proper illumination. To be exact, 23.8 per cent or 21,658 accidents during the year 1910 were traced to this cause. Undoubtedly, similar investigations carried on for the current year will show a marked improvement, at least somewhat commensurate with the activities of those interested in good lighting, in promulgating educational work in this direction, but even to the most optimistic enthusiast there must be apparent a vast field for improvement.

It is evident to those who have had occasion to analyze conditions that a large share of accidents caused by insufficient illumination occur on stairways, passageways and other seldom-used parts of shops, which are just the places that are likely to be slighted in the original installation, or the maintenance, of factories equipped and operated by the rule-of-thumb method. The cost of rehabilitating the lighting equipment is but a small part of what is likely to be incurred in accident liability.

Another fact which is evident to those who are familiar with the lighting conditions in the average small industrial plant, is that because of either ignorance or carelessness, improper use is made of lighting units. Workmen are permitted to adjust the lamps, the adjustment consisting in placing the lighting unit close to the work, very often between the man and the work, and almost always in the direct line of vision.

The old carbon lamp contributed a distinct hazard under these conditions, but this hazard has been greatly increased since the introduction of the high-efficiency lamp.

The manufacturer usually feels that he must necessarily use his own judgment in arranging the lighting installation without recourse to the advice of the consulting engineer or lighting specialist, who is seldom, if ever, called in to give advice on installations where the total connected lighting load is in the neighborhood of one kilowatt. In the larger manufacturing plants the lighting bill will bear about the same proportional relation to overhead expenses as it does in the small shop, although the bill itself will be many times larger.

The responsibility for good lighting must, therefore, rest with the lighting salesman, lamp salesman or accessory salesman. Fortified with statistics such as presented by Mr. Simpson there should be less difficulty in selling good installations, and once made, it is the duty of the central-station representative, at least from the humanitarian standpoint, to see that the equipment is not allowed to deteriorate or that changes are made which will affect the efficiency of the installation.

Digitized by Google

AGAIN THE ELECTRIC VEHICLE.

Electric vehicle manufacturers and dealers and central-station companies interested in the development of the electric vehicle should find much encouragement in the report of the electric vehicle committee of the New England Section, National Electric Light Association, which was presented at the recent convention of this organization. As pointed out on other pages of this issue there seems to be a marked tendency, at least in the New England States, to give the electric the consideration it deserves with the result that many new installations are being made and others contemplated. In this connection it was reported that a department store in Providence, R. I., had just invested $35,000 in a fleet of electric delivery cars and would ultimately entirely eliminate the gasoline vehicle. Other localities reported corresponding advances and the entire discussion took a decided trend toward returning prosperity.

It has often been pointed out that the development of the electric-vehicle industry in a locality is directly proportional to the efforts extended in bringing the merits of the electric to the attention of the public. This involves, of course, the active support and cooperation of the local central station, but also means that the manufacturers and dealers must be actively represented in a community if the best results are to be obtained. While the revenue from the battery-charging business in itself would justify considerable activity on the part of the electricity supply company, the entire burden must not be placed here.

The field of the electric passenger vehicle is already fairly well defined and its future growth may be predicted with some degree of certainty. The popular impression that the speed of the car is necessarily limited to a very low rate and that because of this feature and the fact that the tendency has been to design vehicles to suit the tastes of women drivers, the field for development is limited, is rapidly being dissipated. The electric passenger car of modern design is capable of speeds in excess of 25 miles per hour and is in every sense thoroughly a man's car.

The field for the electric commercial vehicle has, as yet, hardly been touched. Although a representative list of industries are employing the battery-driven wagon with marked success, there has been no consistent effort made to correlate data on the performance of these vehicles with which to convince potential users of the economy of electric delivery. The first step in the collection of such information could well be undertaken by the central station, the most important feature being the employment of electrics in its own service with a careful check on the results.

With records of successful performance in specific industries to point to, the central-station power salesman would be enabled to do considerable promotive work among his customers and it is undoubtedly true that the prospective user would consider advice from this source in a much more friendly light than the arguments that might be advanced by a vehicle salesman for his particular product. The amount of effort that can be extended in this direction by the army of central-station employees would give great impetus to the industry.

It is hoped that during the forthcoming Electrical Prosperity Week, when things electrical will be exploited, due consideration will be given the electric vehicle. The time is particularly opportune as the approach of the Christmas delivery rush and cold and severe weather makes the question of transportation especially timely. The electric, with its record for dependability and absence of trouble encountered with other vehicles in winter, should come in for its share of attention.

SKIN EFFECT.

It is well known that the resistance of a conductor for alternating currents is greater than for direct currents, and this effect increases with the rapidity of alternation. The available data pertaining to this subject have not, however, been many. An important contribution to the subject has been made by Messrs. Kennelly, Laws and Pierce, who presented a paper at the American Institute describing experiments upon wires, tubes and flat strips with frequencies up to 5,000 cycles. This paper was abstracted in our last issue.

The theory of the subject has also been worked over and experimental results are found to be in good agreement with the computed values. The agreement is better in the case of resistance than in the case of inductance, which also varies with the frequency. It is found that where the return conductor is in proximity to the outgoing conductor of the circuit, the skin effect is considerably increased at high frequencies, although below 100 cycles it is relatively small. The proximity effect was usually imperceptible at distance above 20 centimeters. Stranding has no effect where the strands are kept straight, but when they are twisted there is a slight increase in the resistance.

As is well known, thin tubes were found to exhibit less skin effect than any other form of conductor which was tried. Even half tubes show less effect than flat strips of the same thickness and cross-section. Flat strips have more skin effect than is generally supposed.

The paper is rendered especially valuable by the addition of charts and a table giving values of the Bessel functions which are involved in computations of the skin effect. In the case of flat strips, the results are found to depart considerably from the values computed for an indefinitely wide strip. An empirical formula is given, however, which represents the results at high frequencies for widths of strip in the range covered by the tests.

The publication of these experiments will lend added confidence to the use of formulas for computing skin effect and the computation will be rendered more easy by the work of the authors of this paper.

Digitized by Google

Chicago Electric Club-Jovian League.

At a largely attended meeting of the Electrical Club-Jovian League of Chicago, held on September 23, Samuel Insull, president of the Commonwealth Edison Company, was the speaker of the day. Mr. Insull opened his address by citing some reminiscences of the early days of the central-station industry in Chicago. He called attention to the extraordinary increase in the size of generating units from those averaging only a few hundred horsepower in the first Chicago Edison plant to the unit being installed at the new Northwest station of the Commonwealth system, which will have a rated capacity of 30,000 kilowatts. Speaking of the development of the system, he said, it was based upon the idea of monopoly because only by centralized or monopoly production was it possible to generate electrical energy on the extremely efficient basis now attained. He predicted still greater progress for the industry. In the way of improved efficiency, he anticipated important improvements through greatly improved design and construction of steam turbines. It was highly probable that the improved efficiency of these units would far exceed that of gas engines and producer plants, and fully equal, if not exceed, that of the highest type of oil engines.

Mr. Insull touched on a number of features connected with the history of the Commonwealth Edison Company and its predecessors. He commented on the closing down and complete dismantling of the Harrison Street station of the company, which when it was put into operation in the latter nineties, was looked upon as being the most efficient and largest plant in this part of the country. All of the large generating stations in the city built prior to 1903, have been either entirely torn down and superseded, or at least shut down and held merely as emergency reserve during winter peak loads. He touched on the formal opening of the new Edison Building and what it meant in the development of the company. The popular opinion that large utility companies are owned by only a few people is erroneous. For instance, the Commonwealth Edison Company has about 3,000 stockholders, of whom about 40 per cent are women; 72 per cent of the stockholders are residents of Chicago. Something like 700 of the employees either are, or are becoming, stockholders of the company. In conclusion, Mr. Insull pointed out the great future for the central-station industry and the great likelihood of early interconnection of central-station systems so as to form a great network practically covering large states.

Telephone Pioneers Meet at San Francisco.

The annual meeting of the Telephone Pioneers of America was held at the St. Francis Hotel, San Francisco, on September 21. A business meeting was held in the morning, Thomas D. Lockwood presiding. The following officers were elected:

President: Theodore N. Vail, New York City.

Vice-presidents: Thomas D. Lockwood, Boston; A. S. Hibbard, Chicago; T. B. Doolittle, New Haven, Conn.; L. B. MacFarlane, Montreal, Can.

Treasurer: G. D. Milne, New York City.

Executive Committee: E. F. Sherwood, F. A. Pickernall, C. G. DuBois, A. L. Salt, New York City; R. T. McComas, Cincinnati, O.

R. H. Starrett will continue as secretary.

In the afternoon a session was held at which C. G. DuBois presided. Papers were presented by Thomas D. Lockwood, C. B. Hopkins and H. W. Pope.

In the evening a banquet was held at the St. Francis Hotel.

The two following days were devoted to entertainment.

On Wednesday, September 22, a trip was taken up Mt. Tamalpais and to Muir Woods, a barbecue being held at the latter place. On Thursday a trip was made to the Panama-Pacific International Exposition, where a plaque was presented to the Telephone Pioneers. Lunch was served at the Old Faithful Inn, and the Panama Canal exhibit was visited in the afternoon.

World's Insurance Congress.

Brief mention has been made in these columns of the World's Insurance Congress, which opens at San Francisco, Cal., on October 4, and closes October 16. The program for this gathering is an exceptionally interesting one in that it covers in a comprehensive manner all branches of insurance. The meetings during the first week of the Congress will be held in the Municipal Auditorium. The meetings on October 11 to 14 will be held in the Court of the Universe on the grounds of the Panama-Pacific International Exposition. The proceedings of the first week of the Congress will include a large number of addresses by leaders in the various branches of insurance, the keynote of which will be the service performed by the various classes of insurance.

Among the noteworthy topics will be the constructive influence of insurance, to which the second day will be devoted. On the third day will be a discussion of insurance associations. The fourth day will have as its topic the broadening of social economy through insurance; participating in the important discussions of this day will be representatives of the United States Bureau of Mines, Safety-First Federation of America, American Institute of Architects, American Institute of Electrical Engineers and other educational, commercial, industrial and financial bodies. The fifth day will be devoted to a general discussion of present problems and future contingencies in the insurance business. The sixth day will be left open for miscellaneous discussions.

Opening the second week of the Congress, Monday, October 11, will be set aside as World's Insurance Congress Peace Day. The following day will be devoted to the general topic of the conservation of human life. The next following day will be called "Fire Elimination Day." October 14 is to be devoted to the general subject of accident prevention and the "Safety First" movement. October 16 will be the concluding day, which will be devoted to the report of the Resolutions Committee to the National Council under whose jurisdiction the World's Insurance Congress is being held.

Time will be left throughout the Congress for the inspection of the many exhibits at the Panama-Pacific Exposition of interest from the insurance standpoint, and it is believed that the city of San Francisco itself, which was rebuilt through insurance after its destruction in 1906, will be probably the best exhibit in this line.

International Trade Conference to be Held in New York.

On December 6 to 8, at the Hotel Astor, New York City, there will be held under the auspices of the Foreign Trade Department of the National Association of Manufacturers, an International Trade Conference of special interest and practical benefit to the manufacturers of the country.

Prominent representatives of the transportation interests both inland and ocean, also of the bankers, who provide the machinery for the final adjustment of the accounts in business transactions, will participate in the conference, as will also numerous important importers of American products.

Prominent business men from foreign countries will also be invited to attend, particularly as the events of the past year have served to emphasize the necessity of not only aiding the foreign importer by providing him with goods which he needs, but also to co-operate with the foreign exporter.

Digitized by Google

Industrial Power Series—Article No. 140.

ELECTRICITY IN SAND AND GRAVEL PLANTS.

To facilitate easy reference to the articles dealing with the use of electrical energy in the various industries, which have been published weekly, with but few interruptions since the issue of January 6, 1912, the above means of identification has been adopted. Each subsequent article will be consecutively numbered.

The mining of aggregates for concrete uses by means of electrically operated machinery has been developed to a point of high efficiency by two companies in Massachusetts. Motives, of economy and convenience prompted the adoption of this type of power, which in both cases is obtained from central stations which serve the respective territories. In each installation there are 15 motors.

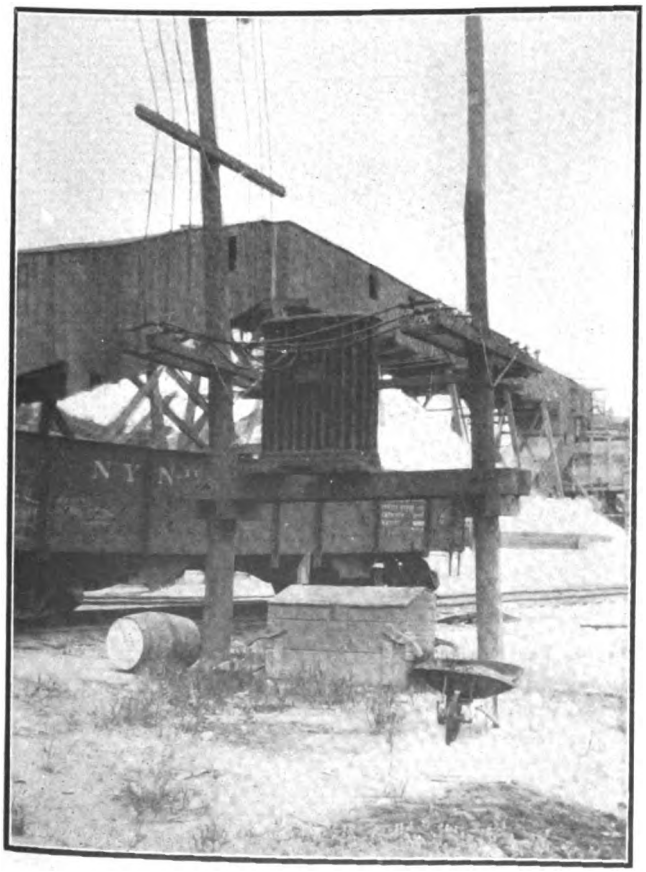
The Hugh Nawn Contracting Company, of Boston, a concern which does a great amount of concrete construction and is at present engaged in excavating and building a long section of the new Dorchester tunnel for the Boston Transit Commission, operates a plant at Sharon Heights, Mass., about 20 miles south of Boston from which the greater part of the sand and gravel aggregates which it uses are obtained.

Here a large deposit of excellent materials, located near the Boston Division of the New York, New Haven & Hartford Railroad, is being mined with the exclusive utilization of electrically driven machinery. A movable excavating house is located at the gravel bank, equipped with a 45-foot boom and a 1.25-yard clamshell bucket which is operated by an 82-horsepower induction motor having variable speed, for the operation of the drum, through a street-car type controller.

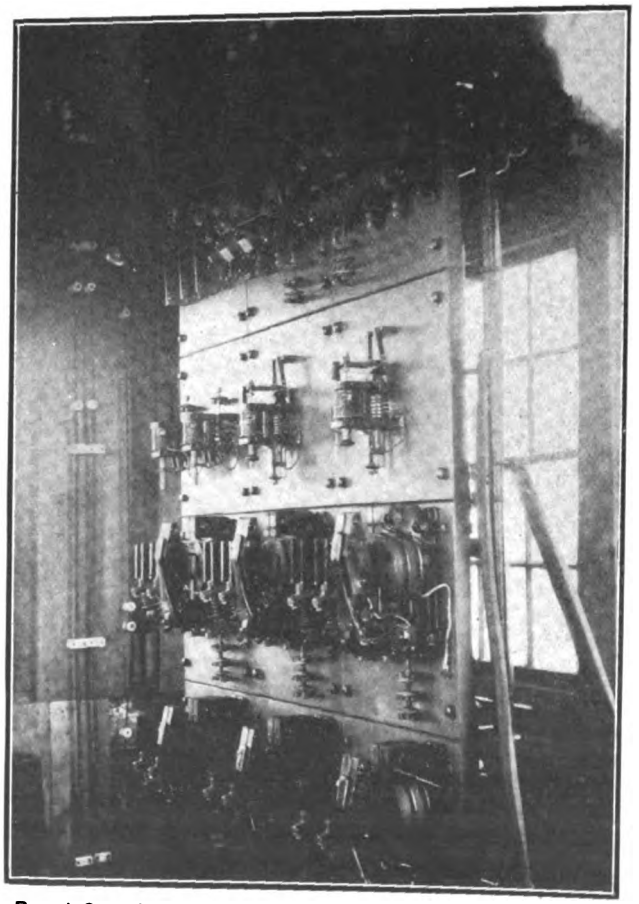
A line of belt conveyors runs parallel to the excavated face of the bank. The bucket discharges into a hopper over the belt, the hopper being agitated by a one-horsepower motor and the materials falling onto the 18-inch belt conveyor, which carries them 155 feet to a junction hopper, there discharging to a 20-inch belt conveyor which carries the materials 300 feet to the foot of the elevator tower. The first belt is driven by a five-horsepower motor and the second by a 15-horsepower motor.

The next movement of the materials is up the incline, which is by means of a 20-inch belt run by a 15-horsepower motor. The materials fall from the belt discharge onto a "grisly" or steel slatted screen. The smaller aggregates fall through this to two finer-meshed pulsating screens, each of which is operated by a five-horsepower motor, while the large stones pass down a chute into a bin which leads to a stone crusher.

From the pulsating screens referred to, the sand falls to a hopper about 20 feet below, while the pebbles come out the end of the screens and fall onto an 18-inch conveyor belt, together with the large stone, and both are carried about 75 feet to the crusher,



Transformer Installation at Sand and Gravel Plant.



Board Carrying Contactors for Operating Large Mill Motor.

Digitized by Google

the belt being operated by a five-horsepower motor.

From the end of this conveyor, the aggregates discharge to another grisly screen, the stone to 1.5-inch diameter passing to a lateral belt, and the larger stones to the crusher. After being crushed, both materials are carried by the same belt, which is run by a 10-horsepower motor, 40 feet to a rotary screen, which is operated by a 10-horsepower motor and automatically sorts the aggregates into four sizes of stone, besides sand. The sizes of stone are 0.5 inch, one inch, 1.5 inches, and tailings.

Under the bins, which are provided with gates in their bottom, an 18-inch belt conveyor, provided with movable trippers, which allow for various dumping places desired, carries the materials 300 feet to chute outlets extending from the bunker over a side track on which standing cars are loaded. The contracting company operates a private locomotive, which shifts cars in the yard and sets loaded cars onto the siding of the New Haven railroad.

Under the tailing bin is another chute, with belt conveyor operated by a five-horsepower motor, carrying the tailings 20 feet to the crusher, which is located on a concrete base and is operated by a 55-horsepower motor.

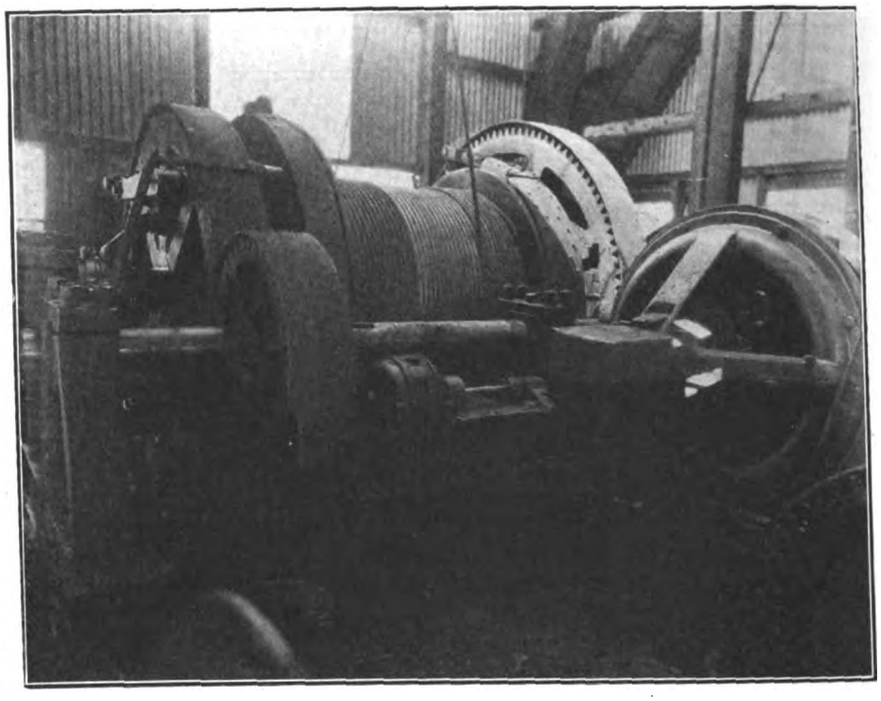
Under the sand piles is a concrete tunnel 150 feet long, 12 feet wide and 7 feet high, through which a 16-inch belt conveyor, operated by a 20-horsepower motor, runs to carry the sand to a hopper over the loading tracks. The same motor runs another conveyor, which carries sand to storage piles if desired, rather than for immediate loading, the mechanism being operated through a double clutch. On the upper, or storage conveyor, a movable tripper with a "butterfly" regulates the flow of sand to one hopper, which conducts it by chute direct to the car, or to a rotary screen, driven by a five-horsepower motor, which screens the sand, and is operated when "screened sand" is ordered. The materials are separated into three bins for the various sized pebbles, and one bin for sand. These bins are located over the railway track, in the form of bunkers, and discharge through gates directly by gravity to the cars underneath.

A notable feature of the motor installation is the fact that each unit, providing one operation, is individually motored, and is independent of the rest of the plant. During non-use, most of the motors are blanketed, but otherwise operate without protection, though the prevalence of flying grits would subject machines of other types than the induction motor to severe tests. Once a week each motor is cleaned and put in condition.

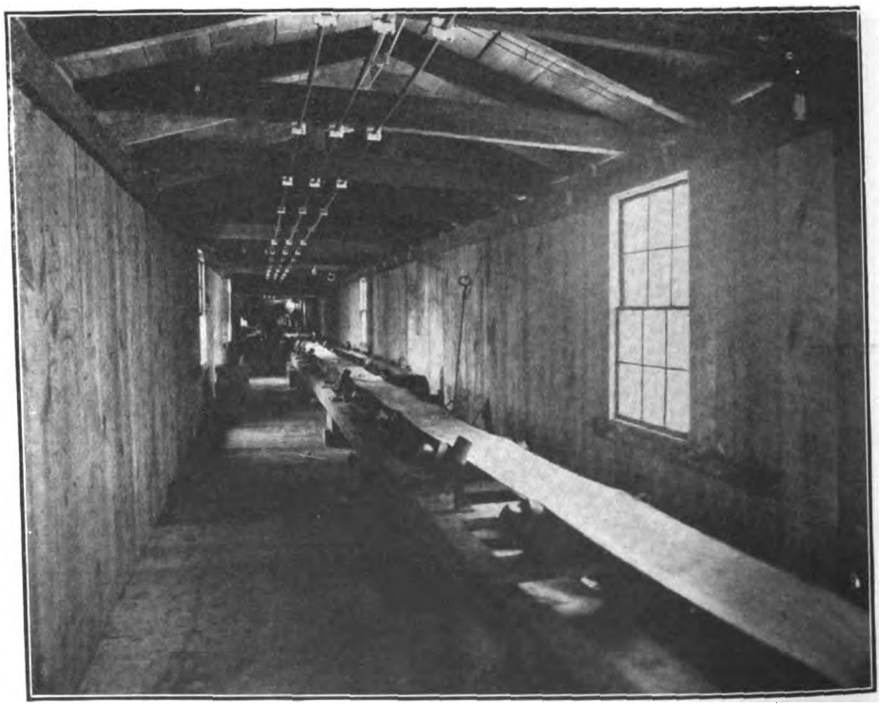
The various machines comprising the plant are operated more or less intermittently, depending on orders or the requirements of construction jobs, but the plant is run the year around. When not engaged in loading, opportunity is taken to excavate and screen materials and place them in storage. This work is more or less subject to weather conditions, but some part of the plant can usually be kept busy at all times. Only by the use of electrically operated machinery could the demands of the situation be met, which require the placing of the motive power in various locations, such as in tunnel, towers, galleries, etc., and in connection with the outdoor belt conveyors, which require being moved from time to time. These motors are housed from the weather in frame boxes, and connections are made on temporary pole lines, which also run to the excavator house.

Energy for the operation of the Nawn plant is obtained from the Boston Edison Company's Walpole substation. A transformer is erected on a platform in the yard for plant operation, and is of 100-kilowatts rating, operating on a primary voltage of 2300/4000 Y, and producing 230/460 volts secondary on a three-wire system.

The plant has a capacity of about

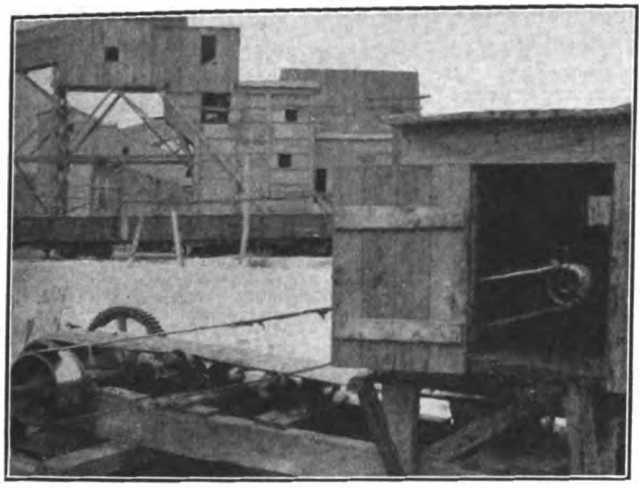


Cable Drum Driven by 165-Horsepower Motor.

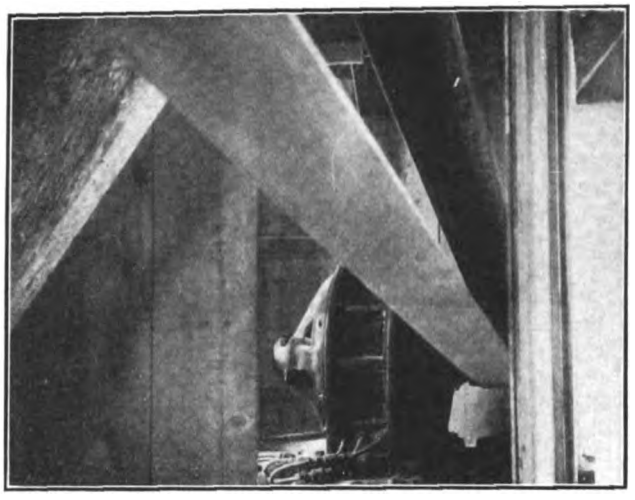


Motor-Driven Belt Conveyor Over Storage Bins.

Digitized by Google



Motor Driving Sand Conveyor.



Motor Operating Stone Crusher.

1,000 cubic yards a day. The belts could handle 2,000 yards, but the shovel's capacity is about 1,000 yards. The average daily volume handled is about 700 yards. The cost of current used is about $280 a month, or 1.6 cents per cubic yard. It requires from six to eight men to run the plant, which is in charge of F. J. McLaughlin.

Electrically Operated Sand Plant at Tidewater.

The sand and gravel plant of the Boston Sand & Gravel Company is at Scituate, Mass., about 25 miles southeast of Boston, on the shore of the North River, about two miles from the ocean. Here a hill, estimated to contain 75,000,000 cubic yards of the two materials in about equal quantities, is being excavated, the sand and gravel separated into various aggregates and conveyed to a wharf and loaded directly on steam lighters for transportation to various cities on the coast. The materials are of glacial origin and are considered without superior for concrete and other types of building construction.

On the crest of the hill, which forms a bluff facing the water side, is a portable digger house, having a heavily reinforced concrete floor which forms a base for the "engines," or drum mechanisms, and the driving motors. A 165-horsepower induction motor is geared to the drum, which handles a dragline bucket of three cubic yards capacity. The bucket is hauled forward and backward on two 1.5-inch wire carrier cables, dumping onto the top of a timber tunnel which has been constructed by drifting into the cliff.

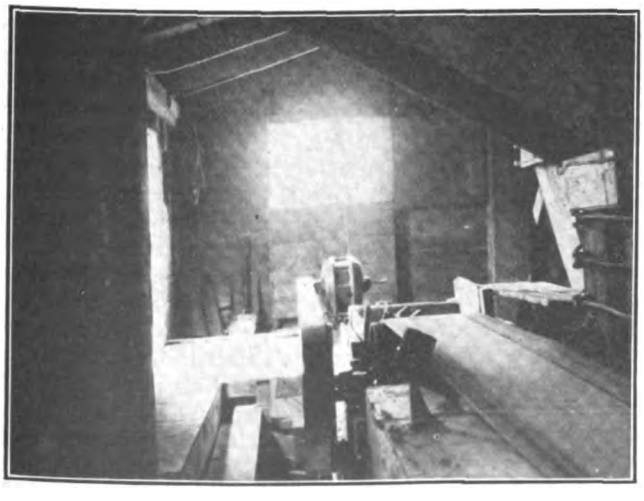
A 35-horsepower motor located back of the main drum-engine raises and lowers the suspension cables and dumps the bucket by pulling a five-eighths-inch cable attached to the back of the bucket. The cable which hauls the bucket forward is one inch in diameter, and the return cable three-fourths inches. The 165-horsepower motor on the main drum operates at 435/450 revolutions per minute. A three-horsepower motor operates an air compressor which sets the friction clutches on the high and low speeds in either direction on the main drum.

A room above that containing the drums and motors is the operating tower. Here is located a street-car type controller for operating the motor working the suspension cables, and five hand levers controlling the various speeds and directions of the bucket cable and two foot brakes. There is also a controller for the operation of the air-compressor motor, all handled by one man.

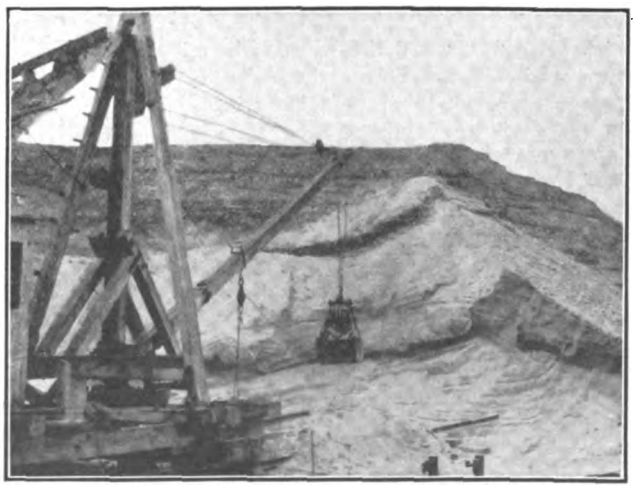
In the operating tower is located a special three-panel board carrying seven contactors which give the several forward and reverse speeds to the large motor. The controller operates these contactors electrically with a current of about 20 amperes. Overload relays are provided on the controller and on the motor.

The digger house is moved from time to time to make each new cut in the hill. It is erected on blocks and moved on rollers, and secured in position by wire guy ropes.

The tunnel is about 150 feet long and 8 feet square. From its entrance a trestle runs on an incline about 300 feet to the crushing and screening plant. Two 10-yard conveyor cars are operated over tracks which are parallel on the trestle and convey to a single line in the tunnel. The cable lengths are such that when one car dumps on the trestle, the other is set in the proper position underneath a gate, which is opened by a man stationed there and in communication with the man on the trestle by means of a bell system.



Motor Operating Belt Conveyor.



Electrically Operated Bucket.

Digitized by Google

In the tower at the top of the trestle are the two drum engines for operating the cars by cable, and the controller and levers. The cable drums are operated by a 75-horsepower induction motor, connected with the drums by friction drive, operating at 575 revolutions per minute at full load and 600, no load.

The cars have automatic side dumping arrangement, and when they come to their berth, the materials are discharged to a chute leading to a grisly screen of interchangeable meshes, according to the size of the largest of the aggregates desired.

The runoff goes to two crushers, both run by a 75-horsepower motor, of 865/900 revolutions per minute. The same mover operates a set of screens, an elevator bucket conveyor, and a sand conveyor, with starting compensator connected. A switchboard room adjacent contains a switch for this motor, one for a pumping motor, one for each of two 35-horsepower motors operating belt conveyors and one for each of three smaller conveyor motors. This enables the whole plant to be controlled from this location in the tower. The various motors are also stopped by the throw of a switch at each unit, but cannot be started without the closing of both switches.

All materials coming to the pulsating screens are thoroughly washed, a Goulds rotary pump with a capacity of 2,200 gallons per minute, located on the wharf and driven by a 75-horsepower motor flooding the screens and driving the sand into a tank below.

The bucket elevator referred to takes the crushed stone for the crusher up to the screens, where it is washed, like the gravel. The sand that falls into the tank is expelled at one end by paddles which are run by the same motor which operates the crushers and conveyors. All the water, together with the loam and dirt, is carried off through a large metal pipe 500 feet to the river meadows.

The stone, having been washed and screened, is carried along a gallery which projects toward the wharf, with storage bins beneath, on three belt conveyors, two of them 14 inches wide and operated by five-horsepower motors, and one 24-inch, driven by a three-horsepower motor.

Underneath the storage piles, which are separated by plank walls, are two parallel tunnels constructed of concrete, each about 8 feet wide and 6 feet 6 inches high. In each of the tunnels is a 30-inch belt conveyor which runs up a gradual incline to the loading tower above the wharf, alongside of which the lighters are tied up. Each of these belts is driven by a 35-horsepower motor and is controlled for variable speed by a street-car type controller located beside the motor near a window from which the loading process can be watched. There are 32 gates in each tunnel, so arranged as to permit of any combination of sizes or grades of aggregates desired. With both conveyors running, a 500-cubic-yard lighter can be loaded in 30 minutes.

The Boston Sand & Gravel Company operates one lighter of 1,000 cubic yards' capacity, five lighters of 400 to 600 yards, and several barges. Throughout, the plant is equipped with electric lights of sufficiently large candlepower to provide for the easy operation of the apparatus at night. In addition to the motors mentioned, there is a five-horsepower motor, connected with a fresh-water pump for supplying drinking water at the plant and for filling the tanks on the boats; two small motors in the blacksmith shop, and an electric portable drill, for use in repairs on machinery.

Energy is obtained from the Electric Light & Power Company of Abington & Rockland, one of the companies under Stone & Webster management. Electricity is received over a 13,000-volt line about 16 miles in length which also supplies the town of Cohasset. The transformer house is of corrugated iron, about 10 by 18 feet, and in it are housed three 200-kilovolt-ampere step-down transformers, which give 550 volts secondary, at which the motors are operated.

The capacity of the Scituate plant is 6,000 cubic yards a day, and it is operated the year around. Ten men are regularly employed. William Barnes is the electrician of the installation, under Superintendent Heyer.

Tabulated data on the motors accompany this article.

Sand and Gravel Mining Data.

Plant of the Hugh Nawn Contracting Company, Sharon Heights, Mass. Capacity, 1,000 cubic yards a day. Six to eight men employed. Plant operates the year around.

Total horsepower connected, 248. Total number of motors connected, 15. Average monthly cost of power, $280.

Motor Installation.

Following is a list of the motors installed and their respective drives. Current is supplied at 230/460 volts, 3-phase, 60 cyles:

No.	Horsepower.	Application.
1	82	Operates excavator with 1.25-yard bucket.
1	1	Revolves hopper.
1	5	Operates 18-inch belt, 310 feet long.
1	15	Operates 20-inch belt 600 feet long.
1	15	Operates 20-inch belt up incline trestle.
2	5	Operates two pulsating screens.
1	5	Operates belt 150 feet long to crusher.
1	55	Operates crusher.
1	10	Operates belt conveying pebbles and crushed stone to rotary screen.
1	10	Operates rotary screen.
1	10	Operates 18-inch belt 600 feet long under storage bins.
1	5	Operates belt conveyor from tailings bin to crusher.
1	20	Operates 16-inch belt conveyor 300 feet long, under sand piles.
1	5	Operates rotary sand screen.

Plant of the Boston Sand and Gravel Company, Scituate, Mass. Capacity, 6,000 cubic yards a day. Ten men are regularly employed. Plant operates 12 months of the year.

Total connected horsepower, 530. Total number of motors connected, 15. Average kilowatt-hours consumed per month, 40,000.

Motor Installation.

Following is a list of the motors installed and their respective drives. Current is supplied at 550 volts, 3-phase, 60 cycles:

No.	Horsepower.	Application.
1	165	Operates an S. Flory Manufacfacturing Company engine, hauling three-yard bucket.
1	35	Operates Flory engine handling suspension cables and bucket-dumping cable.
1	3	Operates air compressor for setting friction clutches.
1	75	Operates double-drum Mead-Morrison engine hauling conveyor cars to screening and crushing plant.
1	75	Operates Symons Brothers' rotary crushers, screens, bucket elevator, sand conveyor and paddles for removing sand deposit in tank.
1	75	Operates 2,200-gallon-per-minute Goulds rotary pump, forcing sea water on screens.
2	5	Operates two 14-inch belt conveyors carrying materials to storage piles.
1	3	Operates a 24-inch belt conveyor to storage.
2	35	Operates two 30-inch belt conveyors for loading lighters.
1	5	Operates fresh water pump.
2	—	In blacksmith shop.

Plans of Cincinnati Interests for Prosperity Week.

The campaign of Cincinnati electrical interests on behalf of "Electrical Prosperity Week" was inaugurated on the evening of September 28 at a meeting of the Electrical Club at the Hotel Gibson, where J. M. Wakeman, of the Society for Electrical Development, was the guest of honor. He explained the general objects of the week's celebration, and outlined methods by which it may be made successful in Cincinnati. Thomas Ryan, president of the club, presided, and appointed a committee, headed by L. J. Milnor, to take care of the arrangements for the week. President W. W. Freeman, of the Union Gas & Electric Company, was present, and indicated the company's interest in the plans contemplated. One of the most interesting features of the week in Cincinnati is to be an elaborate display of electrical machinery and appliances at Music Hall, where such novel devices as electrically-operated machinery for washing money, used by the Government, a hospital outfit with the latest electrical appliances, a complete nursery with electrical conveniences and toys, and other up-to-date applications of current will be shown.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Home Economies Department of New York Edison Company.

A Home Economies Department has been organized by the New York Edison Company under the supervision of Misses Broome, Zimmer and Stratton. The new venture will have its headquarters at the Forty-second Street shop of the Edison Company. On September 17 the new department was formally opened with an electrical luncheon, at which were present a large number of special guests who are leaders in the propaganda for progressive housekeeping. The entire luncheon was electrically prepared and at its conclusion the dishes were washed in an electric dish washer.

It is planned to have a series of electrically prepared luncheons to interest editors of household magazines in things electrical, also leaders of various women's clubs and other organizations, etc. The third floor of the Forty-second Street shop has been finely fitted up and all of the electrical devices are connected up just as they are supplied on the market.

Gas-Filled Tungsten Lamps from Central-Station Standpoint.

One of the topics discussed at the recent convention of the New England Section of the National Electric Light Association was the high-efficiency lamp, particularly the gas-filled tungsten lamp. Henry Schroeder read a paper on the technical features of the Mazda type C lamps, which was reported in our issue of September 25. C. A. Dean, of the Cambridge (Mass.) Electric Light Company, made an address on the commercial prospects of these lamps from the central-station standpoint.

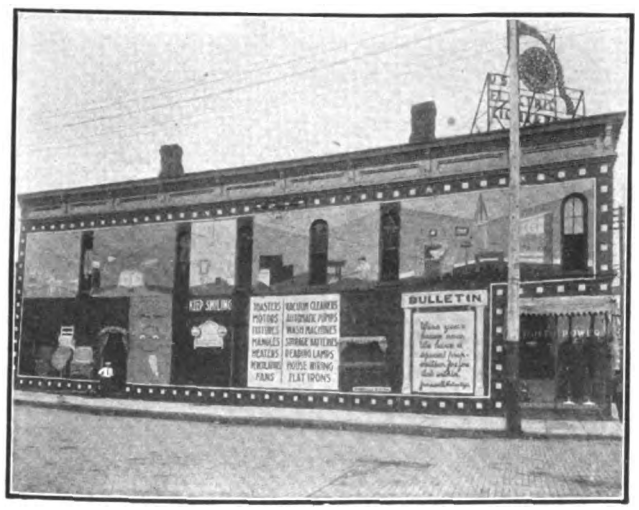
Mr. Dean said the Mazda C lamp has been on the market long enough to prove itself sufficiently reliable to warrant its adoption by central stations. Uniformity would be desirable, but manufacturers are liberal and the average life is high. The largest size available being 1,000 watts, large expenditure for the solicitation of business is warranted, as good average returns to the central stations follow. The speaker pointed out the advantages of the central station co-operating with contractors, architects and builders with a view to securing the best lighting installations in new buildings. In indirect and semi-indirect installations, the customer should be impressed with the importance of frequent cleaning of lamps and reflectors. The placing of the Mazda C unit on trial has proven a successful means of securing new load to the Cambridge company's lines. Each case should be settled promptly, by being made permanent or removed, else the customer is apt to delay decision, the trial being without expense. Mr. Dean pointed out the need of experienced supervision in the distribution of the high-efficiency lamp and said that if a company has a free-renewal policy with respect to carbon lamps, it can well afford to sell the Mazda C below cost. For street lighting, the C lamp is becoming of universal use. In Cambridge is a small installation of 20-ampere 500-watt units, with the prospect of a number more to be added.

Effective Painted Display Sign in Janesville.

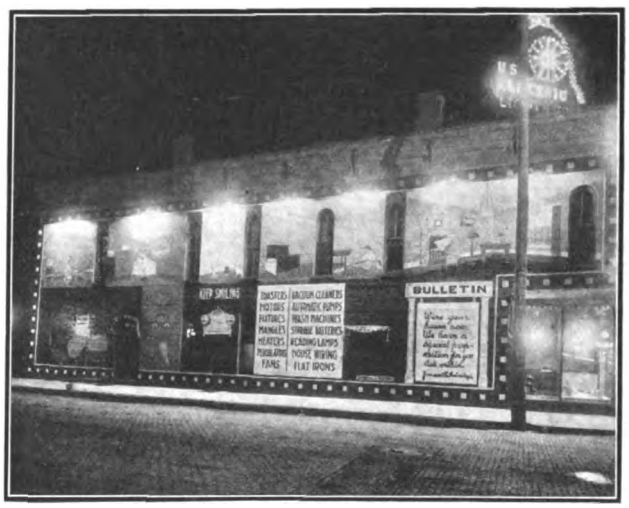
The office building of the Janesville (Wis.) Electric Company occupies one of the most prominent corners in the business section of the city. The potential value of this location, from an advertising standpoint, was only partially realized, however, until P. H. Korst, secretary and manager of the company, conceived the idea of utilizing the outside wall space in the manner shown in the accompanying illustrations. This painted display represents the rooms of a typical house, equipped with the latest domestic electrical devices and provided with suitable lighting fixtures. Day and night views are shown, the wall being illuminated after dark by means of seven 200-watt gas-filled Mazda lamps in suitable reflectors.

The building is owned by the electric company and is occupied also by the Janesville Contracting Company, an allied concern which does the wiring, fixture, and contracting end of the business. A bulletin of this company, of which Mr. Korst is president, is incorporated in the sign.

The painted sign has been given much favorable publicity locally and many inquiries regarding some phase of service indicated in the views have been traced directly to this advertisement.



Bulletin on Wall of Janesville Office Building.



Night View of Bulletin.

Digitized by Google

Massachusetts Electric Companies Show Decided Gains.

Despite extraordinary conditions in the business world, the central stations in Massachusetts show a healthful growth and an unexceptionally sound financial condition. Returns to the Gas and Electric Light Commissioners, which the law requires shall be filed in September of each year, disclose the fact that in all but a very few instances the output of energy for the year ending June 30, 1915, was considerably in excess of that generated the previous year. Current sold for street lighting in most cases is of larger quantity than the year before, though the increase is relatively not so great as that of the current generated. Causes for this condition may lie in the increasing efficiency of street-lighting units and the better quality of carbons used in arc lamps.

Growth in motors and energy supplied for power is to be expected, in view of the constant application of motor drive in substitution for mechanical drive. Noteworthy among the new power applications in the motor installation of the Naumkeag Steam Cotton mills at Salem, which gives the local central station an added load of about 4,500 kilowatts.

Springfield is another city which is fast becoming a manufacturing community of electrically driven factories. Among the large buyers of power are the Hendee Manufacturing Company, Bosch Magneto Company, New England Westinghouse Company, Milton Bradley Company, Smith & Wesson arms factory, and others. Electricity is extensively employed in refrigerating plants, the largest customers for this type of service being Tait Brothers, makers of ice cream.

Table II gives the output of 12 of the largest Massachusetts companies for 1913-14 and 1914-15, a comparison of volume of street lighting sold for the two years, and other details of operation.

I. ENERGY SOLD TO OTHER COMPANIES.

Sold by	To	Kilowatt-hours.	Rate per Kilowatt-hour, Cents.
Fall River Electric Light Company	Town of Tiverton, R. I.	192,855	2
Fall River Electric Light Company	Narragansett Electric Light Company	2,016	2
Haverhill Electric Company	Town of Georgetown	90,450	3.44+
Haverhill Electric Company	Town of Groveland	89,390	3.41
Haverhill Electric Company	Plaistow (N. H.) Light & Power Company	25,880	4.9
United Electric Light Company, Springfield	Turners Falls Power Company	2,354,800	0.8
United Electric Light Company, Springfield	Turners Falls Power Company	1,467,300	1
Worcester Electric Light Company	Conn. River Trans. Company	2,428,280	1
Worcester Electric Light Company	Worcester Suburban Electric Company	1,153	9
Malden Electric Company	Suburban Gas & Electric Company	1,216,000	1
Malden Electric Company	Suburban Gas & Electric Company	5,441	8
Malden Electric Company	Suburban Gas & Electric Company	114,256	1.65
Suburban Gas & Electric Company	Malden Electric Company	66,200	1
Edison Company of Brockton	Abington & Rockland Company	3,849,250	1.31+
Lowell Electric Light Corporation	Town of Littleton	48,590	4.77
Boston Edison Company	Charlestown Gas & Elec.	2,374,453	1.41
Boston Edison Company	Cambridge Electric Light Company	8,137	5.04
Boston Edison Company	Town of Wellesley	796,750	2.36
Boston Edison Company	Town of Norwood	1,484,000	1.92
Boston Edison Company	Town of Wakefield	342,240	2.49

Energy sold to other companies and to municipal plants, and the rate, is shown in table I.

Kansas City Jovians Discuss Prosperity Week.

The Jovian League and Electric Club of Kansas City held its first meeting of the fall on Tuesday, September 21, at the Baltimore Hotel, with nearly 100 present. A committee was appointed to prepare plans for the celebration of Electrical Prosperity Week and to suggest a plan for an electric show during the same week.

Fireclay Company Increases Profits by Use of Central-Station Service.

The Denver (Colo.) Fireclay Company has decreased its coal bill 28 per cent and lowered its power and heating costs $50 per month by substituting central-station service for power formerly generated in a private plant.

The company is engaged in the manufacture of the various types of fireclay apparatus, such as fire brick, crucibles, tiling, oil furnaces for the treating of gold, silver and other metals, pulverizers, crushers, gas and gasoline furnaces, fans, blowers and other apparatus of a kindred nature, used in laboratories, chemical establishments and industrial plants. Between 55 and 60 men are employed in the factory. The plant has been in operation for 45 years.

At first the factory was run by engine drive from shaft transmission. In 1906 it was remodeled. There were then installed a 125-horsepower tubular boiler, a 30-horsepower Chuse engine, direct-connected to a 250-volt, direct-current generator, and a 75-horsepower Chuse engine direct-connected to a 250-volt direct-current generator. The various machines in the factory were driven by 172 horsepower of motors itemized as follows: 15-horsepower motor in the wood shop; 7.5 horsepower in the machine shop, 7.5 horsepower on three clay pressers for making crucibles, 5 horsepower on screen and bucket elevator, 10 horsepower on pug mill and screen, 15 horsepower on pug mill, 70 horsepower on pug mill for fire brick, brick press, grinders, crushers and bucket elevator, 5 horsepower for artesian well pump, 30 horsepower on a grinder, 5 horsepower on bucket elevator, 2 horsepower on a barrel shaker, 5-horsepower freight elevator and 2 horsepower on emery wheel and drill press.

The exhaust steam from the engines is used for the drying of the fireclay materials in the drying room.

In December, 1912, the Denver Gas & Electric Light Company succeeded in connecting a 75-horsepower, 2,200-volt, three-phase, motor-generator, displacing the two engines. This improved the economy of the plant as already noted.

I. COMPARATIVE STATISTICS, MASSACHUSETTS LIGHTING COMPANIES.

Company	Kilowatt-Hours Gen. and Bought, 1915.	Kilowatt-Hours Gen. and Bought, 1914.	Sold for Street Lighting, 1915.	Sold for Street Lighting, 1914.	Arc Lamps Con. in Kw., 1915.	Incand. Lamps Con. in Kw., 1915.	No. Motors Con., 1915.	No. Motors Con., 1914.	Horsepower of Motors, 1915.	Maximum Station Load, Kw.	Date of Maximum Load.	
Boston Edison	198,389,589	188,723,854	14,948,925	18,697,847	4,260	110,848	20,755	.....	96,109	65,342	Dec.	21, 1914
Worcester El. Light Co.	33,399,130	31,564,026	3,179,085	2,168,231	766	13,149	1,853	2,010	17,735	10,000	Nov.	19, 1914
United El. Lt. Co., Springfield	31,106,240	27,900,008	4,019,323	3,846,445	713	15,934	1,891	1,585	10,975	12,665	Dec.	28, 1914
Edison Elec., Ill. Co., Brockton	16,285,691	13,990,203	1,082,109	1,004,193	126	6,255	828	856	6,683	5,000	Dec.	7, 1914
Fall River El. Lt. Co.	14,008,335	13,578,430	1,776,910	1,673,952	481	6,298	735	670	6,891	4,925	Dec.	23, 1914
Lowell El. Lt. Corp'n	13,097,151	12,785,899	1,883,502	1,804,067	507	6,250	1,123	992	6,325	3,830	Dec.	23, 1914
Malden Elec. Co.	10,743,760	10,100,956	1,534,190	1,578,790	159	9,383	694	621	4,439	3,010	Dec.	7, 1914
Lynn Gas & Electric Co.	12,755,920	12,005,080	1,533,307	1,447,913	474	9,917	822	758	7,501	4,150	Dec.	23, 1914
New Bedford Gas & Edison Lt.	8,356,375	6,283,355	1,430,768	963,486	498	4,922	509	517	6,331	3,400	June	19, 1915
Salem El. Lt. Co.	6,648,280	9,188,860	693,486	759,526	172	4,409	1,735	368	4,648	2,500	Jan.	12, 1915
Haverhill El. Co.	6,992,650	6,938,080	345,747	333,029	136	4,400	984	890	4,100	2,600	Dec.	22, 1914
Suburban Gas & El. Co.	3,497,497	3,441,356	563,390	554,670	123	3,707	172	151	1,035	2,000	Aug.	15, 1914

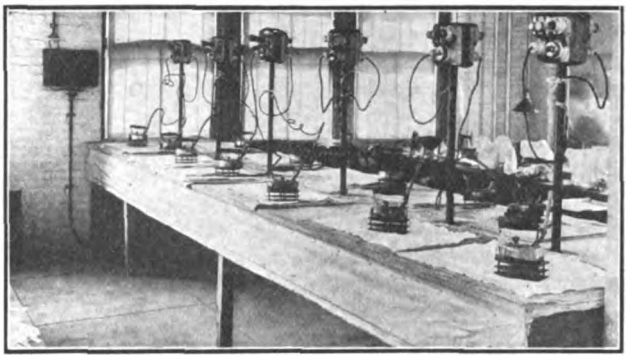
Digitized by Google

Electric Heating for Light Manufacturing Plants a Profitable Load.

Although rapid strides are being made in introducing the electrically heated appliance in manufacturing plants, the efforts in this direction have in no way been commensurate with the vast possibilities in this field. It is not uncommon to see a manufacturing plant with a thoroughly modern and efficient lighting system and a complete installation of electric motors still using crude and bothersome heating appliances.

The New York Edison Company, with a full realization of the possibilities in this direction, has created a separate department to handle this class of work and is now actively engaged in increasing its revenue through this channel. The two accompanying illustrations show two typical installations in New York. The electric iron, because of its wide use in domestic service, was readily adopted by manufacturers and the same success can be had for the many other appliances when advantages of reduced fire risk, increased product, better quality and better surrounding for operatives are properly placed before the prospect.

Electric Heaters in Button Factory.



Electric Irons in Embroidery Factory.

Central-Station Practice in Renting Motors.

As reported in our issue of September 25, the most important topic considered by the recent Kineo convention of the New England Section, National Electric Light Association, was the supply of electric power to isolated mill and factory plants. One of the subjects considered under this general head was the practice in renting motors and an interesting paper dealing with this matter was presented by G. F. Parsons, of C. D. Parker & Company, Boston, Mass.

In Mr. Parson's paper various methods of facilitating a change-over were considered — that of renting, furnishing on trial, etc. The rental of motors for temporary or breakdown service is common. Some companies rent motors for one or two months, with the understanding that they will be purchased at the expiration of that time. Many New England central stations have adopted the policy of selling motors and equipment on the deferred-payment plan, so as to lighten the burden of expense of change from steam or gasoline power.

The company with which Mr. Parsons is connected controls two central stations in Massachusetts which when acquired had a power load of only 40 horsepower. There were 18,553 horsepower of steam and water in use, of which about 11,000 horsepower were in water power. The following plan was decided upon: To offer a complete installation of electric motors including belts, pulleys, shafting and wiring, all installed, allowing the use of the equipment on trial for one year, the prospect paying 15 per cent, which it was estimated would cover interest at 6 per cent and depreciation, set at 9 per cent on the retail price of motors and other materials, and in addition the contract price for installing. The prospect is required also to pay about 1.43 per cent to cover insurance. At the end of the year the company will either sell the equipment at the price set in the lease, or continue the leasing arrangements, the prospect having the option at any time of buying the installation at lease figures less 60 per cent of the 15-per-cent rental charge paid up to the time of purchase. If the customer does not continue the use of electric service the company will remove the equipment and reconnect his machinery.

The plan practically insures the purchase of the equipment. The results covering two years have been: Twenty-nine installations have been made, with a total of 1,436 horsepower in motors. The investment is $28,344; the yearly revenue from the installations is $24,746, and the yearly rental, $4,252, making a total revenue of $28,998. Seven of the customers have repaid $5,997, leaving a balance of $22,347 on which the company is receiving 15 per cent, subject to the reductions in the principal as holders decide to buy their equipment. In addition to the 1,436 horsepower secured under this plan, 1,142 horsepower more were connected to the lines.

The leasing proposition has great advertising value, said the speaker, as it expresses to the prospect the readiness of the company to risk capital in motors in his factory. Otherwise, it might require months of salesmen's work to convince the prospect of the benefits of motor drive. A state institution located in the company's territory has an installation of 118 horsepower, obtained under the leasing plan, which was passed upon favorably by the attorney general. The proposition is also offered to municipalities for pumping.

Valuable suggestions affecting the leasing plan were given by Mr. Parsons, as follows:

Stencil each motor with the central-station company's name and the statement: "Leased for —— months."

Record the agreement in the county recorder's office without delay, to protect against failure or sale of the prospect's machinery.

If a mortgage exists on the prospect's effects, obtain a release relieving the installation from all claims under the mortgage.

Have a clause in the lease to the effect that the prospect will pay the company sufficient money to cover insurance. A blanket policy held by the company should cover all motors and installed apparatus in the territory, enabling the moving of motors from place to place. A rate of about $1.43 per $1,000 is obtained.

In order to secure the company from risk of attachment, a copy of the lease should be recorded in the city or town clerk's office (in Massachusetts) within 10 days.

In a total of 45 installations made in all the Parker properties, no motors have been taken back nor has the prospect's business been lost at the end of the trial period. "Once the prospect acquires the habit of using central-station service he will not get along without it."

In the general discussion on power problems which followed the presentation of Mr. Parsons' and other problems, the practice of other New England central stations was explained. This discussion was reported on pages 580 to 582 in the issue of September 25.

Digitized by Google

Electrical Construction

Float-Switch Control from Two Points for Motor-Driven Pump.

An interesting system of automatic starting, allowing two points of control by means of float switches, for the operation of a small motor-driven pumping plant was recently devised by an electrical contractor and the writer. The scheme is outlined here with the idea that it may be of value to others who are doing this class of work.

The pumping plant contains two units, each consisting of a centrifugal pump direct-connected to a 25-horsepower, three-phase, 440-volt motor of the squirrel-cage type. Water for the pumps is supplied by a natural spring flowing into an open reservoir, which is about 20 feet deep. The water is pumped into a large elevated tank, but the piping is so arranged that the pumps may discharge directly into the water mains when necessary.

One of the motors is started by a hand-operated compensator equipped with the usual overload and low-voltage release attachment. The other is controlled by a self-starter, which is also provided with overload and low-voltage protective devices. This self-starter is actuated by two float switches which are connected in the same manner as the ordinary three-way switches used for lighting circuits. The switches were originally single-pole but two extra contact points, one at each end of the switch lever, were added to adapt them for this service. The connections are shown in Fig. 1. The leads *A* and *B* connect to the binding posts provided for the pilot or control circuit.

The tank switch is set to open the control circuit when the tank is filled and to close it when the water reaches the lowest level. This is shown in Fig. 2-A and is the ordinary method of working such switches. The reservoir switch is, however, set to operate in the reverse way, opening the control circuit when the water has dropped to the lowest level and closing when the reservoir is filled. The switch is made to work in this way by reversing the position of the weight and float which trips the switch. This is shown in Fig. 2-B.

The scheme insures that the tank will be supplied with water at all times and at the same time eliminates the possibility of the pump and motor running idle when the reservoir has not sufficient water to supply the pump. Again, should the water in the reservoir reach its maximum level while the tank-switch float is midway between its points of travel, the pump will be started, thereby preventing any waste

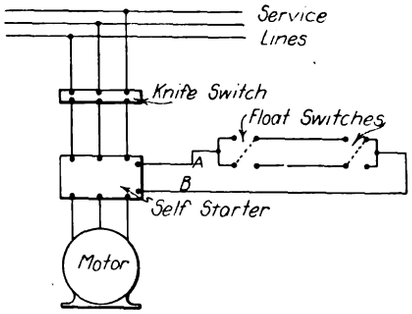
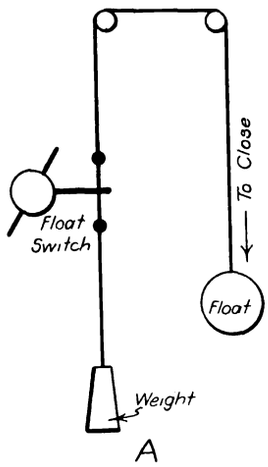


Fig. 1.—Connections of Float Switch.



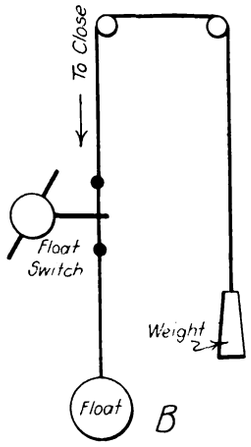


Fig. 2.—Arrangements of Tank Switches.

of water until the tank is again entirely filled. Any standard type of self-starter can be controlled in this manner.

This system has been working for some time and is very satisfactory.

G. A. Schneider.

Rules of New York City Board for Licensing Electricians.

The License Board, appointed in accordance with the new Electrical Code of New York City, has established the following rules:

1. An applicant for a license or a special license shall be required to submit with his application a sworn statement which shall give the age of the applicant, if an individual, shall inform the Board of the period of time such applicant shall have been in business as a master or employing electrician, and shall give a list of at least twelve complete equipments for electric light or power which he has installed. The Board reserves the right further to examine such applicant, either orally or in writing, as to his fitness and qualifications.

2. Applicants unable to comply with the above conditions shall be required by the Board to submit to a written examination.

3. Applications may be made in the name of an individual, a corporation or a copartnership. In the case of a corporation or a copartnership, the applicant shall state the name, age and official position (with such corporation or such copartnership) of its representative who will submit to examination.

4. Where two or more buildings are under one ownership or one management, the person employed by such owner or by such management to supervise the installation, alteration or repair of electric wiring or appliances in such buildings shall be licensed under subdivision 8 of Section 1; or else, the electrician in each building must hold a special license, as provided in Subdivision 11 of Section 1.

Shortly after this week application blanks will be available for distribution. Written examinations as may be necessary will be held during the latter part of October.

Telephone Society of New York.

At the 162d meeting of the Telephone Society of New York, which will be held on the evening of October 5 in the Engineering Societies Building, New York City, Theodore N. Vail, president of the American Telephone & Telegraph Company, will address the meeting.

Digitized by Google

NEW ENGLAND CONTRACTORS' MEET.

Annual Convention at Springfield, Mass., September 21-23.

The development of plans for an organization which shall embrace all reputable electrical contractors in New England; the decision to employ a permanent paid secretary for the Massachusetts Association, and the financing of the expense; the enlistment of the state organization in efforts to the end that improper persons shall not obtain licenses under the new law; and the careful consideration of relations with central stations, employees, manufacturers and jobbers, with a valuable discussion of cost accounting were features of the annual convention of New England contractors held at Springfield, Mass., under auspices of the Electrical Contractors' Association of that state September 21-23. About 250 were in attendance and the sessions claimed the attention of the full number throughout the convention.

At the reception Tuesday evening a silver loving cup was presented to President John R. Galloway of the National Association by W. K. Tuohey, president of the state organization.

Wednesday morning's session opened with an address of welcome by Mayor Stacy of Springfield. President Galloway responded, and outlined the work of the convention. He put the contractors' calling on a high plane, and said that reputation should always stand above money. Mr. Galloway advised contractors to give more opportunities to trained young men who are entering the business, and to discourage the efforts of unqualified men seeking to break into the industry "with a screwdriver."

A report of a contractors' committee on conference with central stations was presented through H. A. Holder, of Boston. It stated that the joint committee had held several meetings in Boston and Worcester and discussed at length the mutual relations. The following topics were under consideration: (1) The maintenance of good will; (2) co-operation in locating prospects for business; (3) following up prospects; (4) securing and signing up contracts; (5) wiring campaigns, and financing such contracts; (6) sale of appliances; (7) sale of motors; (8) furnishing and installing of lamps; (9) following up customers for more business; (10) locating and installing service; (11) metering details; (12) inspection; (13) advising customers on lamps and reflectors best adapted for their use; (14) extension of lines for new business.

Recommendations were as follows: (1) That through the initiative of the New England Section, N. E. L. A., central stations be urged to arrange local get-together meetings with contractors, to discuss business methods; that the Contractors' Association recommend the formation of local organizations, one of whose functions shall be to promote harmonious working relations with the stations. (2) That central stations confer on more uniform working rules affecting relations with contractors, so that rules affecting meter connections and locations, service attachments, ground wires, motor starting currents, etc., be standardized as nearly as practical; and that they influence local inspectors to the same end as regards requirements in the various localities.

That the Contractors' Association print lists of members who are licensed contractors, to be distributed by central stations.

(4) That where prospects are being developed by a contractor on his initiative and the help of the lighting company is needed in locating services, meters, or furnishing information, obtaining right of way, etc., the contractor feel free to ask this without fear of risk of unnecessary competition through any station employee giving away the knowledge. If, however, the central station after consultation with the contractor is satisfied of undue delay in closing the business, the former should take steps to secure the business for its lines.

(5) That central stations prepare lists of unwired houses for use in their own campaigns, these lists to be open for use of established contractors; and that where the former employ wiring and appliance salesmen, they should work for the mutual interests, without partiality toward, any contractor.

(6) That when stations are conducting wiring campaigns, conferences be held with reputable local contractors to take up the question of establishing prices and methods which would be remunerative to the contractors.

(7) In connection with contracts financed by central stations, the prices and terms for additional wiring or appliance sales arranged for after the original contract is closed should be left solely to the contractor and customer for settlement, provided that if the addition is to be financed by the central station, the amount shall be subject to its approval.

(8) On business financed by contractors, lighting companies should help to secure the credit of prospects not listed by the commercial agencies, furnishing the contractor information.

(9) Contractors should help secure business to warrant expensive line extensions, having secured one customer for the line.

(10) That a permanent committee be established to arbitrate differences between contractors and central station.

(11) That it is recognized that the province of the central station is to distribute current, and of the contractor to sell appliances and wire buildings. If dealers do not take proper initiative, the arbitration committee to recommend.

The contractors held that these recommendations were a belated measure of reciprocity, the lighting companies having long dictated. The benefits of close co-operation with the station were recognized.

"It has been and will be the right and privilege of central stations to dictate proper conditions to be observed before the contractors' work can be connected to the lines," the report says. "In the past, contractors and dealers have been greatly hampered in their legitimate trade by the central station overlapping, in doing wiring and joining in the sale of apparatus and appliances. We claim that there is no longer good reason for central stations subjecting contractors to ruinous competition in wiring schemes, and dealers to equally ruinous competition in the sale of lamps, apparatus and appliances. We claim that such practice is unwise policy on the part of central stations and that their true interest lies in recognition of contractors and dealers as capable of being among those most active in advancing their interests. We claim the day has come when contractors and dealers are capable of the entire handling of all installation equipments and that they should be the sole final medium between the product of the manufacturer and the consumer."

The Central Station's Side.

The point of view of the central station was given in a paper by C. R. Hayes, manager of the Fitchburg Gas & Electric Company. Mr. Hayes pointed out that the central station is leading the way in dealing fairly with the public, its controlling interests not tolerating any attitude on the part of their representatives that does not increase the company's standing in the community. The difficult position of the contractor who has to meet competition from the "carpet bag" variety of workman was clearly recognized, as was the hardship of having to compete with lighting companies which maintain elaborate showrooms and instali wiring of various kinds.

"It must be conceded," said the speaker, "that contractors will prosper most where located in a territory served by a live, progressive company with broad, liberal and consistent policies." The welfare of the two factors are tied up together, he said, and the contractor is bound to profit from the growth of the central-station industry

Digitized by Google

The contractors should not feel that there is a reward due them from the central station for business turned into them through the natural activities of their calling; the contracting business would not exist except for the central station.

Mr. Hayes saw in the willingness of the two interests to discuss their mutual concerns a good omen for the adjustment of local differences.

Discussion was opened by F. C. Hard, of the Boston Edison Company, who read a paper by L. R. Wallis, superintendent of its sales department. The latter held that the contractor expects too much; he doesn't appreciate the situation of the central station, which is obliged to deal with the public without discrimination.

Mr. Wallis called upon the contracting fraternity to adopt systematic methods of working, and to follow up hints and idle inquiries about electrical extensions or prospective purchases. Often such lead to permanent business.

Mr. Holder criticized the Edison Company's system as being slow, and suggested a list of the several departments through which an order must go. He said the contractors are reluctant to turn over prospects to the central station to be followed up because of "leaks" by employees of the lighting company, who sometimes give the tips to friends in the contracting business.

Mr. Hard said it would be impractical for the Edison Company of Boston, with its 300 or more installation orders a day, to open up avenues of telephone conversation with contractors over the progress of an order. The company does its utmost to expedite orders, and eliminates unnecessary red tape, but system is imperative. Alluding to the suggestion of an employee giving information to friends, he said such a breach of confidence would result in a summary fate for the offender.

F. L. Barnes, Boston, agreed with Mr. Holder as to the desirability of a published list of departments handling installation orders.

A. J. Hixon, Hixon Electric Company, Boston, suggested a "tracing department," such as is maintained by railroads, which should have the duty of looking up and reporting on orders in which a hitch occurs. The whole central-station organization, he said, could not be expected to be available to outside inquiry.

F. H. Smith, Worcester Electric Light Company, said that his company has a girl who handles all telephone inquiries from contractors and reports on orders, etc. He called attention to the company's eagerness to get service to a customer, because not until then does its income begin.

E. C. Sanderson, a Winchester contractor, and J. P. Coghlin, Worcester, also participated in the discussion.

L. D. Gibbs, superintendent of advertising for the Boston Edison Company, commented on the harmony which pervaded the convention. Commenting on the Edison Company's attitude toward contractors, he said that a mailing list of 350 so-called contractors had been kept. At the office of the State Examiners he found recently that only about 125 had taken the examination and 30 had passed. The contracting business is being purged of its burden of unauthorized contractors, he said. This is of more significance than the problem of selling appliances, etc., which will settle itself.

The contractors, said Mr. Gibbs, will be obliged to take care of the men who have not qualified as employing electricians. The good men among them should be employed. By the working of the licensing law in Massachusetts, the contracting business has been put on the plane with doctors, dentists and lawyers, all of whom must qualify according to law.

"Have every license-holder a member of your organization, and make outsiders feel like smugglers," said Mr. Gibbs. He suggested that the discussion at meetings of the joint committee be manifolded and copies mailed to all contractors in the state. The New England Section, N. E. L. A., will pay half the cost of committee meetings for the year. It was urged that association influence be extended into all the New England states, for better organization.

"Central-station men and contractors have seldom met in the past, except when a contest was on, or else when the contractors were under the patronage of the lighting company," said the speaker. He urged contractors to make friends in central-station organizations and to use them in daily business. He held that central stations should furnish contractors with lists of prospects, and suggested that a fertile field for young men would be to enter the employ of contractors as solicitors of power and lighting installations on a commission basis. Even if such an arrangement were but temporary, the employee would gain an interest in things electrical which would later result in benefit to the employing company.

One reason why many central stations have left the wiring business was that it clogged the company's normal activities. In the matter of appliances, this adjunct enables the lighting company to keep in touch with the customers on a personal footing. How else can this be done? Often, low-priced house wiring campaigns at the outset cause "a holler" from the contracting interests, but prove money-makers for the people who perform the contracts, because of the extras that are added. Three Edison wiring contracts at $14.35 closed finally at upwards of $225 each. The average price paid was between $80 and $90 a contract.

On motion of A. J. Hixon it was resolved that the report of the joint committee be accepted and confirmed and the committee be continued, the findings to be considered binding. It was also voted that the minutes of the convention be sent to contractors in other states having local associations, with the aim that state organizations be perfected throughout New England. It is the aim to make the next convention one of all New England associations.

Licensing Legislation.

The Legislative Committee presented a report of the year's accomplishments, through A. J. Hixon, chairman The law which was passed by the Massachusetts Legislature of 1915 requiring employees and journeymen to take out certificates went into effect September 1. This act has been described in the columns of the ELECTRICAL REVIEW AND WESTERN ELECTRICAN.

Credit for securing the bill is due largely to activities of the Association through its legislative committee, assisted by organizations of electrical workers, inspection and wire departments of city governments and the Association of Municipal Inspectors.

The law is regarded as a decided step in the right direction, but needs following up by keeping in touch with the Examining Board, informing them of the true conditions which the law is aimed to meet, and by following up infractions by either licensees or men who failed to secure certificates of fitness; also, by collecting data on the working of the act, with a view to securing necessary amendments by the next Legislature.

There have been about 700 applications to date for contractors' (Class A) licenses, and 5,500 applications for workmen's, or Class B, licenses. About 650 contractors' and 5,000 workmen's certificates have been granted. In the first rush for certificates, the Examiners had to lay down a temporary policy that they would accept a sworn statement of the applicant meeting the 5-years' experience exemption from examination requirement. In future, however, applicants will be required to make the sworn statement and the clerk of the Board will investigate before the license is issued.

Owing to the simple character of examination questions, many licenses have been issued to undeserving people, the committee said. It is the duty of responsible contractors and work-

Digitized by Google

men to report cases of improperly granted licenses. They are subject to revocal, with severe penalty for misstatements.

Paragraph 2, Section 3 of the law has been interpreted to mean that 5 years' livelihood in electrical work included such people as picture operators, stationary engineers, and others who touch electrical work incidentally. Licenses have been issued to practically all members of the Moving Picture Operators' Union, and a number of steam engineers.

This is contrary to the purport of the law, and should be stopped, the committee held. The rightful interpretation of the act is liable to depend somewhat on the way in which the case is presented to the Examiners.

In the discussion it was stated that a workman holding a journeyman's license can legally take wiring contracts, according to the opinion of an attorney. An exception taken on this point has been put up to the Attorney General for an opinion. Asked whether a helper, working when a journeyman is absent from the job, is legally employed, the chairman replied that there had been no formal ruling on this point.

A. E. Truesdale, Pittsfield, said that employers are loath to prevent employees taking out licenses; it should be the duty of the Association to do this. Mr. Hixon replied that it is a citizen's duty to see that every law is enforced. It is a criminal act for anyone to do wiring in Massachusetts without a license. The duty of prosecution rests with city and town officials, and not with the Examiners.

T. F. Tuohey, Springfield, stated that it was proposed to employ a local agent for the Springfield association, to examine installations and report irregularities.

A. T. Sampson, Lynn, asked if the municipal inspector has not the duty of reporting infractions of the law. Mr. Hixon said that he has that duty. It would be well if the Association were to take up one or two concrete cases of violation and prosecute them as examples, he said.

H. D. Chapin, Springfield, thought it necessary that the law-breaker be caught in the act. This is true, said Mr. Hixon. In Boston a licensee must first obtain a permit from the wire department before installing work. Commissioner of Wires Cole has promised to report incompetents, with a view to the revocation of licenses.

J. P. Coghlin, Worcester, said that country towns, without municipal inspectors, are at the mercy of fake wiremen.

A. T. Sampson, Lynn, pointed out that chiefs of police of the cities should be formally notified that it is against the criminal code to install wiring without a state license. The State Police should also be specially notified.

A resolution drafted by the committee was presented and acted upon at the session of Thursday afternoon.

Relations with Employees.

The Labor Committee was heard, on the relation of the employer to the workman, especially as related to the closed shop. Robert H. Hallowell, of the Lord Electric Company, Boston, spoke from the employer's standpoint, and L. W. E. Kimball, representing the Brotherhood of Electrical Workers from the men's viewpoint.

Mr. Hallowell traced the growth of the labor movement. Disagreements are no longer settled by violence, and strikes are of decreasing numbers and severity. Profit-sharing is the ideal method of harmonizing the interests of labor and capital, but in building trades this is not practical, Mr. Hallowell said.

Labor costs are fluctuating items, said the speaker, because of the diverse capacities of workmen. A good, full day's work is only possible from contented workmen.

The Contractors' Association of greater Boston, employing union and non-union men in about equal proportions, operate under an agreement with the men, whereby a joint board arbitrates all disagreements. A sliding scale of wages was fixed in January, 1914, but by mutual consent the increase that would have become effective July 1, 1915, was not put in force. The plan obviates possibility of strikes.

Mr. Hallowell pointed out that relations between labor and capital must be perfected, in order to meet conditions that would arise were war to be forced upon this country.

Mr. Kimball, of the union, believed in co-operation. His talk was directed principally against the growing menace of the vocational schools of the State. These have turned to the work of wiring public buildings, with the result that many regular electricians are idle. The State Board of Education is not observing a proper ratio between the number of students taking electrical courses and the opportunities for employment, he held. The union is not opposed to vocational training which aims to raise the standard of workmanship, but views with disfavor the turning out of hundreds of youth, more than the labor market can absorb, and the violation of the Board's promise that students are not to do productive work.

The plan in vogue in Chicago, of giving a half day's school training to apprentices who work in shops the rest of the week, was regarded by Mr. Kimball as excellent.

Mr. Hixon held that the schools are a menace to the contractor as well as to the journeyman. The evil should be checked by joint action of the contractors and labor men. It was voted that a permanent committee investigate the subject and devise a remedy. The committee appointed was Messrs. Coghlin, Weatherby and Hallowell.

The National Code.

The Committee on Code, H. W. Kimball, chairman, reported the work of the year, and referred to a meeting of electrical interests in Washington in November, when suggestions for placing the National Code in the hands of the general Government will be considered. Mr. Kimball said the code is often looked upon as a hardship, but actually it is the contractor's greatest protection.

The session of Thursday forenoon was devoted to the relations between manufacturers, jobbers and contractors. George J. Murphy, treasurer Pettingell-Andrews Company, Boston jobbers, presented a paper which set forth the jobbing situation. The wholesale distributor was held to be a necessary factor in the merchandising of all commodities. This is doubly true of the electrical industry, where there are several hundred manufacturers who cannot carry the burden of warehousing, selling and exploiting small articles, which are a large portion of the trade. About 30,000 different articles must be brought together for quick distribution. This involves an expense of 6 per cent for interest on stock carried. There is also a loss of at least 5 per cent for breakage, changing values and obsolescence. The cost of printed catalogs is a large item.

The jobber's selling staff, and advertising costs, involve an outlay of large proportions, also.

The jobber is obliged to keep in touch with the rapid evolution of new inventions, and give his customers the benefit. He is constantly brought in close contact, not only with the contractor, but also with the central station in co-operative promotion of new articles, which tends to increase the commercial use of electricity.

This opens a field of immense possibilities for increase of sales, and the contractor should supplement wiring contracts by selling these new devices.

The manufacturer and jobber have established grade discounts, which take into consideration: 1, the benefits derived from the volume of the order as a factor in increasing sales and moving their merchandise; 2, allowance for the additional warehouse and clerical cost by handling the smaller unit shipment. Every jobber or contractor buys at an equitable cost, based on his working capital and the requirements of his trade.

Digitized by Google

The contractor can and should sell to manufacturing plants in his town, but in order to resell at a profit must buy of the jobber in standard packages or incur the expense of stocking the material. He has the advantage of the jobber in promptness of delivery.

The present method of establishing differential prices, as practiced by all electrical manufacturers and jobbers, is so well identified with the industry as to make difficult any radical change. This policy protects every element of the trade and is a stimulus, rather than a check on the expansion of any factor.

The Manufacturer's Attitude.

W. F. Aberly, sales manager, Western Electric Company, Boston, read a paper on "Loyalty to Accepted Standards vs. the Utilization of Cheap Substitutes." The speaker asked: "Does anyone believe that conditions would be bettered in any way if all co-operated to handle cheaper materials rather than those of accepted standards? If not, the gain is solely to the individual who gets the advantage of his neighbor by underselling him."

The handling of cheap goods is bound to brand a man, unfavorably. A change of lines of material handled induces a lack of public confidence. Unless a contractor has a fixed policy of only buying accepted standards, the price he gets for the cheaper substitutes is of no advantage to him unless he alone receives that price, said Mr. Aberly.

"As a general rule, there is no greater percentage of profit in handling cheaper material than in handling standard goods. * * * I believe it is essential for those who are making the fight for standard materials to stick fast to those who show a disposition to assist in improving conditions," said the speaker.

It was pointed out that in the plumbing trade a division is established between construction materials and domestic fittings; the two lines are sold by different sources. It would be well if there were in the electrical business a clearer distinction between the functions of the contractor for installations and the dealers in domestic appliances. Mr. Aberly held that the contractor would make more money by devoting his whole time to construction, unless specially fitted to handle the merchandise end.

Frank L. Barnes, Boston, held that the contractor is allied equally with the central station, the manufacturer and the jobber.

J. P. Coghlin, Worcester, felt that the diversity of discounts on electrical merchandise is misleading, causing many to believe there are very large profits in handling them.

H. F. Haskell suggested that a "standard" article is one which has passed the laboratory test.

Concluding the discussion, Mr. Aberly said there is no agreement between jobbers for the control of a manufacturers' product, this being illegal.

The following committee of manufacturers, jobbers and contractors was named, to report, next year, a plan to conserve harmony among the several interests:

From the manufacturers and jobbers: W. F. Aberly, Boston; G. J. Murphy, Boston; W. H. Hoppin, New Haven; J. E. Greene, Boston. From the contractors: H. D. Temple, Worcester; P. C. Fitzpatrick, Springfield; E. M. Baldwin, Hartford, Conn.

J. P. Mallett, of the Society for Electrical Development, asked the contractors to help make Electrical Prosperity Week the greatest event in the history of the industry. He called attention to the fact that the contracting interest has equal representation in the direction of the Society, and hoped more contractors would become members. One of the Society's objects is to promote harmony between factors, two men being regularly engaged in this work.

At this session it was announced that the proposal that a paid secretary who should give his whole time to the work had been provided for by the underwriting of the expense by about 25 contractors subscribing $50 each for the year.

Resolutions on Licensing Law Interpretation and on Contracts.

The session of Thursday afternoon took up matters of business interest to contractors. Resolutions on the interpretation of the new licensing law were reported by A. J. Hixon, as follows:

"Resolved, That the interpretation of the meaning of 'journeyman' electrician as set forth in paragraph 3, section 1, should not be interpreted to mean other than a person employed at a daily wage and not include the right to the sale of material or labor other than as a daily wage; that in paragraph 2, section 3, 'gaining a livelihood' be interpreted to mean the principal part of a living by the actual installation of electrical materials." It was also resolved that examinations given applicants for certificates should consist in part of a practical demonstration of mechanical and electrical skill.

The resolutions were voted and the secretary instructed to send copies to the Examiners.

Resolutions were adopted, relating to the segregation of electrical from general contracts, endorsing the attitude of the American Institute of Architects. The contractors' association held that the details of installation should always be taken up with the architect or owner of the building, that the general contractor's habit of adding a per cent of profit to the electrical contract is not proper, that the general contractor is usually obliged to award the electrical contract to the lowest bidder and has no interest in quality, except that it pass inspection: and that estimates are usually secured in a hurry and are likely to be inaccurate and low. The Legislative Committee will follow up this matter.

Estimates and Cost Accounting.

Valuable data on how to estimate costs and keep accounts in electrical contracting was presented in a carefully written paper by J. P. Coghlin, a successful contractor of Worcester. He asked: "Why is there such a great difference in bids made by electrical contractors?"

"I believe," said Mr. Coghlin, "that this is generally due to three reasons, the most important being that contractors do not know how to figure, and invariably guess at quantities and labor. This brings the bid generally either away too high or too low, and if the bid is low, the contract is taken at a loss or with too little profit: rarely does this type of contractor get a job at other than the low bid.

"The second reason is that the contractor leaves out something in his estimate: mains, wire for conduit, cut-out cabinets or some other important item. The third reason is that a contractor often is willing to 'take a chance.' He reasons that the last job he figured was 25 per cent high and another got it, by trimming the job, working up extras, or in some other way.

"Large and successful contractors are so because they know how to figure costs. The way to figure contract estimates is to have an estimate sheet, ruled and printed for the kind of business you are asked for an estimate on. For example, have one form for knob and cleat work, another for conduit work, another for factory work, etc. On each sheet have printed the materials that usually go into that kind of work.

"On this sheet there should be two columns, one for totals of quantities estimated, and one for totals of quantities used. When you get a job, keep absolute track of every particle of material which goes onto the job and check back all material returned from the job to be put back in stock. Keep track of scrap material, such as copper wire, etc.

"When you get the totals of materials used, put these totals in the columns of quantities used. This being next to your estimate column, you have opportunity to compare

Digitized by Google

items, and by studying these from job to job, you will soon see where you made errors in your estimates. You will find that some workmen use less material than others on similar jobs, and that different conditions arise which make material vary more or less on individual jobs.

"On large jobs total up material used every week or month. This will enable you to find out whether your workmen are carrying on the job economically. As soon as you start this system your workmen will be more economical of material and labor, since they know their progress is being followed in the office.

"By this system our firm found that a workman had charged up to one job some 8,000 feet of rubber-covered wire not found installed. The check led to the confession of having taken the wire, which was found in the man's room."

Mr. Coghlin pointed out that guessing on labor costs usually resulted in underestimating. "In our experience in checking up the costs of contracts we find that on new house work labor runs from 40 to 50 per cent, on old house work for 50 to 65 per cent; on iron conduit work, fire-proof construction, from 35 to 55 per cent, and wooden construction from 50 to 75 per cent.

"The only way to figure labor is by the unit system. Find what the cost for labor for wire per foot is to put up; on knob and tubes; running wire on cleat work; pulling wire into conduit; the cost per foot to run conduit on various kinds of construction, to set a switch box, to set up and connect cabinet cutouts, etc. Then all that you have to do is to take your quantities on such material as is affected by labor, extend these prices at the unit figure, and you have your total labor costs.

"Have your workmen report each day. Time slips should be put in every day, no matter whether the man is working in town or out of town, and should be O K'd by the foreman on the job. Have the workman indicate the kind of work he is doing, number of hours to do this work, quantity of material installed, and conditions under which the work is done. By taking a series of these and averaging them, you will get your unit cost of labor.

"Electrical contractors will find, if they know their costs, that there are certain lines of work which they will be able to take at a good profit, and should keep after this line of work and let competitors who are unable to discriminate have the other; because if you work out this cost system correctly on different lines of work, you will be surprised to find that on some lines of contracting you are making a larger per cent than you figured, while in other lines you are making a much smaller per cent, sometimes doing certain work at a loss.

"The system outlined will require, for the average contract, the addition of only one girl in the office, at about $8.00 a week. There are many jobs on which you lose more than that amount.

"To determine overhead expense, keep account of every expenditure, no matter how small. A contractor employing one or two men, working with his men and having no office, has at the same time a certain overhead expense, and he will find if he keeps account that it will generally amount to 30 or 40 per cent of his gross business. In the first place, he must charge up to the business a reasonable wage for himself—at least as much as he would get by working for another. If he carries a stock, the interest on money invested is a part of overhead. Insurance, telephone, advertising, contributions to societies, charity, entertainment, etc., are all to be included.

"Account should be kept of all items, such as cost of gasoline, solder, carfares, keeping team or automobile, the yearly total being a substantial sum. The proper way for the contractor, whether large or small, to handle this matter is to charge every item and have the bookkeeper separate them into nonproductive costs and costs charged to particular jobs. Another way is to take the difference between the total of all charges at full cost to the job for a month or year, and subtract the total expenditure, to which should be added nonproductive labor, bad bills, cost of collecting, broken, lost or stolen stock. The total will be the overhead expense."

Mr. Coghlin explained the method of accounting in his own business. There are three different colored stock sheets: a yellow sheet for checking material bought, each package of stock being opened and checked; a red sheet for material returned from work or from a customer, and a white sheet for charging out all material which goes on contract work.

These sheets are turned in to the office daily and totalized against their respective jobs.

For repair work, a special form is used, blocked and with carbon. The workman is given the carbon half, which contains instructions about the job. The original sheet remains in the office. Material on this job is charged out and checked back with white or red stock slips, and is totaled up when the job is completed. On this slip is a billing price column and a cost column. The selling prices are put on and extended by one clerk, and the cost prices by another clerk who is not familiar with the selling prices.

These two clerks, working independently, are unlikely to make the same mistake. Before the bill is made up, the totals are examined by another clerk, to insure correctness.

For cash sales, still another form is used, made in duplicate and handled through a cash carrier system. One copy is wrapped in the bundle and the other goes to the office with the money after being rung up on the cash register by the sales clerk. The register prints the amount of sale on both slips and is thus recorded and totaled.

On the cash sales is a cost column, and every cash sale slip with the cost is extended, as well as the selling price. By extending all these costs one is checking up every sale and at the end of the day, by adding up sales and costs one has gross proceeds. By doing the same on charge sales, one obtains gross proceeds for charges: and as fast as a job is completed, by totaling from charge sheets one has his cost on all sales.

On the sales journal, when making out bills, by extending the billing cost item in a separate column, it is only necessary to add totals of sales and costs for a given period, and the net profit or loss, less overhead expense, is always available. By separating labor from materials, and adding up materials at cost, one has a simple means of keeping inventory of stock.

Starting the first of the year, after having taken an inventory, by adding to this inventory the value of purchases and deducting each month values of sales at cost plus materials used on contracts, the difference in value will be your actual amount of stock in hand, subject only to broken goods and slight fluctuations in prices.

Only by a continual study of costs can a man become a successful contractor, said Mr. Coghlin. Scarcely 25 per cent of contractors have a good knowledge of costs today.

A banquet occurred in the evening, at which Kurt R. Sternberg, of Springfield, was toastmaster.

The following are the officers for the ensuing year:

President, Alfred J. Hixon, Boston.

Vice-president, Charles W. Stiles, Milton.

Secretary, Henry D. Temple, Worcester.

Treasurer, F. L. Barnes, Boston.

Directors, W. K. Tuohey, Springfield; George D. Gidd, Dedham; H. W. Jones, Lenox; J. P. Coghlin, Worcester; Samuel Cook, Northampton, and the above officers.

It was voted that the 1916 convention be held in Hartford, Conn., the association of that state to act as host on this occasion.

Digitized by Google

Should the Business of the Electrical Contractor and Dealer Be Combined?

A meeting of the California Association of Electrical Contractors and Dealers was held in San Francisco on the evening of September 24. C. L. Chamberlain was chairman and there was an attendance of 52.

R. J. Holderman presented a paper discussing the reasons for running an exclusively retail store. He said that contracting and selling are two separate businesses, and gave the reasons why he attempted only one of them. (1) He had knowledge of a merchandising business but not of contracting. (2) Investigating the success of others, he found that only 20 per cent of those carrying on a combined business made a nominal success of them, the other 80 per cent being failures. This was largely because they neglected one branch of the business, the one they were less familiar with. Price cutting was also more likely to be introduced where there is a combined business. (3) In the contracting business alone success is achieved by about 50 per cent of those entering it, as against 20 per cent in the combined group. (4) The same stocks of material are not required in the two branches of the business. To carry two sets of stocks requires greater capital or larger credit. A contractor would probably overstock when acting as a dealer and dead stock leads to failure. (5) The percentage of profit in the two branches of the business is not the same, that of the dealer being 10 or 15 per cent higher than that customary in the contracting business. The result is likely to be misleading cost figures. (6) The future of the retail business is likely to be injured by the participation of those doing a combination business, just as it has been by the department stores.

L. R. Boynton presented a paper giving his reasons for running an exclusive contracting business. (1) He said he was not capable of earning a living any other way. (2) Contracting work can be done more cheaply when not combined with merchandising. Thus the quantity of material necessary for any job can be taken directly from the jobber to the ground. (3) Better credit is extended to contractors who are not retailers. (4) Patrons have more confidence in one conducting a single line of business. (5) Employees are more efficient if their work is not too diversified. (6) Manufacturers do not give the proper support to dealers to enable them to make a success of their business. They have no price protection and credit is not extended so fully as to contractors. Dealers are consequently not able to work up a successful business.

These papers were discussed by R. B. White, George Webber, W. Gribble, W. L. Goodwin, W. S. Berry and W. D. Kolway. Mr. White, Mr. Webber and Mr. Kolway gave reasons why under most circumstances it is desirable for the functions of dealer and contractor to be combined. Material is bought in standard packages and must be kept in stock anyhow. In small towns there is not enough business to conduct exclusively a retail store. When appliances are sold the dealer should be in position to install them.

Mr. Gribble said that there are too many small concerns in the electrical business and not enough qualifications are demanded of anyone entering the business. Even where license laws are in effect and examinations are held there is no test of business ability. Business is consequently not so stable as it should be. It would be more so if contractors conducted stores, which would involve a greater investment of capital.

Mr. Goodwin said there was a field for the strictly retail store in every large city, but this does not apply to outlying districts and small towns. Specialization is only warranted in certain cases and the combination of the two kinds of business is often essential. The fields of the two overlap in supplying extras and in installing appliances. Either class of man should be able to analyze his business and ascertain the different profits necessary in different kinds of work and different lines of merchandise.

Mr. Berry gave an illustration of a particular firm which had suffered by attempting a combination business. This had resulted in overstocking. He thought, however, that combination was necessary in some cases.

Stanley V. Walton then gave an account of a session of the Northwest Electric Light and Power Association which was devoted to a discussion of cooking appliances.

This was followed by a paper by W. S. Orrick on the subject of why contractors should patronize the legitimate jobber. He pointed out that the jobber sells service, which involves carrying in stock about 7,000 different items, if telephone supplies are included. This service costs something and the contractor should support him even though those not supplying equivalent service are able to cut prices. This support will put the business on a firm basis. Many contractors think that they can get along without the jobber, but if they tried to do so, would find that they would suffer. By supporting him they enable him to continue to extend the service which he offers.

Elmer Harding, of the Emerson School of Efficiency, then gave a talk on how the contractor can improve himself by increasing his efficiency.

Secretary W. S. Handridge made some announcements, and M. G. Lloyd, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN was called upon for a few remarks.

A Practical Call System.

In an office building of 22 stories that is kept in good condition, there is a staff of mechanics constantly in service. To find the foreman of any of these gangs is a problem, since he may be in any of a dozen or so rooms. In the superintendent's office is a little switchboard with three flush switches each controlling a lamp on the board for a pilot and one of three over the freight elevator door on every floor. Red, white and green lamps are used. Each foreman has his call; for instance, the electrician's is green, the carpenter's red and white, the head porter's white, and so on. When the superintendent wishes to speak to any of the staff, he calls by this lamp signal and the party called plugs a pocket telephone set that he carries into a little flush receptacle beside the elevator door on any floor and he is then in communication with the chief.

The whole thing is so simple and flexible that it could readily be adapted to suit any requirement of factory or office building.

By being placed near the freight elevator it is easy to wire, using conduit and condulet fittings. All that is exposed comprises three condulet receptacles over the door, the conduit running up the shaft and a short extension coming through the wall on each floor.

The pilot board is placed beside the telephone private branch exchange in the office of the building so that the operator cuts off the signal when the conversation is closed. The lights are conspicuous enough for some of the staff to surely see and yet are not as objectionable as a bell or other call in a public building. All stock materials can be used.

Ben R. Browne.

Concentric Wiring Equipment for Louisville.

A limited number of Louisville houses will be wired on the concentric system by the Louisville Gas & Electric Company in the next two or three months, according to a statement made by Robert Montgomery, manager of the commercial department of the company. Mr. Montgomery recently returned to Louisville from the meeting of the wiring committee of the National Electric Light Association of which he is a member. While in the East he placed the order for the fittings, etc., which will be used in the experimental installations. The plan on which this business will be handled has not been decided on as yet.

Digitized by Google

Boston Contractors and Edison Company Plan for Prosperity Week.

Plans for Electrical Prosperity Week, November 29-December 4, were discussed at a meeting of 210 electrical contractors, jobbers and dealers at the Boston Edison Company's service buildings on the evening of September 8. The company was host at a dinner served the party from the electrical kitchen of the Welfare Buildings, after which the business of the evening was taken up.

L. D. Gibbs, superintendent of advertising for the Edison Company, welcomed those present and stated that the Edison Company would expend between $10,000 and $15,000 in connection with "the week." About $2,800 will be invested in a two-month's street-car-sign campaign, in the 42 towns served by the company, and $1,200 will be expended for bill posting. Other forms of advertising will be window displays in all the company's stores, circulars and newspaper advertisements.

Mr. Gibbs characteristically exhorted his hearers to work unremittingly for the success of Electrical Prosperity Week. He stated that a committee of the Society for Electrical Development in New England, of which President Charles L. Edgar, of the Boston Edison Company, is chairman, will get in touch with central-station men in communities of 5,000 population and over, and the latter will be asked to exert their energies with the men of the smaller towns. The attention of the Massachusetts Electrical Contractors' Association, whose convention will be held in Springfield, September 22 and 23, will be focused on "the week."

H. W. Alexander, of the Society for Electrical Development, gave an illustrated address on the aims and plans for Electrical Prosperity Week.

The following committee of Massachusetts contractors and dealers will co-operate with the central-station interests in making "the week" a great success: H. A. Holder, L. C. Billings, H. S. Potter, William St. George, E. C. Sanderson, M. M. Jacobs and M. C. Brown.

Among the Contractors.

The contracting firm of Charles J. Sutter, St. Louis, Mo., has recently secured two important contracts. One of these is the entire electrical work in the new State Capitol Building of Oklahoma, at Oklahoma City. This structure will have an estimated total cost of $1,500,000. The architects are Layton & Smith, of Oklahoma City, and the general contractors are James Stewart & Company, of St. Louis. The other contract is for the entire electrical work on the Central Trust Building, a seven-story, fireproof office and bank building being erected for the Central Missouri Trust Company, Jefferson City, Mo. The architects of this building are Miller & Miller, of Jefferson City, and the general contractor G. W. Miller & Company, Carthage, Mo.

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The City of Kendallville asked the Commission to approve a new schedule of rates for electric service from its municipal plant to consumers outside the corporate limits of the city. The new rates grade from nine cents a kilowatt-hour for the first 20 kilowatt-hours used per month, to six and one-half cents for 250 kilowatt-hours or over. The Commission approved the rates, adding a minimum charge of 50 cents a month and 10-per-cent discount on bills paid promptly.

NEW YORK—Second District.

The Long Island Lighting Company was authorized to issue $135,000 of five-per-cent bonds and $66,000 of common stock to finance improvement and additions to its plant and distribution system. The bonds must be sold at not less than 87.5, to net $118,125, and the stock at not less than par.

The Empire Gas & Electric Company. The Commission has approved issues of securities by the Empire Gas & Electric Company, Central New York Gas & Electric Company and the Empire Coke Company, which will result in an expenditure of $161,200 for improvements to the gas and electric lighting systems in Auburn, Geneva, Waterloo, Seneca Falls, Phelps, Palmyra, Newark, Lyons and Clyde.

The money will be secured by an issue of $72,000 of the five-per-cent 30-year joint first and refunding bonds of the Empire Gas & Electric and the Empire Coke companies, to be sold at not less than 85, netting $61,200, and the issue of $100,000 capital stock of the Central New York Gas & Electric Company, which will be bought at par by the Empire Gas & Electric. The latter will in turn issue a like amount of its stock at par for the payment of the Central New York and the Empire's issue will be bought at par by the Empire Coke Company.

The Municipal Gas Company. The Commission has approved the franchises of the Municipal Gas Company for the furnishing of electric service in the towns of Bethlehem, New Scotland and Guilderland, and the villages of Altamount and Voorheesville. There was no opposition to the approval of the franchises.

WISCONSIN.

Secretary Resigns. The resignation of L. E. Gettle as secretary of the Railroad Commission has been filed with the Commission, to take effect January 1. Mr. Gettle has been with the Commission as secretary for over four years.

Random Lake Telephone Company. The Commission, in granting the application of the Random Lake Telephone Company for authority to increase rates, calls attention to the receipt of a letter from certain subscribers protesting against the increase and making the statement that if the increase is authorized subscribers will order the service discontinued. The Commission says: "This would be a rather unusual case if subscribers did not threaten to discontinue service in case rates were raised, but we do not believe that the threat of one or of a number of subscribers to discontinue service should interfere with our approval of the schedule proposed, nor with the application of that schedule by the company. Subscribers must not expect that service will be furnished to them at a loss, nor that they could permanently furnish it to themselves at a lower figure, if all costs incurred were to be considered. The continuance of the present rate schedule would almost inevitably mean that the service would deteriorate far below the standard which subscribers have a right to demand, and which they must expect to pay for."

Digitized by Google

International Engineering Congress.

Special Report of Electrical and Related Sessions.

The International Engineering Congress was held in San Francisco, Cal., September 20 to 25, the sessions being held in the Auditorium of the Civic Center. The total registration at the Congress numbered about 850 and the total enrolled membership in the Congress to date is nearly 3,500.

The opening session of the Congress was called to order by the chairman of the Committee of Management, William F. Durand, at 10:30 a. m., on Monday. In opening the Congress, Professor Durand spoke of the inception and organization of the Congress, and pointed out that about 230 papers had been prepared, of which 200 were in print. These represented 18 countries, and were distributed in 52 sessions. He then presented Major-General George W. Goethals as honorary president of the Congress. The latter, after acknowledging the honor which had been conferred upon him, introduced the mayor of San Francisco, James Rolph, who welcomed the delegates to the city, and referred to the engineering features of San Francisco. Charles C. Moore, president of the Panama-Pacific International Exposition, was introduced and made an address, pointing out the importance of the Congress, and how much he expected to come from it.

Major-General Goethals then made an introductory address upon the Panama Canal, pointing out that the present exposition was the first one of its kind to celebrate a contemporaneous event. He paid tribute to those who were responsible for the early work and the plans of the Canal. He said that the failure of the French to complete the Canal was due to maladministration of the directors and promoters, and not to the engineers, nor to sanitation. The French engineers did excellent work, and the United States got full value for what it paid to the second French company. He gave a brief history of the construction and administration of the Canal, which at one time employed upwards of fifty thousand men. He held up the Canal as an example of the fact that engineers can fill big executive and administrative positions. The position of governor of the Canal Zone is an engineering one, and he hoped it would always be filled by an engineer.

The next address was by Major Jean L. de Pulligny, an honorary vice-president of the Congress, and a delegate from the French Government. The following delegates were then called upon for brief addresses: J. B. Challies, Canada; J. R. Villalon, Cuba; Admiral Wei-Han, China; Don Fernando Cruz, Guatemala; Admiral M. Kondo, Japan; H. J. E. Wenckebach, Netherlands; Don Alejandro Canton, Nicaragua; J. M. de Lasarte, Spain; Richard Bernstrom, Sweden; A. E. Rohn, Switzerland. A telegram was read by the secretary from J. W. Lieb, representing the Associazione Elettrotecnica Italiano, who was unable to be present.

The remainder of the week was devoted to separate sessions for the different sections of the Congress, which was divided up as follows: (1) Panama Canal; (2) Waterways and Irrigation; (3) Municipal Engineering; (4) Railways; (5) Materials; (6) Mechanical Engineering; (7) Electrical Engineering; (8) Mining; (9) Metallurgy; (10) Naval Architecture and Marine Engineering; (11) Miscellaneous.

On Monday evening there was a reception to visiting members at the Palace Hotel. Among those in the receiving line were Prof. William F. Durand; Major-General George W. Goethals; Major de Pulligny; President J. J. Carty, of the American Institute of Electrical Engineers; John A. Britton, president of the Pacific Gas & Electric Company; Prof. and Mrs. Harris J. Ryan.

On Tuesday there was a trip to Mt. Tamalpais. Wednesday afternoon was devoted to a visit to the exposition, no sessions being held at that time. On Thursday afternoon there was a lawn party on the grounds of the University of California. On Friday morning there was an automobile ride for visiting ladies, and in the evening there was a banquet at the Palace Hotel.

On Wednesday afternoon W. D'Arcy Ryan, chief of the Department of Illumination of the exposition, delivered a lecture at Recital Hall, under the auspices of the American Institute of Electrical Engineers. This lecture was illustrated with colored lantern slides, and described the illumination of the exposition. In the evening, Mr. Ryan piloted a number of engineers and ladies about the grounds, pointing out the special features.

The closing general session was held on the morning of Saturday, September 25, and the afternoon was devoted to a cruise about the harbor.

Panama Canal Session.

The Panama Canal Session was held on Monday afternoon, with Vice-President de Pulligny occupying the chair. The first paper was one by George W. Goethals, which treated the subject from the historical standpoint. Other papers presented at this session were the following: "Commercial and Trade Aspects of the Panama Canal," by Emory R. Johnson; "The Working Force of the Panama Canal," by R. E. Wood; "Purchase of Supplies for the Panama Canal," by F. C. Boggs; "Outline of Canal Zone Geology," by Donald F. MacDonald; and "Climatology and Hydrology of the Panama Canal," by F. D. Willson.

Electrical Sessions.

The first electrical session was held on Thursday morning with J. J. Carty, president of the American Institute of Electrical Engineers, in the chair. Mr. Carty made some introductory remarks on the specialization so prevalent among present-day engineers, and the co-operation which is necessary between different groups of engineers.

He then called upon H. H. Barnes to present a paper entitled "Economics of Electric Power-Station Design," by H. F. Parshall, as the author was not present.

Power-Station Design.

This paper discusses power-station design from the economic point of view, considered from the principle that the amount of capital that can be used in effecting any economy in generation is proportional to the number of hours in the year during which such economy can be realized. An attempt is made to show the properties of the plant under different conditions of operation. Curves are given showing the relation to installed capacity of the total investment per kilowatt, the percentage efficiency, the coal cost per kilowatt-hour, total operating expenses and variation of cost with load-factor. The distance of economical transmission is also considered on the basis of load-factor and the effects of varying pressure, vacuum and superheat in the operation of turbines are also plotted in curves. The most economic values in the majority of cases are in the neighborhood of 250 pounds per square inch boiler pressure and 200 degrees of superheat. The variables entering into a determination of the saving of an economizer installation are next considered and a number of curves plotted for varying chimney temperatures. The installation of an economizer is dependent upon the load-factor and is of doubtful value unless the load-factor is above 40 per cent. It is often urged that turbine-driven auxiliaries exhausting to a feed-water heater are most efficient, but such efficiency is more apparent than real as with increased feed-water temperature the saving due to the economizer is less. Another method for the auxiliaries is to exhaust into the main turbine at atmospheric pressure and expand to condenser pressure. This is of doubtful advantage. It is

Digitized by Google

now a common practice to drive the exciter from the main turbine shaft and the author favors giving it sufficient output to drive the auxiliaries also. The development of rotary apparatus for all purposes has long since passed the experimental stage and reciprocating machinery should find no place in a modern station. The ideas brought out are then applied to the specific case of London, which is now supplied by 45 separate stations, and it is concluded that the capital required for bulk supply would be only 35 per cent and the fuel cost 45 per cent of the present amounts.

The discussion was opened by D. B. Rushmore, who said that fundamental principles should be applied to design. He pointed out the uncertainty which always exists regarding future conditions, one of which is the breakdown of some factor and there should be preparation to meet such a contingency. As to auxiliaries, he favored the independence of the separate parts. The efficiency of generators and prime movers is near the limit, the cost of investment for these being not more than one-third of the total. Any future savings must be in the line of transmission, distribution, etc.

C. R. Weymouth said that the application of high steam pressures and superheats on the Pacific Coast is new. He considered it advisable to design for higher pressures than were actually intended to be used on account of the uncertainty of the regulations under which a station may be in the future compelled to operate. As turbines of small size are not economical, auxiliaries so driven are likely to provide more exhaust steam than the feedwater heaters can use. The municipal plant in Seattle furnishes an example where it would have been better to use fewer turbines for the auxiliaries.

H. H. Barnes also discussed the matter of boiler pressures and pointed out that higher pressures are likely to be used in the future. Even 1,000 pounds for units up to 40,000 kilowatts has recently been given consideration.

W. J. Davis said that future economies must be made in the boiler room, since the limit of efficiencies has been reached in prime movers and generators. Increasing the pressure, however, will complicate the design of the turbine. He favored one auxiliary turbine for driving all auxiliary apparatus or else using electric motors for this purpose.

R. Tschentscher said that the matter had been discussed from the standpoint of the public utility company. There are now, however, equally large industrial plants, as in the steel industry, where the load conditions are different from a central station. The load is comparatively uniform for the entire 24 hours in this case, the lighting load in the night balancing the ore-unloading load in the day. In the central station there are only a few hours during the day when the entire equipment is in use. The industrial plant consequently needs greater care in the selection of auxiliaries and more spare equipment is required. He did not agree to the recommendation of turbine-driven auxiliaries, as there is less likely to be trouble with those driven by reciprocating engines.

A paper by Sven Lübeck entitled "The Water Power of Sweden," was then presented by Carl J. Rhodin.

Water Power of Sweden.

This paper described the available water power of Sweden, which amounts to 4,500,000 horsepower, figured for nine months of the year. The installation usually has a capacity 40 per cent greater than this. Sweden is favored with a relatively uniform run-off so that the regulation of water supply is cheap. The total turbine installation at present is about 850,000 horsepower. The total length of transmission lines is about 5,000 kilometers; 96 per cent of the power is utilized in large industries, the domestic consumption being very small. Electric heating and cooking are convenient but not very practical. The importance of electric power for farming has been overestimated. The importance of hydroelectric development is pointed out, especially in the northern part of Sweden where there has been little development as yet. An appendix gives descriptions of twelve of the more important hydroelectric installations and the existing legislation and regulations concerning water power.

This paper was discussed by Selby Haar and J. W. Beckman. Mr. Haar pointed out that the Porjus plant was the only high-tension transmission line in the world operating with single-phase. It operates at 80,000 volts. Mr. Beckman stated that there is more water power available upon the Pacific Coast of the United States than in the entire country of Sweden. The latter utilizes its power even though raw materials must be imported, and foreign capital depended upon. The latter is not necessary here and we do not have trouble from ice.

The next paper was by Charles H. Mitchell and was entitled "Electric Power in Canadian Industry." It was presented, in the absence of the author, by P. H. Mitchell.

Electric Power in Canada.

In studying electric power generation and supply in Canada the author analyzes the make-up of the typical power load, which usually is a combination of street lighting with commercial lighting and domestic and industrial power. The use of electric power is universal for street lighting and municipal pumping. It has an unlimited field in industry. Every Canadian city is within the economic distribution zone of some hydroelectric source. The total available horsepower is estimated at 17,764,000, of which 1,712,000 horsepower is developed. Statistics are given of the development of other countries as well. The relation of cheap power to industries is considered, with special reference to electrochemistry and electrometallurgy. The hydroelectric system of Ontario is considered in detail and is stated to be an entire success both as an engineering work and as a commercial system. Its load-factor averages 80 per cent, due to a great deal of pumping which is done at off-peak hours. The system of the Shawingan Water & Power Company is described also and mention made of other Canadian plants.

This paper was discussed by L. T. Robinson and H. R. Summehayes.

A paper by Frank J. Baum entitled "The Effect of Hydroelectric Power Transmission Upon Economic and Social Conditions, with Special Reference to the United States of America" was presented by Stanley V. Walton, as the author had been taken ill.

Economic and Social Value of Hydroelectric Power.

This paper points out the importance of transportation and power application in industry to the development of civilization. Nations have progressed in proportion to their uses of the energy available in such natural resources as oil, coal and water. The energy produced by water power is at the present time about 4 per cent of the total and less than 10 per cent of this is transmitted electrically. Eventually, however, water power will be practically the only available form and all important transportation systems will soon be electrically operated. The great economic value of distributed power to the consumer as well as to the power companies is pointed out. Electrical transmission systems will ultimately form a network all over the country. An appendix gives 11 tables of statistics relating to the subject. One of these refers to the Mount Whitney Power & Electric Company, the gross earnings of which are less than 12 per cent of the total value of the property.

This paper was discussed by J. J. Carty, S. V. Walton, John Coffey Hays and J. B. Fisken. Mr. Hays, who is president of the Mount Whitney Power & Electric Company, emphasized the importance of the commercial department of the central station in the development of the community. In agricultural districts it is necessary to introduce electric power by demonstrating its possibilities and it is also necessary to do banking for consumers, who must be financially carried along in bad years. He referred to the details of his company, pointing out the small ratio of gross earnings to investment and out of these earnings approximately one-half must be paid for operating expenses. The minimum cost of installation is about $200 per horsepower, although it often figures out less on paper in the preliminary computations. He objected to the term "cheap hydroelectric power" as it usually creates a false impression.

Mr. Fisken said that his company already had its lines tied together with those of another company and he expected that such co-operation would

Digitized by Google

increase. The cost of supplying small consumers is mainly due to distribution. In Spokane it amounts to $1.25 although the minimum charge is 70 cents. He referred to the operating rules which have been put into effect in Washington, which he deemed absurd, as they have increased the cost of distribution 25 per cent without any corresponding gain.

The session on Thursday afternoon was presided over by J. F. Stevens, vice-president of the American Institute of Electrical Engineers. The first paper was entitled "The Application of Electricity to the Heating of Metals" by F. L. Bishop.

Application of Electricity to Heating of Metals.

This paper covers the recent developments, present status and limitations in the application of electricity to the heating of metals for the purposes of annealing, hardening, etc. A brief discussion is given of several types of furnaces and their application to commercial service. Three methods are cited: (1) passing the current through the metal; (2) passing the current through a resistance material which radiates or conducts the heat to the metal; (3) surrounding the metal with an alternating-current circuit so that eddy currents are produced. The first method is limited in application by the size of pieces which can be conveniently handled and has had few commercial applications. The second method is represented by the furnaces of Heraeus and Arsem. The former is advantageous where a constant temperature is desired and has been extensively applied. The latter utilizes a vacuum chamber and is especially useful for experiments on a small scale. The furnaces of Borchers, Watts, Sosman and Bailey are also described, as well as a form of furnace which utilizes a bath of molten salts used especially for hardening. The latter has a number of advantages and data are given for its cost of operation compared with gas. The third method is exemplified in a furnace developed by the author, which is described. It has a number of advantages and is particularly applicable to large pieces. It has been used extensively for the treatment of automobile engine pistons.

This paper was discussed by E. H. Martindale and J. B. Fisken.

D. B. Rushmore then presented a paper on "The Electric Motor as an Economic Factor in Industrial Life."

Electric Motor as Economic Industrial Factor.

The electric motor can be truly seen as an economic factor only by viewing its proper place in modern industry and by seeing modern industry as a part of present-day activities and a historical culmination. This is the age of power, which is used in transforming raw materials into useful form and in transporting and distributing them. The advantages of electric motor drive are summarized and many statistical data given with respect to the application of motors in manufacturing, mining, transportation, etc. A classification of motors is given, with a discussion of the factors involved in their application. Motor ratings and design are also considered, as well as their control equipment. The electric motor is a source of economy for a number of reasons. The fields of motor application are listed.

This paper was discussed by Stanley V. Walton, who emphasized the importance of distribution as an element in the use of electric energy and stated that the future of electrical engineering is mainly in its application to agriculture.

A paper by C. B. Auel entitled "Electric Welding" was then presented, in the absence of the author, by F. D. Newbury.

Electric Welding.

Three processes of electric welding are considered, arc, incandescent and electro-percussive. The arc processes of Zerener, Benardos and Slavianoff are considered in detail. The first utilize two carbon electrodes, the second one carbon and one metal, and the third two metal electrodes. Applications, methods of control, fluxes, filling material, protection for the operator and types of electrodes are considered in detail. A list of metals which can be welded is given and the different processes compared. Only the Benardos process can be used for cutting. Costs are considered at some length, as well as the speeds of welding and cutting. The physical and chemical characteristics of the joints, including the mechanical strength and methods of testing for same, are considered. Under incandescent welding the processess of La Grange-Hoho and Thomson are considered. The latter is the only one which has been used in this country. It is described in detail and its applications considered Electro-percussive welding is then described. It involves percussive contact between two metals at the instant when a condenser discharge takes place between them.

This paper was discussed by F. D. Weber and W. J. Davis. Mr. Weber referred to the hinges of metal cabinets which had been welded on, resulting in about 25 per cent of failures, which required the abandonment of this method. Mr. Davis attributed this to the lack of using a flux, which is necessary for such work as it is for welding copper.

A paper by Edward Schildhauer, formerly electrical engineer for the Panama Canal Commission, entitled "Electrical and Mechanical Installations of the Panama Canal" was then presented by R. F. Schuchardt.

Electrical Features of Panama Canal.

This paper was a description of the electrical and mechanical work which has made the operation of the locks possible. It first described the hydro-electric station at Gatun, the steam station at Miraflores and the substations along the Canal Zone. A description was then given of the applications of electric motors to the lock machinery and the control of the same. A description of this was given in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 27, 1913.

Mr. Schuchardt pointed out that the digging of the canal was principally a quantity operation and that the real engineering work was involved in the features described in this paper.

Final Electrical Session.

The third electrical session was held on Saturday morning with Harris J. Ryan presiding. The first paper presented was entitled "The Mechanical Problem of the Electric Locomotive," by G. M. Eaton. This paper made a study of the static problem of the electric locomotive from a point of view different from that customary, and contained a number of diagrams worked out according to the suggested

Left Half of Group of Attendants at International Engineering Congress.

Digitized by Google

method of analysis. It was discussed by Selby Haar and H. J. Kennedy.

A paper by A. L. De Leeuw entitled "The Influence of the Electric Motor on Machine Tools" was, in the absence of the author, presented by W. J. Davis.

Influence of Motor on Machine Tools.

Changes in machine tools since the application of the electric motor are marked, but it is often difficult to trace the effect of the motor on the design, especially on account of the simultaneous introduction of high-speed steels. The main advantage of applying motors was at first believed to be individuality of drive, and hence independence of location. It caused, however, a better understanding of requirements, and facilitated measurements of the exact amount of power required. It has influenced the machine tool beneficially by permitting a better knowledge of necessary data, greater possibilities in regard to power, closer control, and flexibility in use. Its use disclosed the fact that the capacity of belts had been underestimated. Speed control is fully discussed. The adjustable-speed motor with field control has supplanted other types. The best machine tools nowadays are more self-contained and are provided with gear boxes or other mechanical speed-changing devices.

C. L. Cory described the installation of a motor-generator set for driving printing presses by direct-current motors from alternating-current supply. Two generators of 80 to 140 volts used separately or in series provided a variety of speed, resulting in a large increase in output.

The paper by Albert F. Ganz entitled "Effects of Electrolysis on Engineering Structures" was presented by H. W. Foester.

Effects of Electrolysis.

Electrical distribution systems grounded at two or more points will cause stray currents, but the most important source is direct-current electric railways using a ground return, which frequently cause electrolysis of metallic structures. Alternating currents have only a minute effect. The principal structures affected are electric-railway tracks and their supports, underground lead-sheathed cable systems, piping systems, and steel foundations. These are separately discussed in the paper. To prevent damage to railroad supports, the author recommends removing connections between the tracks and the steel elevated structure and using insulated negative returns. The most common method of protecting lead cable sheaths is to electrically drain them to the return circuit of the electric railway. They are frequently overdrained, rendering them a source of danger to piping systems. Insulating joints are used in some cases, but should be used with precaution. A cheap method is to cut a narrow band of lead out of the sheath. Attempts to protect pipes by painting have not been successful, but insulating coverings are good. Imbedding a pipe in concrete will not protect it. Current flow on pipe lines can be prevented by using insulating joints. An auxiliary surrounding pipe for shielding will give protection. No complete tests of the electrical drainage of gas and water-piping systems are available. This method may produce fire in the case of inflammatory gases. Where steel structural work is in contact with earth, every precaution should be taken to prevent currents flowing from steel to earth. Suggestions are given for future installations and the status of electrolysis in Great Britain and Germany is summarized.

This paper was discussed by Selby Haar, C. L. Cory, E. D. van Loben Sels and A. H. Babcock. Mr. Haar stated that in elevated-railroad structures the contact between tracks and structure should be made as good as possible. Professor Cory said this would protect the structure, but the safety of other structures demanded insulation. He also pointed out that voltage measurements in connection with electrolysis are often wrongly interpreted.

Mr. Sels said that the Pacific Gas & Electric Company had attempted to prevent electrolysis by using insulating joints, but had found a great deal of pitting even on streets with waterproof pavements. He did not consider an insulating joint satisfactory.

A paper by Ernest Wilson entitled "On the Production of High Premeability in Iron," was presented by J. C. Clark.

This paper considered the methods of magnetic shielding and the method of heat treatment, using both alternating and continuous currents. References were given to original experiments.

S. H. Blake then presented a paper entitled

Electrical Illuminants.

This paper considered past progress and the present status of electric lamps. At first only carbon was used in both arc and incandescent lamps. Efficiencies were greatly increased by the introduction of other material. The most successful lamps of today are the luminous arc and the gas-filled tungsten incandescent lamps The latter is lower in first cost, but the former in maintenance cost. As to the future, incandescent lamps have about reached the limit of development, and luminous gases and vapors represent the field for progress. An appendix includes a chart classifying illuminants in different ways and giving the characteristics of different types of lamps. A tabulation of efficiencies at different stages of development is included.

Chairman Ryan, in his closing remarks, referred to the achievements celebrated by the Congress. The Pacific Coast is no longer so much isolated from the rest of the country as formerly. The Panama Canal and transcontinental telephony have brought them closer together and the Congress was fortunate in the presence of both Goethals and Carty. He expressed for the engineers of the Pacific Coast their appreciation of their good fortune in having the Congress at San Francisco and what it meant for the solidarity of engineers.

Right Half of Group at International Engineering Congress.

Public Utilities.

At the session of the section on municipal engineering on Friday morning two papers were presented dealing with public utilities. One of these was by Alexander C. Humphreys, entitled "Public Utilities," and the other by Edward Willis entitled "Short Paper on Public Utilities". Dr. Humphreys is well known as the president of Stevens Institute of Technology and for his work in connection with gas utilities. Mr. Willis is connected with the administration of the City of Chiswick, England. Neither of the authors

Digitized by Google

was present, but the papers were abstracted by others.

The paper of Dr. Humphreys distinguishes between different classes of municipal administration and of utilities. Activities for the benefit of all of the inhabitants of the city should be conducted by the city authorities, while those which serve only such as apply for service and pay for it are best conducted by private owners. The cost is then laid upon those directly benefited. Most of the paper is given to a consideration of the report of the National Civic Federation in 1905 dealing with this subject, and lengthy extracts are made, particularly from the minority report of Walton Clark, which was strongly adverse to municipal ownership. The author is convinced that private ownership under American conditions is best for both citizens and consumers. Governmental regulation of these utilities is advocated. Although there are exceptions, much of the regulation so far has been of an undesirable kind, as it has degenerated into an irresponsible control which threatens to destroy the activities upon which the prosperity and happiness of the people depend. Authority is exercised while responsibility is avoided. The result has been strangulation of the public service corporations. Depreciation is discussed and exception taken to the common point of view of this subject. The author contends that for rate-making purposes no deduction from the value of the property (new) should be made for depreciation. A plea is made for publicity by corporations and open and frank testimony before the public service commissions. The efficiency of the commissions can be increased by having at least one experienced, well trained and open-minded engineer as a member. A remedy for present deplorable conditions surrounding railroads and other public utilities and other business in general is in an honest, determined and persistent effort on the part of these interests to protect their property rights. This involves education of both stockholders and the public.

The paper of Mr. Willis covers a large number of activities not usually regarded as public utilities in this country, such as housing of working classes, public baths, provision of amusements, and markets. Each of the eleven classes of activities is considered in some detail and recommendations made for the best means of administration. Some statistics are given of municipal undertakings in England with the rates and profits.

The discussion centered mainly around the consideration of the desirability or otherwise of municipal ownership and operation of utilities.

T. W. Ransom pointed out that the San Francisco municipal railway resulted from a refusal of the private company to make extensions under a 25-year franchise. This line is a financial success. The future of municipal activities lies in the recognition among citizens of their public duties in taking an interest in such questions, and engineers especially should take an active part in them.

M. H. Brinkley disagreed with nearly all of Dr. Humphreys' conclusions. The latter recommended that municipal ownership should be permitted only by special sanction of the legislature, which is entirely opposed to the growing sentiment for home rule. While the author advocated regulation, the paper shows that he does not really believe in it, since he would deprive the commissioners of as much power as possible. The speaker regarded regulation only as a step toward public ownership.

M. M. O'Shaughnessy thought the conclusion reached by any one on the subject depended upon the point of view with which he approached it. This was well exemplified by the majority and minority reports of the National Civic Federation. He thought that municipal ownership developed the capacity of citizens for self-government, and cited examples. Dr. Humphreys is correct if finances are the only consideration; but larger questions are involved and Dr. Humphreys evidently does not think in community terms.

A. H. Dimock said that the vital things in the development of any community are, of right, municipal functions. An improvement in efficiency naturally follows a concentration of responsibility. He cited the Seattle electric light plant as an example of satisfactory and efficient municipal management which had already resulted in enough saving to the citizens to pay for the plant.

H. C. Vensano favored private ownership. He pointed out the instability and the problem of financing connected with municipal ownership, especially in small towns. The successful examples in a few larger cities will encourage similar action in small towns and deter investors from initiative in this line. This will be a hardship, as many small communities are not able to finance their own utilities.

William C. Rommel pointed out that the principles for good operation given in the paper cannot always be applied under municipal management. They can be most easily secured, however, under a nonpartisan commission form of government.

R. F. Schuchardt said that the engineer does not take enough interest in nonengineering matters concerned with municipal management. If a public service company is properly managed there will be no demand for municipal ownership. He pointed out the great gain to the consumer through the activities of private owners of utilities, for which there is no parallel in the history of municipal ownership.

C. H. Holcomb pointed out that it is not a question of revenue, but of the interest of the public. The private owner is always in business for profit, but this is not the right attitude for the management of a public utility.

Miscellaneous Topics.

Among the papers presented at other sessions of the Congress were the following: "Transit Problem in American Cities," by W. F. Reeves; "London Traffic in 1913," by Albert Stanley; "City Planning," by Nelson P. Lewis; "Electric Motive Power in the Operation of Railroads," by William Hood and E. H. McHenry; "Preservative Treatment of Timber," by H. F. Weiss and C. H. Teesdale; "The World's Supply of Copper," by T. T. Read; "The Engineering Uses of Aluminum," by J. W. Richards; "The 1915 Steam Turbine," by E. A. Forsberg; "The Internal-Combustion Engine in 1915," by C. E. Lucke; "The Diesel Engine in America," by Max Rotter; "Developments in Modern Water-Turbine Practice," by H. Zoelly; "Water Wheels of Pressure Type," by Arnold Pfau; "Water Wheels of Impulse Type," by W. A. Doble; "Hydraulic Power Development and Use," by J. D. Galloway; "The Boiler of 1915," by Arthur D. Pratt; "Steel-Making in the Electric Furnace," by J. H. Gray; "Electrometallurgy," by E. F. Roeber; "Boronized Cast Copper," by E. Weintraub; "Electrolytic Refined Copper," by A. C. Clark; "The Develoment of Electrolytic Copper Refining," by Lawrence Addicks; "Physical Properties of Copper," by C. R. Hayward; "Some Economic Fundamentals of Freight Handling," by D. B. Rushmore.

Final Congress Session.

The final session of the Congress was held on Saturday, September 25, at 11:30 a. m. Chairman Durand called the session to order and pointed out that while European events had prevented as large a participation as had been desired, the other object of the Congress—the presentation of papers—had been a great success. He then read a cablegram of greetings to the family of de Lesseps, the pioneer in constructing the Panama Canal.

Closing addresses were made by Charles D. Marx, president of the American Society of Civil Engineers; J. A. Brashear, president of the American Society of Mechanical Engineers; J. J. Carty, president of the American Institute of Electrical Engineers; Major de Pulligny, honorary vice-president of the Congress and delegate from France; and also by the delegates from Canada, China, Guatemala, Japan, Netherlands, Nicaragua, Spain and Cuba.

Mr. Brashear then moved a vote of thanks to General Goethals, Professor Durand, and all others associated with the success of the Congress. This was unanimously carried, and the Congress then adjourned.

Digitized by Google

Illuminating Engineering Society.

Ninth Annual Convention, Washington, D. C., September 20 to 22.

The opening sessions of the ninth annual convention of the Illuminating Engineering Society, which was held at the New Willard Hotel, Washington, D. C., September 20 to 22, were reported in our last issue. The opening session was held on Monday morning, the important feature being a presidential address by Dr. A. S. McAllister, dealing with "Simplification of Illumination Calculations" and also the presentation of the Code on Lighting Factories, Mills and Other Work Places. A general session was held Monday afternoon and two sessions were held on Tuesday, one of the latter being a street-lighting session at night, at which several important papers were presented. Dr. Steinmetz, president-elect of the Society, led in a discussion of the papers at this session, and while predicting greater fields for the application of the high-efficiency of nitrogen-filled incandescent lamp for street-lighting service, believed that the arc lamp, particularly in the newer types, will always be specified where high grade installations are desired.

First Commercial Session.

Parallel commercial and laboratory sessions were held on Wednesday and Thursday, this arrangement permitting delegates to choose those sessions which most closely touched their interest.

The first commercial session was held on Wednesday morning with C. A. Littlefield in the chair. A paper entitled "How Can the Combination Gas and Electric Company Render the Best Service to the Customer," by A. B. Spaulding and N. H. Potter, was presented by the latter. This paper deals with illumination service, pointing out that in order to render it intelligently it is essential, first, that the representative be capable of laying out and supervising a lighting installation, and, secondly, that the consumer be educated to appreciate the difference between proper and improper lighting, in so far as the value of proper lighting in business is concerned. The authors believe that with a gas and electric company under one management specialists for gas illumination and specialists for electric illumination are productive of the best results, particularly as regards service to the customer. The duty of a combination company is not to predetermine what service to give, but to give the customer the benefit of the best practice and leave him the decision. Separate lighting representatives are in the end no more expensive than combination men, and there is absolutely no question that this separation does stimulate trade. Each salesman becomes more proficient in the art of gas or electric illumination as the case may be. Furthermore, he has co-operative competition, and will necessarily have to watch his installations more closely. The paper deals with the education of the salesman, advocating periodical tours after dark to the store sections. He can thus pick out the improperly lighted stores, and by one night's work of this sort obtain sufficient leads to keep him busy for several days. The authors suggest that the representative should also visit other districts than his own, and, where possible, other cities, thus acquainting himself with conditions perhaps different than those in his territory, which will enable him to more successfully handle new and similar problems as they arise. The education of the customer is equally important, and the company should send advertising literature, preferably non-technical, pointing to proper methods of using lighting units. The architect, builder, electrician and gas fitter should also be educated by both the company and the manufacturers, in order that they may in turn do their part towards the education of the prospective customer. The paper recommends demonstrations, referring to the practice of the Public Service Electric Company in successfully using window demonstration sets. The same ideas may be employed in demonstrating proper factory, office or store lighting. After the installation is laid out it is necessary that the representative should closely follow the development in the work, to see that the suggestions of the electrician or plumber are not such as to spoil the desired results. After an installation has been completed it is also essential to see that no changes are made in sizes of lamps or location of additional fixtures, which will affect the original installation.

The discussion was opened by Norman Macbeth, of New York, who questioned the necessity of separate lighting specialists for combination companies. He thought that a prospective customer approached by two salesmen selling different service, and each equally enthusiastic, would have difficulty in deciding what class of service he wants, and often perhaps would be influenced by the personality of the salesman.

P. S. Millar, of New York, called attention to the fact that both gas and electric service is better standardized from the plant to the customer's meter than on the customer's premises. This is particularly true with gas service, and has been largely responsible for the rapidity with which electricity has displaced gas for lighting. He urged central stations to supervise all lamps used by customers. Otherwise, inferior lamps may be purchased, dissatisfaction will result and practically the same conditions obtained as in the gas business, where many open flame lamps are still in use, and where in other cases, unscrupulous manufacturers have marketed inferior and inefficient lamps.

R. B. Ely, of Philadelphia, pointed out that the present tendency is for utility companies to furnish service rather than gas or electricity, and this includes supervision of installation and insuring satisfaction to customers. He asked to what extent the Public Service Electric Company goes in checking recommendations by tests after installations are made, and to what extent they make demonstrations in trying to close a sale.

H. T. Owens, of New York, brought up the point that the real lighting salesmen are the fixture salesmen, and the fixtures salesmen are really the illuminating engineers. It is, therefore, important for central stations to cultivate the co-operation of these interests.

W. R. Moulton, of Baltimore, stated that the only satisfactory policy in Baltimore is to see that the proper fixtures are installed. This, of course, means the selling and installation of lighting equipment. He took issue with the author's statement that the decision as to gas or electricity should be left entirely with the customer, claiming that the specialist, whose business it is to study conditions, is better able to recommend the service that will give the best satisfaction. He further emphasized the value of salesmen visiting installations at night.

A. A. French, of Newark, thought that where both gas and electric fixtures were to be installed an effort should be made to have them harmonize in design and be practically interchangeable, if necessity demands.

N. H. Potter, in closing the discussion, stated that the experience of the Public Service Company has been that separate representatives for gas and electric service are much better than combination men. The latter are prone to take the path of least resistance, knowing that if they are not successful in selling one class of service, the cus-

Digitized by Google

tomer will necessarily take the other.

A paper entitled "A Selection of a Standard Unit for Commercial Lighting" was then presented by W. R. Moulton, of Baltimore. This paper points out that the rapid advancement of incandescent lamps has rendered practically obsolete the commercial fixtures that were formerly installed by the central station for its customers. In selecting a standard fixture for a commercial campaign special consideration must be given to the following points: First cost of fixture; efficiency and distribution; maintenance; construction; appearance; adaptability to varying conditions, and merchandising loss, that is, depreciation that is liable to occur in carrying fixtures in stock and handling an installation. The author describes the activities of the Consolidated Gas, Electric Light & Power Company, of Baltimore, in selecting a commercial unit adapted for general use.

Several types were selected for consideration, keeping in mind the requirements mentioned. Two types were finally selected as offering the best possibilities for a commercial campaign. Both are adapted for use with lamps varying from 100 to 500 watts. Complete data on the units are tabulated for convenience of the salesman, and photographs of a few typical installations are also used. In carrying out the campaign illustrated circulars are mailed to store owners with return post cards attached. All information received in this way is turned over to the salesman to follow up. The author holds that ease of adapting these standard fixtures to practical requirements materially simplifies the commercial lighting work of the central station, and the figuring on a large number of installations becomes merely a repetition of a simple problem. Further, the adoption of such a standard unit is the means of rendering good service to the customers. It relieves them of the necessity of studying the merits of a number of different styles and the possibility of their unwittingly selecting an inefficient of impractical fixture. It is also very good business from the merchandise or sales standpoint.

J. R. Spaulding, of Jersey City, thought that for commercial lighting campaigns the selection of units should be limited to three. Two units selected in accordance with the specifications enumerated in the paper should be actively pushed, while the third, a more inexpensive unit, should be held in reserve as an alternative in case customers are approached by outsiders, who desire to capitalize on the advertising of the central station and sell a cheap, inefficient unit. Mr. Spaulding also thought that aside from this feature it was confusing to the customer to have to select from a large number of units.

W. A. Durgin, of Chicago, believed that the tendency in the present commercial units is to too great a brilliancy. He thought that greater attention should be given this important item in the selection of a unit.

Norman Macbeth, of New York, urged that central-station companies co-operate with fixture dealers and contractors. He thought it possible for the central station to agree to install, or pay for the installation of approved units sold by the dealer or contractor, or dealers could be induced to handle the same units as sold by the central station, the latter allowing commission on all such units sold.

Z. M. Hyer, of New York, stated that he could not conceive of standardizing fixtures for commercial service. He thought that different classes of stores needed to have distinctive styles of fixtures and each installation must be considered as a separate problem.

A. L. Powell, of Harrison, discussed commercial lighting from the standpoint of direct lighting. He held that type C lamps are not objectionable for direct lighting when used with proper reflectors. In response to Mr. Hyer he thought that the largest number of stores in any community are those which can use and demand a standard, inexpensive unit, while the better class of stores, which are in the minority, of course, require units of distinctive character and must be considered individually.

A. O. Dicker, of Chicago, thought that in the selection of standard units provision should be made to insure that no change can be made in the size of lamps after the installation is completed. Frequently outsiders will influence the merchant to change the lamps, thus ruining the effect of the installation. He thought it desirable for the central-station company to rent fixtures, so as to control this feature and also to insure proper maintenance.

H. T. Owens, of New York, said that the units under discussion represented a distinct step backward. The tendency, he thought, is too much toward direct lighting, with too high an intrinsic brilliancy, whereas efforts should be made to depart from this by employing semi-indirect lighting.

Robert P. Burrows then presented his paper entitled "Small Incandescent Lamps and Special Illumination Problems." This paper discusses the rapidly increasing utilization of the miniature incandescent lamp, and points out that a careful study of voltage condition, reflector design, and the requirements of the devices using these small lamps is important. Considerable of the paper is devoted to a study of the characteristics of dry cells and the method of testing dry cells when discharging through miniature tungsten lamps.

The paper was discussed briefly by E. C. Porter, of Lynn, who called attention to the rapidly increasing use of miniature incandescent lamps in theatrical work and for signaling service in the army and navy.

The paper entitled "The Flame Pilot Ignition of Incandescent Gas Lamps" was then presented by C. W. Jordan.

First Laboratory Session.

The first laboratory session was opened with a paper entitled "The Effect of Variation of Atmospheric Pressure on the Candlepower of Various Flames," by E. B. Rosa, E. C. Crittenden and A. H. Taylor, which was presented by Mr. Crittenden. This paper describes a series of tests conducted by the authors to determine the effect of atmospheric pressure on the candlepower of various flames. The apparatus used and the methods of conducting the experiments are outlined in detail and tabulated results given. It is pointed out that a variation in the candlepower of the gas flame with variation of atmospheric pressure is due to two separate causes: First, the quantity of gas burned is reduced when the pressure is reduced 5 cubic feet per hour (for example) giving a mass of gas that is directly proportional to the pressure. Second, the luminous efficiency of the flame, that is the quantity of light per unit mass of gas burned, varies with the pressure. The experiments give the combined effect of these separate causes and when the first can be calculated (as when the volume of gas burned is measured) the second can be determined by itself.

This paper was discussed by F. H. Gilpin, of Philadelphia, F. E. Cady and Dr. E. B. Rosa, of Washington. It was pointed out that results vary by using water gas and coal gas. Gas candlepower varies with different sea levels, and as the candlepower has been standardized at low levels, where standardizing laboratories are usually located, measurements made in high altitudes have varied greatly with the performance specified by laboratories at low altitude. The experiments provided data for arriving at a factor which can be used to determine the candlepower at high altitudes. Dr. Rosa explained that equipment was now being installed at the Bureau of Standards to test both coal gas and water gas.

A paper entitled "Life Testing of Incandescent Lamps at the Bureau of Standards," by G. W. Middlekauf, B. Mulligan and J. T. Skogland, was then presented by Mr. Mulligan.

The method employed by the Bureau of Standards in the inspection and life testing of incandescent lamps for the federal government is outlined and a description of the power plant, the life racks and the photometer is given.

Digitized by Google

Particular attention is directed to the special equipment of the photometer. This includes a watts-per-candle computer and a recording device by which observed values of candlepower, watts, watts per candle, and actual life are recorded on a separate card for each lamp. These records are made in such a way that life at forced efficiency is corrected to life at normal without computation or reference to tables of factors. The procedure in actual measurement and testing is described with considerable detail.

In the discussion P. S. Millar brought up the relation between the cost of testing and the value of tests. He thought that tests must be held well within commercial limitations as regards expense.

C. E. K. Mees, of Rochester, spoke of the important part that the incandescent lamp plays in photographic work. In this work the cost of testing is not the only element, as the use of lamps involves not so much the question of life as of reliability. He thought the entire question of lamp testing hinges upon the use to which the lamps were to be put.

J. L. Minick, of Altoona, stated that the Pennsylvania Railroad purchases possibly a million lamps per year. Lamp testing is of decided importance, although the tests conducted are not nearly so elaborate as those mentioned in the paper. Life tests are usually made at excess voltage, as this condition frequently obtains in railroad service.

Dr. Rosa explained that all work done at the Bureau of Standards is done entirely for the government departments, and the Bureau is, therefore, not as limited financially, or in equipment, as would be true of a commercial laboratory.

Dr. H. E. Ives then presented the paper entitled "The Application of Crova's Method of Colored Light Photometry to Modern Incandescent Illuminants," by H. E. Ives and E. F. Kingsberry. This paper described some experiments conducted by the authors to determine the most practical method of colored-light photometry for use in the gas photometric laboratory to obtain monochromatic light. Crova used a solution of nickel nitrate and ferric chloride, placed between the eye and the photometer. After some study of colored glasses the authors decided in favor of the use of a solution similar in properties to the one used by Crova as being more definitely representable and as being more nearly monochromatic. The solution finally adopted was as follows: 90 grams of $CuCL_2$; 30 grams of $K_2Cr_2O_7$, and 40 cubic centimeters HNO_3. This solution was used in a thickness of 25 millimeters.

This paper was discussed briefly by C. E. K. Mees, of Rochester, and M. Luckiesh, of Cleveland. The stability of the solution used by the authors was questioned. In closing Dr. Ives said their experience has been that the solution did permit of reliable tests.

The final paper in this session, entitled "The Relative Photographic and Visual Efficiencies of Light Sources," by L. A. Jones, M. B. Hodgson and Kenneth Huse was then presented by Mr. Jones. This paper deals with the relation existing between the visual and photographic efficiencies of various illuminants when used in connection with photographic materials having certain typical spectral sensibilities. The work is confined by authors to high-speed materials used for negative making, no attempt being made to cover the entire field of photographic sensitive materials.

Second Commercial Session.

The commercial session on Wednesday afternoon was opened with a paper entitled "Present Practice in the Lighting of Armories and Gymnasiums with Incandescent Lamps," by A. L. Powell and A. B. Oday. Mr. Powell presented the paper, which deals with the general requirements for lighting large areas from a practical viewpoint. Typical installations are pictured and briefly described, the data covering a considerable number of buildings, and including such information as dimensions of area, spacing, hanging height and size of lamps, type of reflector, equipment, etc. From these data average values of power consumption per unit of area can be obtained. The armories and gymnasiums referred to specifically in the paper are located within a convenient radius of New York City. In this territory the gas-filled tungsten lamp has become practically the standard illuminant for lighting armories. The lofty ceilings give hanging heights such that lamps are always well out of the ordinary angle of vision. Because of the peculiar interior construction of armories with ceilings usually broken by trusses, direct lighting is generally essential. In most cases it is advisable to use either a translucent reflector or a unit which permits some of the light to escape above the horizontal. The type of distribution will vary with conditions, because of the high hangings. Some sort of practical lowering device should be provided. The actual average watts per square foot for 15 drill halls with wood floors was 0.39 and for six armories with loam and tanbark 0.34. Some general considerations for indoor range lighting, company rooms, locker rooms, offices and corridors are also given. In gymnasiums the center part of the main exercising floor requires even illumination of moderate intensity with lamps located so that lighting apparatus will not cause dense shadows. Particular attention should be paid to the shielding of the eye from the lamp filament when one is forced to look upward. The lighting of swimming pools, shower rooms, locker rooms, etc., present no special problems, but must be considered for each individual case.

G. B. Nichols, of Albany, expressed the opinion that undoubtedly a large number of armories will be built within the next few years because of the attention given military affairs, and the paper should be of great value in assisting illuminating engineers and architects to plan a satisfactory lighting installation. In New York City he said the incandescent lamp is displacing the flame arc, which was recently rather extensively used. He presented supplementary data on some of the New York armories referred to in the paper, and added that there is a need for a more inexpensive and satisfactory lowering device.

W. R. Moulton, of Baltimore, thought that the trouble experienced with lowering devices could be eliminated by constructing runways near the ceiling of armories and hanging lamps from these.

C. E. Porter, of Lynn, discussed the lighting of indoor rifle ranges. He said that previously it was thought only desirable to illuminate the targets, but as modern rifle practice includes instruction in handling the gun mechanism it is desirable to have some light between the marksman and the target. Flood lighting units installed above and behind the marksman were suggested for this service.

R. B. Ely, of Philadelphia, raised the question of the necessity of inclosing incandescent lamps suspended over swimming pools, shower rooms, etc., to guard against accident in case of lamp explosions or breakages. He cited two accidents which have occurred because of such trouble. In the discussion of this point it was the consensus of opinion that no extra precautions need be taken, as the installation is similar to that in bath rooms of residences, where no troubles have been experienced.

A paper by W. A. D. Evans entitled "Industrial Lighting with Mercury Vapor Lamps" was then presented by the author. He advanced the claims of visual acuity, low intrinsic brilliancy and natural diffusion for the mercury-vapor lamp, which he said may be classified as strictly an industrial illuminant. Data are given on lighting metal-working plants, woodworking plants, varnishing and body finishing shops, textile plants, printing establishments, paper mills, clothing plants, glass manufacturers and for lighting

Digitized by Google

power houses, shipping and storage rooms and motion-picture studios.

Second Laboratory Session.

The first paper of the afternoon laboratory session on Wednesday was that by P. G. Nutting, entitled "The Retinal Sensibilities Related to Illuminating Engineering." The next paper entitled "Vision and Brightness of Surroundings" was then presented by P. W. Cobb.

The paper by Mr. Nutting points out that retinal sensibilities of importance in illuminating engineering are sensibility to brightness and brightness differences and sensibility to color and color differences. The various sensibilities and their inter-relations are outlined and data are given and the methods of evaluation then described. Several direct applications of these data to illuminating problems are indicated.

The paper by Dr. Cobb is divided into two parts, the first being supplementary to results presented by the author dealing with an investigation on vision and the brightness of surroundings conducted some three years ago. The second portion deals with a modification of the method introduced to remedy certain defects inherent in the one first used, and gives the results of work with it, which seem to clear up points in which the former work was indecisive.

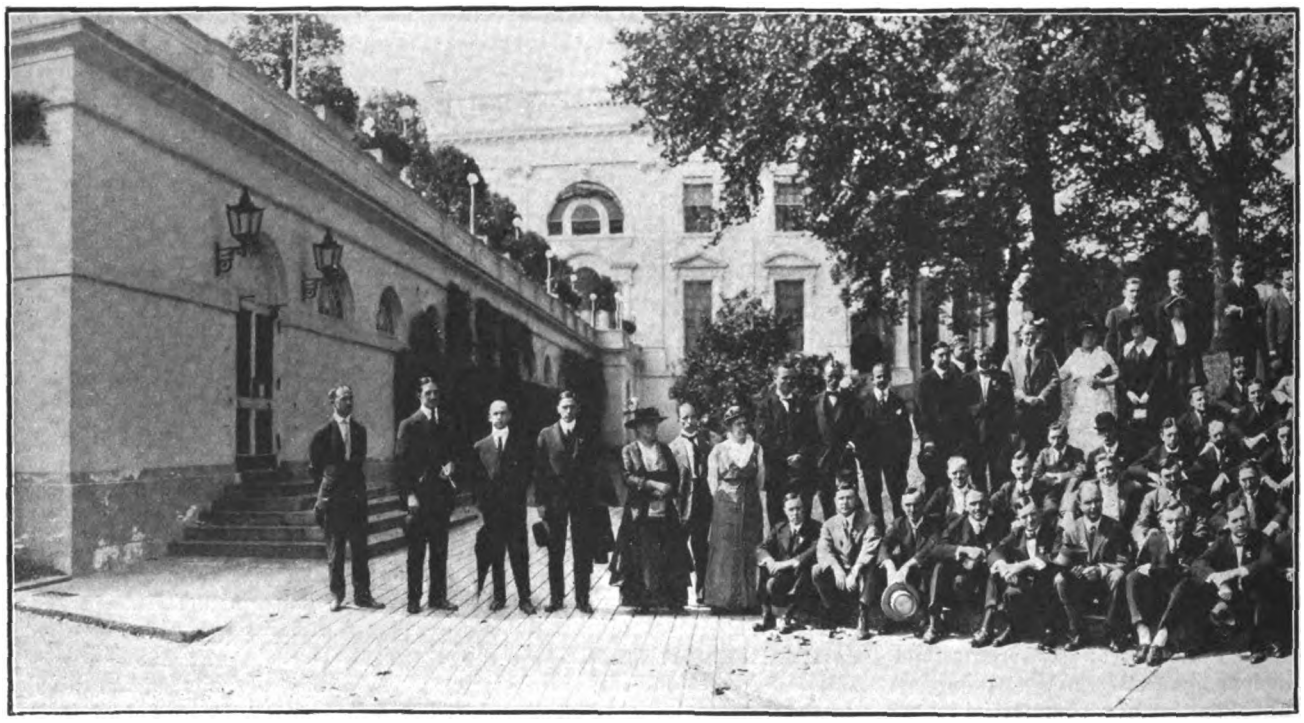
These papers were discussed jointly by C. E. K. Mess, M. Luckiesh and C. H. Sharp, the question of "How Much Light the Eye Can Take In" being the point at issue.

Following this discussion a paper entitled "A Flux Method of Obtaining Average Illumination," by F. A. Benford and H. E. Mahan was presented by Mr. Benford. The paper presents the method for calculating the average illumination of a lighting installation, which is claimed to be nearly as quick and simple as the "average effective angle" method, and exceeds all others in accuracy, except the method employing the lumen chart. The method proposed is based on the total flux generated by the light sources. The lower hemisphere surrounding the lighting unit is divided in three 30-degree zones, and the lighting unit classified according to the percentage of flux delivered in these zones. Having determined the proper classification for any lighting unit by means of one or more of the graphic charts shown, one is enabled to calculate the flux incident on the floor area for each unit, and by adding these together determine the flux over the entire floor space.

Third Commercial Session.

The commercial session on Thursday morning was opened with the paper by M. P. Chapman entitled "Artificial Lighting of Typical Offices in the State, War and Navy Department Building." This paper gives a brief description of the light conditions in a typical office of this building, which was erected in 1886. The present lighting requirements and a description of the latest remodeled installation employing tungsten lamps are given. In the new lighting system lamps of about one watt per candlepower were selected and placed uniformly so as to give an energy consumption of one watt per square foot. The floor area of each room was divided into squares of about 100 square feet each and a bowl-frosted lamp with a modern translucent light-opal reflector suspended over the center of each square at a height of nine feet above the floor. The walls were givn a flat finish of buff and the ceilings a finish of ivory white. The fixtures proper are of two kinds, solid brass chains in the principal office room and gold colored silk lamp cords suspended from a brass canopy in other rooms. Each group of four lamps is controlled by a wall switch.

The paper entitled "Lighting in Downtown Office Buildings," by A. O. Dicker and J. J. Kirk, was then presented by Mr. Kirk, and a joint discussion of the two papers followed. The paper contains data in tabular form concerning electric lighting service in certain office buildings in the downtown district of Chicago. The buildings were selected as typical examples of lighting installations made thirty, twenty-five, twenty, fourteen and six years ago, and one which was completed recently. Curves are given to show the relation between watts per square foot and foot-candles for the 30 years, and also the relation of cost per square foot per month for the various buildings. No attempt has been made in the paper to give a technical description of the present installations or to give recommendations for changes. The installations have been taken as they are, and the description given. It is pointed out in the paper that the working efficiency of a clerk or stenographer is reduced 25 per cent after sundown in a poorly lighted office.



Convention Group at White House Grounds—Left Half.

Digitized by Google

W. A. Durgin, of Chicago, opened a discussion, pointing out that the maximum foot-candles in the office of the State, War and Navy Department Building is somewhat below three. He said that if these measurements were taken when the lamps were new, or just after cleaning, the average intensity would be somewhat below two, which was, in his opinion, entirely too low. In reply Mr. Chapman stated that the figures represented average condition of the lamps. In reply to the question as to why semi-indirect or indirect lighting had not been given consideration, Mr. Chapman stated that funds were not available with which to install a more expensive system.

G. H. Stickney, of Harrison, stated that office employees have a more severe strain on their eyes than any other class of workmen. The problem of lighting offices, getting some daylight, is particularly difficult, and in such cases high intensity is more important than guarding against glare from exposed light sources. This is because of the diffusing effect of the daylight.

G. S. Barrows, of Philadelphia, thought that illuminating engineers should try to induce architects and builders to provide in the construction of office buildngs for all future demands of both gas and electric service. This should include piping for gas illumination, as well as proper electric wiring, as no one can foretell what the future developments in illumination may be.

The paper entitled "Illumination and One Year's Accidents" was then presented by R. E. Simpson.

The paper presents the results of a study of one year's industrial accident records, the purpose being to determine the effect of the lighting conditions in the causation of the accidents. Of the total number 23.8 per cent were due either directly or indirectly to the lack of proper illumination, and of these 51.6 occurred in the four months having the fewest number of daylight hours. A few typical cases are given, showing how the lighting conditions were responsible for injuries to workmen. The use of proper reflectors and care in maintaining proper mounting heights, especially when high efficiency lamps are used, are essential if accidents are to be prevented by good illumination.

The discussion was opened by S. B. Burrows, of Newark, who cited two cases where industrial installations were made in accordance with the desires of the employees. In both instances very poor illumination was the result. He said while this represented the extreme, illuminating engineers should solicit suggestions from employees who will have to use the light, particularly as to class of work to be done and the location where the light is most needed. These suggestions should be coupled with engineering considerations.

G. S. Barrows, of Philadelphia, thought that maintenance men who visit gas installations should have a fundamental knowledge of good lighting, and where necessary, make suggestions for improving the installation. Such a plan has been adopted by one large gas company with excellent results.

Mr. Regar, of Philadelphia, stated that the Philadelphia Electric Company is now inaugurating a system whereby all employees who have occasion to visit customers' installations will be required to submit any recommendations as to changes or additions to the lighting department. These will be followed up by lighting specialists, and an endeavor made to improve the installation.

J. L. Minick, of Altoona, showed curves of accidents caused by poor illumination and accidents from other causes. By superimposing these curves the peak of the curve due to accidents from poor illumination exceeds that of general accidents, and it should be the function of the illuminating engineer to bring these two curves together.

Convention Group at White House Grounds—Right Half.

An illustrated paper entitled "The Illumination of Interiors as Related to Architecture and Decoration" was then presented by David Crownfield. This paper deals with the lighting of large interiors of different architectural styles and classes with special reference to the selection of the type of lighting which will best harmonize. It is shown to be highly important if satisfactory artistic results are desired, to inclose light sources in color-modifying light-transmitting media that will bring the light into the range of agreeable colored sensations. Such media should, however, have such transmitting qualities as will preserve the efficiency of the light sources. Practical demonstrations of this were made by showing stereopticon views of various types of interiors and then interposing different colored screens between the lens and the screen. Considerable attention is given

Digitized by Google

to the location of the lamps, as the direction of light plays an important part in securing suitable illumination.

The paper was briefly discussed by P. S. Millar, W. A. Durgin and H. T. Owens.

Third Laboratory Session.

The final laboratory session was held Thursday morning, the first paper being that by F. A. Benford entitled "The Parabolic Mirror." This paper directs attention to the increasing importance of parabolic reflectors for the production of light for military and navy service, transportation, flood lighting and specular illumination. The paper is for the most part a mathematical treatment of the reflector used with point, spherical and disk sources.

Dr. C. H. Sharp opened the discussion emphasizing the value of the paper as a theoretical basis for determining designs of mirrors for searchlights, signaling apparatus and automobile headlights. He thought it probably the most complete treatment of the theory of the reflector that has thus far been presented.

J. L. Minick, of Altoona, called attention to the relation between the theoretical reason for glare of headlights and the legislative problems that have arisen because of the activity in numerous states to reduce the annoyance of glaring headlights. He said the railroads are quite willing to design equipment to match any legislation, but there has been no standard for such legislation in the past, which has meant redesigning equipment from time to time as new laws are enacted. He expressed the hope that the paper would tend to standardize headlight practice. He thought a disadvantage of the parabolic mirror is that it is hard to keep clean.

C. E. K. Mees, of Rochester, spoke of the relation between the source of light and glare produced by the light. He thought the tendency in automobile headlights to concentrate the filament of the lamps may be responsible for the increasing glare.

In answer to this J. R. Cravath, of Chicago, stated that the glare varies as the square root of the candlepower and does not depend upon the size of the light source.

Dr. E. P. Hyde, of Cleveland, thought that the problem of automobile headlights was of sufficient importance to justify the appointment of a special committee to consider this subject.

D. McFarland Moore, of New York, explained that in the design of new headlights for automobile service it is possible to adjust the lamp so as to avoid glare in the eyes of the oncoming driver.

A paper entitled "Ultra-Violet Radiation and the Eye" was then presented by W. E. Burge. This paper discusses an investigation undertaken to determine which wave lengths in the ultra-violet region of the spectrum are harmful to living tissue and the mode of action of this wave length in producing injury.

The final paper of the session, entitled "A Method for Studying the Behavior of the Eye Under Different Conditions of Illumination," by F. K. Richtmyer and H. L. Howes, was then presented by H. E. Crittenden. This paper comprises a report on some preliminary tests and the proposed method of studying visual efficiency.

Get-Together Luncheon.

At the conclusion of the morning session on Thursday a special "get-together" luncheon was held at the New Willard Hotel, at which business matters relating to the Society were discussed. Dr. A. S. McAllister spoke of the financial situation, calling attention to the need for greater revenue, and outlining the new membership classification, which provides for active and associate members.

He also announced that Alten S. Millen, of New York, who has been elected secretary for the coming year, has found it impossible to serve the Society, because of his removal from New York, and action on the appointment of his successor will be taken up at the next meeting of the council.

There was also some discussion relative to the respective duties of the Editing Committee and the Papers Committee, and it was agreed that hereafter papers must be published in the transactions as submitted by the authors without permitting changes to be made, which may have been influenced by criticisms or suggestions brought up in the discussion. Qualifying statements or changes can be either contributed in another paper or in a written discussion.

Closing Session.

The closing session of the convention opened with a paper entitled "Yellow Light," by M. Luckiesh. Knowns and unknowns and the various objections regarding yellow light are briefly discussed with respect to visual acuity, glare, fatigue, penetrating power and esthetic value. The paper outlines the procedure involved in altering the light from tungsten lamps to match the light from a kerosene flame and the old incandescent lamp.

This paper was discussed briefly by W. A. Durgin, of Chicago, who thought the color of light largely a matter of personal taste.

C. E. Porter, of Lynn, held that a yellowish-green tone was the best light for reading purposes.

Dr. C. P. Steinmetz emphasized the fact that the light must be selected with a view to the use to which it is to be put.

The paper by C. E. Ferree and G. Rand entitled "Some Experiments on the Eye with Inverted Reflectors of Different Density" was then presented by Dr. Ferree. This is the fourth of a series of papers in which the effect of the various conditions of lighting on the eye is investigated. Gradation of surface brightness is made the chief variable. Semi-direct reflectors of six degrees of density are employed and a correlation is made between the illuminating effects obtained and the tendency to cause loss of visual efficiency and to produce ocular discomfort.

Entertainment.

In spite of the fullness of the program opportunity was had to visit some of the many interesting sights of the National Capital, and special consideration was given the entertainment program for ladies. On Monday night President A. S. McAllister and the other officers of the Society held a reception in the ball room of the New Willard Hotel.

The most notable feature of the entertainment program was the reception at the White House on Tuesday noon by President Wilson. The annual banquet of the Society was held on Wednesday evening, at which Gen. George H. Harries acted as toastmaster. An address was made by Dr. Charles P. Steinmetz, president-elect, and by Major C. W. Kutz, engineer commissioner of the District of Columbia.

The prize gavel, which is annually awarded to the Section having the largest representation at the convention, was presented by Gen. Harries to the Pittsburgh-Cleveland Section. In making this award consideration is given the total membership of the Section and the distance which the delegates have to travel to the meeting place.

The entertainment for ladies comprised various sightseeing expeditions to points throughout the city, and a visit to Mt. Vernon, the home of George Washington.

Meeting of San Francisco Electrical League.

A meeting of the San Francisco Electrical Development and Jovian League was held on September 22 at the Palace Hotel. President George C. Holberton called the meeting to order, and after some routine business it was turned over to F. W. Wilson, chairman for the day. The principal address was made by Ralph W. Pope, honorary secretary of the American Institute of Electrical Engineers. Mr. Pope gave reminiscences of his early experiences on the Pacific Coast, he having visited that part of the country as early as 1864.

Digitized by Google

AMERICAN ELECTROCHEMICAL SOCIETY.

San Francisco Meeting, September 16 and 17.

The twenty-eighth general meeting of the American Electrochemical Society was held at San Francisco, Cal., on September 16 and 17. Headquarters were at the Clift Hotel. A session for the reading of papers was held on the morning of September 16 at the Auditorium of the Civic Center. On Friday joint sessions were held with the American Institute of Mining Engineers in the morning and with the American Institute of Electrical Engineers in the afternoon. On Thursday evening the visiting members were the guests of the local members at a dinner at the Techau Tavern on Powell Street.

The first session was called to order by President Lawrence Addicks and announcements were made by Secretary J. W. Richards. The latter then abstracted a paper by W. H. Wills, Jr., and A. H. Schuyler entitled "Heat Losses from an Electric Steel Furnace."

Heat Losses from an Electric Steel Furnace.

This paper describes experiments made upon a steel furnace of the Treadwell Engineering Company, at Easton, Pa. The objects were to determine the heat losses due to gases escaping and due to conduction into the electrodes and by the water jackets surrounding the electrodes. Sheet-iron flues were arranged to collect the issuing gases. Runs of 4.5 hours were made, with measurements of the temperature and velocity of gases, power input, analysis of gases and barometer. Electrode heat losses were determined by measurements of temperature on the electrode surface beyond the water jacket, the current in the electrode, temperature of incoming and outgoing water and rate of discharge of water. Values were assumed for the electric and thermal conductivities of the electrode. The average door and taphole loss is found to be 12.5 per cent and the electrode loss 7.3 per cent of the power input. The loss increased toward the end of the run, on account of rising temperature. The door loss could be reduced by better fitting doors.

Carl Hering submitted written discussion, in which he pointed out the crudeness and inaccuracies of the measurements made by the authors. The entrance of cold air into an electric furnace should be carefully avoided.

L. Addicks suggested that the use of the equipment probably created a draft of air through the furnace, to which Dr. Richards agreed.

A. M. Williams pointed out that the graphite electrodes used were entirely too large to get the best results.

A paper by F. T. Snyder entitled "Electric Steel Costs" was then presented by the secretary.

Electric Steel Costs.

The first part of this paper is a condensed statement of the average cost of the electric melting of steel over long continued periods of regular operation in two furnaces of especially high thermal efficiency. These costs include all standby losses between heats and indicate what may be expected from such furnaces in ordinary commercial service, under average conditions, as to cost of electric power, labor and supplies. Each furnace is operated one shift per day. The smaller furnace averages six tons per shift and puts steel into the ladle at $21.36 per 2,000 pounds. The larger furnace averages ten tons a shift and puts steel into the ladle at $19.06 per 2,000 pounds. The second part of the paper is a summary of the technical reasons causing these unusually low commercial costs. A large part of the low costs is due to the use of only one electrode in each furnace, and the important cost advantages that indirectly result from this. The other causes of the low costs are effective heat insulation, due to form of roof, doors and shell, and to the inherent method of temperature regulation for which the furnace was built.

F. A. Lidbury submitted written discussion in which he suggested that the value of the data would be greatly increased by information as to the nature of the scrap used, of the treatment given it, and of the steel produced.

D. A. Lyon suggested that cost figures may be very misleading, as the same elements of cost are not always included in the total.

J. W. Richards commended the author highly for the precautions he had taken to avoid heat losses. A small graphite electrode is used, the walls are jacketed and a thick door used. The efficiency attained is probably equal to that of any furnace in existence.

J. W. Beckman and A. M. Williamson also joined in the discussion.

The next paper was one by W. R. Mott, entitled "Use of the Flame Arc in Paint and Dye Testing." It was abstracted by Mr. Parmelee.

Use of the Flame Arc in Paint and Dye Testing.

The flame arc has forced out all other forms of illumination for photo-engraving and similar work, and the author proposes it for dye-testing, using 25 amperes with the lamp at a distance of two feet. Sunlight is notoriously unreliable and variable, not only at different seasons, but at different hours of the day. The author has made several hundred comparisons of sunlight with white-flame arc light, and finds the latter far superior, and also superior to nitrogen-filled lamps and other artificial sources. The action of light on dyes may cause fading, darkening, change to a different color tint, or a composite effect. Six maior factors affect the action: kind and intensity of light, atmosphere, dye, mode of applying dye, fiber and temperature. These elments are all discussed. The white-flame arc is equally rich in the green, red and yellow regions, and has the strongest actinic power, but other colors of flame arcs may be used where colored light is desirable. Action of the light on the paint lithopone was also investigated. The flame arc not only gives more uniform conditions of test, but is also more rapid and tests can be made in ten hours which require two weeks of sunlight.

Written discussion of this paper was submitted by Maximilian Toch, E. W. Lutus and Edward C. Holton. Mr. Toch explained the difference between paints, lakes and dyes. Only one paint, lithopone, had been used by the author, and the results confirmed the Bancroft-O'Brien theory of darkening.

Mr. Lutus said that the flame arc offered a means of investigation of great use and considerable value.

Mr. Holton said that the flame arc had been used in the laboratory of the Sherwin-Williams Company for testing and was very valuable in locations where sunlight is uncertain. The best form of cabinet had not been determined, but consideration must be given to temperature, moisture content of air, and presence of ozone or other active gases. Plans are being developed for the use of the flame arc in the bleaching of oils and varnishes on a commercial scale.

J. W. Beckman and J. W. Richards also joined in the discussion.

The next paper was entitled "Single Potentials and the Silver-Cyanide Plating Bath, as Affected by Its Composition and Concentration," by F. C. Frary and R. E. Porter.

Single Potentials in the Silver-Cyanide Plating Bath.

This paper describes a study of the effect of free cyanide, potassium chloride and potassium hydroxide on the electrode potentials of mercury, copper, silver, brass and iron in potassium-silver-cyanide solution of various dilutions. It is an attempt to ascertain the causes of differences in the behavior of silver plating baths when various silver salts are used with potassium cyanide to make the bath. The single potentials of the different electrodes were measured by the potentiometer method, and are given in tables and shown in curves. Considerable difficulty was experienced in obtaining good results, on account of the fact that most of the metals used precipitate silver from the double cyanide. It is shown that the presence of a very slight excess of free cyanide has a large effect in decreasing the concentration of the silver ion in the solution of the pure double cyanide. Another surprising fact is that, in all the solutions, calculation shows that the silver ion concentration apparently increases when the solution is diluted. This is probably connected with the hydrolysis of the free cyanide. The presence of potassium chloride or hydroxide appears to have practically no effect on the electrode potential of a silver electrode in the solutions studied. The same statement holds for electrodes of mercury and copper, and generally for brass, although there may be a difference in the presence of a large excess of cyanide. In the case of iron, the chloride and hydroxide appear to make the metal about 0.1 volt less positive to a silver electrode than it is in a

Digitized by Google

solution which does not contain these salts. In the pure potassium-silver-cyanide solution, iron is negative to silver, but the addition of free cyanide reverses the relations, and it becomes positive to the silver. The specific conductivities of the solutions used have been determined and plotted as functions of the concentration and composition.

A paper on "Electrodeposition of Nickel," by C. W. Bennett, C. C. Rose and L. G. Tinkler was read by title. This described an investigation of the paradoxical fact that in plating out nickel a higher current efficiency was obtained from a stationary than from a rotating cathode.

Other papers presented were "Electrolytic Precipitation of Gold, Silver and Copper from Cyanide Solutions," by G. H. Clevenger; "Collection and Therapeutic Use of Radium Emanation," by R. S. Bosworth; "Electrolytic Antimony Refining," by A. G. Betts; "Electrochemical Synthesis of Phenylhydroxylamine," by F. M. Frederiksen; "Peptonization of Chromium Oxide," by W. D. Bancroft; "Electromotive Forces," by W. D. Bancroft.

Joint Meeting With Mining Engineers.

At the joint meeting with the American Institute of Mining Engineers on Friday morning at the Bellevue Hotel, Lawrence Addicks presided. The first paper was one by D. A. Lyon and R. M. Keeney on "Metallurgical Industries as Possible Consumers of Electric Power." It was presented by Dr. Lyon.

Electrometallurgical Industries as Possible Consumers of Electric Power.

Utilization of hydroelectric power may be in the form of heat of electrolytic action. Commercial success depends upon: (1) A market for the product. (2) The cost of electric power. (3) Freight rates. (4) Labor conditions. (5) Cost of raw materials. The present commercial status of the manufacture of aluminum, ferro-alloys, pig iron and tonnage steel in other places is discussed, as well as the possibilities of developing these industries on the Pacific Coast. It is concluded that the latter could not prove profitable at the present time for any one of these industries, and electric smelting of copper and zinc ores is yet only in the experimental stage. The present market is thus not great, but the authors believe there will be a future market in the indirect application of hydroelectric power to metallurgy.

This paper was discussed by J. W. Beckman, L. Addicks and others. It was brought out that power represents a small fraction of the total cost of any process; that the principal obstacle is the lack of a market on the Pacific Coast, as steel can be produced electrically in competition with the open-hearth furnace; that the Utah aluminum deposits will furnish large quantities of cheap aluminum oxide without silica, thus opening great possibilities for making aluminum, and that lampblack from oil is plentiful for making electrodes.

Other papers presented at this session were "The Thermal Insulation of High-Temperature Equipment," by P. A. Boeck; "The Radiography of Metals," by Wheeler P. Davey; "Roasting and Leaching Concentrator Slimes Tailings," by L. Addicks; "Electrolysis of Copper-Sulphate Liquors, Using Carbon Anodes," by L. Addicks; "Melting of Ferro-Alloys in the Electric Furnace," by R. S. Wile; "Solution Stratification as an Aid to the Purification of Electrolytes," by F. R. Pyne.

Electric Furnace Melting of Ferro-Alloys.

This paper points out the advantages of melting ferro-alloys in the electric furnace, especially when introducing them into steel as is so commonly done with ferro-manganese, for example. The author's furnace is of the three-phase type, with one bottom and two top electrodes. Glass is used as a slag, and is melted in the furnace first, after which the electrodes are lowered into it, and it acts as the resistor. The metal is charged underneath the slag and heated by it to the melting point. On pouring the slag remains in the furnace for the next heat. Figures are quoted from French experience which show the results obtained and the cost. There is a saving of 35 per cent in the amount of solid ferro-manganese, as compared with the direct introduction of the solid into the steel. Other advantages of separate melting are also given, including improvement in the quality of steel and increase in capacity of plant. The author's own tests show a consumption of 800 kilowatt-hours per ton. With current at 0.5 cents per kilowatt-hour and with allowances for electrodes and lining, the cost is less than $5.00 per ton, exclusive of labor. Other alloys show even greater advantages. The author also referred to the smelting of tin ores in his furnace.

Solution Stratification in the Purification of Electrolyte.

In the electrolytic refining of copper there is an accumulation of impurities in the electrolyte and a tendency for the electrolyte to stratify. The latter is usually avoided by circulation. The author proposes in place of this circulation to introduce fresh electrolyte at a steady rate in the bottom of the tank near the cathode and to remove it in two portions, one outlet being at the other end of the tank near the bottom and the second outlet near the top. Owing to the stratification the liquor taken from the top is weak in copper, and one of the steps in the process of recovering the metal from it may be avoided, thus lessening the expense.

Joint Meeting With Electrical Engineers.

Lawrence Addicks presided at the joint session with the American Institute of Electrical Engineers on Friday afternoon.

The first paper considered at this session was on "Treatment of Silver-Furnace Fumes by the Cottrell Process," by C. H. Aldrich. The paper was read by H. F. Fischer.

Treatment of Silver-Furnace Fumes by the Cottrell Process.

This paper describes the treatment of gases from the Doré refining furnaces of the Raritan Copper Works for the recovery of metal. Experimental equipment, tried in 1912, indicated the success of the Cottrell method for precipitation of the fume by electrical discharge. The commercial treater consists of a three-kilowatt plant, which converts direct current to 154 volts alternating at 60 cycles, which is then stepped up by an oil-cooled transformer to 50,000 volts and rectified. The gases are extremely corrosive and the electrodes have been made of lead strips, which are perfectly satisfactory. The treater consists of a lead-covered iron chamber connecting with a sludge tank. The gases first pass through a flue and scrubber in which the dust is deposited, and only the true fume passes to the treater. An analysis of the deposit is given, showing the principal metal recovered to be silver, with considerable gold; all elements are highly oxidized. The cost of operation has been low, the labor required being that of one man for one or two hours per day. The gases after passing through the flues and a water scrubber are cool and saturated with moisture. The moisture is found to be advantageous as compared with dry gas.

Joseph W. Richards emphasized the importance of a knowledge of the vapor tensions of metals at various temperatures. It was an estimation based on the principle of corresponding vapor tensions which led to the conclusion that $30,000 of silver was being lost annually and to the installation of the plant described, which had actually saved this amount.

F. G. Cottrell stated that some tests were being carried on at the Exposition grounds as to the possible extension of the work to the problem of fog dissipation, as particularly good possibilities were there presented for the work. There is quite a unique equipment of apparatus available to carry on the work, which is under the supervision of a local committee made up from members of Stanford and Berkeley universities. There is on the grounds a 350,000 volt transformer of 75 kilowatts capacity, and there is now being installed a 60-cycle transformer of a rated capacity of one million volts. The works the past year had consisted chiefly in testing out the electrical conditions surrounding the operation of these transformers and rectifiers and developing possibly new types of rectifiers which would be better suited to these experimental voltages. In the case of the rectification of the current for the smelter work that has been done by mechanical rectification, simple commutation of a larger or smaller portion of the total wave. That is satisfactory as to voltages of 250,000, but above that the peripheral velocities of the rotating parts, due to the large diameter necessary to get insulation,

Digitized by Google

become very difficult to handle, and it is a question whether some other form of rectifier may not be necessary, even though it may have some disadvantages. In answer to a question Dr. Cottrell stated it was not essential to have a transformer as large as one million volts, but it was used because it was available at the Exposition.

W. D. Peaslee said he had occasion to do some research work in connection with the stimulation of plant growth by electrical means, and it was necessary to secure very high direct voltages. He had discovered that the kenetron tube was superior to the rotary or any other form of rectifier. It is considerably above 95 per cent efficient.

The next paper was that on "Overhead Electrolysis and Porcelain Strain Insulators," by S. L. Foster.

Overhead Electrolysis and Porcelain Strain Insulators.

There is a slight leakage of current from trolley wires to earth, through insulated supports on all electrical overhead construction, which if not checked permits a flow of current which gives rise to electrical separation of water into oxygen and hydrogen. The oxygen liberated acts vigorously upon the adjacent metal parts, which in time become badly corroded. This electrolytic action also seems to remove the galvanizing from live metal parts before attacking the iron. A partial remedy for this rusting of live galvanized wire is painting. This electrolytic effect is also seen to take place over strain insulators where the creepage distance is insufficient. This indicates that a creepage distance proportional to the conditions met must be secured to stop the flow of current around the outside of the insulators. The author concludes that, under fog conditions, the insulator surface exposed for creepage is insufficient in our present standard devices. Another form of overhead electrolytic action noticed in electric railway work is caused by use of dissimilar metals in contact. Sulphuric acid and other fumes in the air, and ozone from a nearby ocean, are supposed to be the electrolytes that set up a local battery action at these points of contact. The logical remedy for this trouble is to use similar metal in contact. The paper then describes the troubles encountered in San Francisco due to these causes and the remedies which have been applied.

A communication from L. W. Webb, of the Norfolk Navy Yard, was read, in which he stated that copper-clad wire used in wireless antennae on shipboard had rapidly corroded, rendering it unfit for use. The deterioration is most rapid near the smokestacks, and in some cases wire has lasted only two or three weeks. There are evidences of both chemical and electrochemical action. Standard silicon-bronze wire is now used.

J. B. Fisken referred to the contact of the span wires, and said he had occasion not long ago to look up the life of guy wires over railroad tracks. He said that ordinary galvanized wire, which had been up ten years, was in absolutely good condition, having tensile strength just as high, and he had found that some of the span wires supporting the trolley wires, apparently of the same materials, had a very short life. He could not understand the reason, but after reading the paper under consideration thought the solution was that the smoke from the locomotives forming on the insulators would allow the leakage referred to in the paper, and the electrolytic effect of the direct currents on this wire is probably what is causing them to have such short life.

S. L. Foster said he believed the trouble referred to was due to the formation of sulphuric acid and smoke from the coal burned in the locomotives.

John H. Finney said that while he did not know anything about coast conditions, it was a fact that aluminum wire in the East had stood up for 14 or 16 years, and is in very good condition today, notably in Charleston, S. C. The middle strand of the seven-strand cable is just as bright as the day it was put up.

T. M. Stateler asked if there had been noticed any particular leakage from the concrete poles used in the city of San Francisco.

Paul T. Ost replied that the poles had not been in use long enough to determine their durability. They had recently taken down a line which was put up 18 months ago, and found all of the galvanizing was gone, and in most instances the wire was half eaten away.

The last paper, "Electrochemical Possibilities in California and on the Pacific Coast," was then presented by J. W. Beckman.

Electrochemical Possibilities of the Pacific Coast.

The potential water power in Washington, Oregon and California is 11,504,000 horsepower, of which only 7.3 per cent is being utilized. There are also vast resources in Alaska. Power can be obtained close to generating stations as cheap as at Niagara Falls, and even at the end of long transmission lines off-peak power is offered at low prices. Specific cases are cited. Prevailing prices for labor are from $1.50 to $3.00 for unskilled and up to $3.50 for skilled men. Unionism generally prevails. Raw materials, coal and other reducing materials, and fluxes are then considered, and it is concluded that there are a large number of industrial possibilities, a few of which are especially apparent. One of these is the manufacture of caustic soda and bleaching powder. Others are the fixation of atmospheric nitrogen, the manufacture of iron, steel, calcium carbide and potassium chlorate. The home markets are limited and world markets must be looked to. A large part of the world's population is in lands bordering the Pacific Ocean.

W. E. Herring pointed out the great waste which occurs in lumbering, the largest industry of Oregon and Washington. The by-products are numerous, but no market has been found for them. Coke can be produced abundantly when a market appears. Iron ores are available and can also be imported from China. There is a rapidly increasing demand for fertilizer. Electric furnaces are increasing, and the production of electric steel will soon supersede the present type. Transportation facilities are good. Russia is a potenial market. In Washington waterpower developments can be made at low unit costs and near tide water.

In a written communication F. A. Lidbury expressed the idea that the generalities in the paper were valueless, and statistical definiteness is necessry to warrant any conclusions.

Gano Dunn said in electrochemical processes the problem is one which involves other conditions than the fact that power is derived from water. It is a matter of the consideration of load-factor and expenses due to transmission, as well as losses in transmission, the maintenance charges, fixed charges and returns due to capital on the investments in transmission. There are undoubtedly costs accruing to electrochemical enterprises from the fact that they perhaps are removed too far from the centers of population. Land may be very much cheaper, but transportation rates may be locally expensive. It must not be forgotten that the cost of power production by means of steam and by other means is pursuing the cost of water power at such a rate that when taken in connection with the returns due to capital in both cases and in connection with the rapid reduction in first cost of steam and other similar plants, as compared with the rather increasing first cost of waterpower plants, the suitability of water powers for electrochemical industries should be discussed, not on the basis that the power comes from water, but on the basis of whether you can have a 100-per-cent load-factor, and whether you can have a power in which the transmission losses and charges are removed as a burden on the enterprise.

John H. Finney remarked that there exists in Congress, as in many other places, a feeling that the water powers of the United States are tremendously valuable, and that every foot of falling water can be developed into power. There are tremendous water powers in the West that will never be used unless it is found that they can be used for electrochemical or electrometallurgical processes. These powers are too remote from the centers of distribution, from the market; it costs too much to get the power over the long-distance transmission lines, and

Digitized by Google

unless it can be made the basis of a permanent operation chemical or metallurgical, it will be wasted.

C. L. Cory said the utilization of hydroelectric plants for chemical industries must be considered from an economic as well as an engineering side. If an analysis of the gross revenue of a hydroelectric system is made it will be found it rarely exceeds 25 per cent of the investment. This must cover overhead charges before any dividend is paid. He then contrasted this revenue with that of an automobile plant, where the annual revenue was more than six times the investment in the plant. Personally he expected to see in the state of California a pair of busbars extending from Siskiyou County to Los Angeles County. These busbars will be three-phase and the voltage on the line will probably be 175,000 volts. They might be termed "clearing-house" busbars.

J. W. Beckman, in closing, said that the electrical engineer apparently is looking on all of the developments from the transmission point of view. The electrochemical point of view, in the West, he thought absolutely disregarded the transmission point of view, because some of the large water powers are so situated that it is cheaper to manufacture the chemicals at the site of the water power than to transmit the power to tide water. As to the cost of power, the projected development at The Dalles, Ore., will sell very large blocks of power at less than $10 per horsepower-year, and there are large developments on the Coast ready to supply power at less than $5 per horsepower-year. The Pacific Coast possibilities are equaled only in Switzerland and Norway.

Association of Edison Illuminating Companies Re-elect Officers.

At the recent convention of the Association of Edison Illuminating Companies, held at Spring Lake, N. J., the following officers and executive committee were re-elected:

Walter F. Wells, Brooklyn, N. Y., president.

Peter Junkersfeld, Chicago, Ill., vice-president.

George C. Holberton, San Francisco, Cal., secretary.

Louis A. Ferguson, Chicago, Ill., treasurer.

Edward A. Baily, Brooklyn, N. Y., assistant secretary.

Executive committee: Charles L. Edgar, Boston; Louis A. Ferguson, Chicago; W. W. Freeman, Cincinnati; George C. Holberton, San Francisco; Samuel Insull, Chicago; Peter Junkersfeld, Chicago; John W. Lieb, New York; Joseph B. McCall, Philadelphia; Walter F. Wells, chairman, Brooklyn.

INSTITUTE OF RADIO ENGINEERS.

Joint Meeting with American Institute of Electrical Engineers at San Francisco.

At the Panama-Pacific convention of the American Institute of Electrical Engineers, held at San Francisco, Cal., as reported in our issue of September 25, two of the sessions were joint sessions with the Institute of Radio Engineers. The first of these was held on Thursday afternoon, September 16, in the Building of the Native Sons of the Golden West, R. B. Wolverton presiding.

A paper by Harris J. Ryan and Roland G. Marx, entitled "Sustained Radio-Frequency High-Voltage Discharges," was presented by Professor Ryan.

This paper described experiments made upon discharges in air at 60 cycles and at 88,000 and 188,000 cycles per second. The experiments included discharges from a single electrode, between a blunt point and plate, and the corona about a wire. Diagrams of the apparatus and photographs of the discharges were included. A sphere gap was used for measuring voltage. The ability of the radio-frequency brush to produce thermionic conduction through glass, porcelain, quartz, etc., was found to be its most remarkable property. The application of high voltage at high frequency to a porcelain insulator was found to produce hot conducting cores in the porcelain. No insulation supporting a conductor under such conditions can endure unless so designed that no air in contact with it is overstressed. The cyclograph was used to measure energy and power-factor. The following conclusions are reached:

Sustained radio-frequency corona brushes or flames once started are maintained at much lower voltages than those required to start them by overstressing and ionizing the atmosphere. They quickly destroy even the most refractory insulations by their heating and ionizing properties. The power-factor of the charging current of a conductor in corona due to the application of sustained radio-frequency high voltage is decidedly lower than the corresponding power-factor at low frequencies. Nevertheless, because of the high values of the currents that produce the radio-frequency coronas, the losses they cause may be hundreds of times the corresponding low-frequency losses. The sustained radio-frequency voltage required to discharge between corona-forming electrodes may be as low as one-third of the corresponding low-frequency voltage. At higher voltages this ratio will probably be found to be less than one-third. Sustained radio-frequency and low-frequency voltages when combined, discharge through distances between corona-forming electrodes that are substantially the sum of the distances through which such voltages would discharge when acting alone.

This paper was discussed by R. H. Marriott, F. Rieber, Haraden Pratt, E. W. Stone and R. E. Thompson. In answer to questions, Professor Ryan stated that harmonics are produced with the Poulsen arc generator used in the experiments. They do not appear in the cyclograms because they are damped out in the first six turns of the helix. He also explained the evidence which proves that hot, molten, conducting cores are formed in the porcelain.

At the joint session on Friday afternoon, H. J. Ryan presided and Robert H. Marriott presented a paper entitled "Radio Development in the United States."

The paper was discussed by Ellery W. Stone, Mr. Thompson, Mr. Cousins, Ralph W. Pope, Mr. Dunne, Thomas D. Lockwood, and A. H. Babcock.

Civil Service Examination for Electrical Draftsman.

The United States Civil Service Commission will hold an examination on November 3 and 4, at the many usual places throughout the country where Civil Service examinations are held, for eligibles to fill the position of electrical draftsman for service at the various navy yards and other establishments of the Navy Department. This position brings an entrance salary of $4 per day. Its duties require the preparation of electrical installation plans for ships, power, lighting, interior communication, the designing of switchboards, writing of specifications for apparatus, estimating, checking plans, etc.

The examination will include mathematics, electrical machinery and materials, drawing and designing; 40 per cent of the credit will be based upon education, training and experience. Applicants who have had the equivalent of a high-school education should possess four years' practical experience, of which two years have been in marine electrical drafting; applicants possessing a degree in engineering from a technical school of good standing must have one year of additional practical experience in marine electrical drafting; this drafting experience should be such as is acquired in the electrical department of a ship-building company or in some naval establishment. Applicants must be 22 years or over; they should write to the United States Civil Service Commission, Washington, D. C., for Application Form 1312, stating the title of the examination.

Digitized by Google

Big Chicago Jobber's Employees Make Money.

One of the big events of the year among the employees of Chicago jobbing houses is the annual picnic of the Electric Appliance Company. The accompanying illustration gives a good idea of the crowd and spirit attending this affair this year. The annual field day and outing was held last month at Ravinia Park, Ill., one of the most beautiful spots on the North Shore, on the edge of Lake Michigan, and only two hours' ride from the center of Chicago.

Group of Electric Appliance Company Employees at Picnic.

The crowd gathered at Evanston, Ill., and took a special train on the Chicago & Milwaukee electric railroad at 9:00 a. m. arriving at the Park at about 10:00 a. m.

The athletic committee had made arrangements for a series of 20 events which were participated in by both the children and the grown-ups. The prize list totalled something like $200, including both merchandise and merchandise certificates.

One of the principal events was the ladies' 50-yard dash in which the first prize was a $10 gold-piece. The first prize in the matrons' 50-yard dash was a Thor electric vacuum cleaner. The ball game that took place at 5:00 p. m., between the "Bourne's Shillalahs" and "Wattling's Pumpernickel Braves" was a very close contest and the final score was 6 to 5 in favor of the "Braves."

The prize-winners were Dexter Lempke, Theo. LeJeune, Jr., Joseph Bourne, Sofia Nauta, Viola Doelle, L. Kempel, Edith Jube, H. Nauch, Raymond LeJeune, Magnus Larsen, Joseph Kreagechent, A. Fremer, Henry Barth, George Hennessey, L. Vranck, Anita Alderson, Gertrude Arnold, B. Narod, Miss M. Hanson, Miss M. Lee, Miss H. Hayden, Mrs. Margaret Flickinger, Miss A. Stone, H. Hawley, P. W. Couch, William Donald, A. B. Jenkins, F. E. Sparks, P. W. McCauley.

To Popularize Electric Lighting by Edison Day Prize Contest.

In conjunction with the celebration of Edison Day, October 21, this year, commemorating the thirty-sixth anniversary of the invention of the electric incandescent lamp by Thomas A. Edison, a nation-wide prize contest for boys and girls has been inaugurated by the Edison Lamp Works of the General Electric Company. Thirty-three grand prizes and 2,000 smaller prizes amounting to $2,500, are offered, and the conditions are such that either boys or girls may compete with equal chances. The contest will be carried on in co-operation with lighting companies and dealers all over the United States, and is for the purpose of extending the growing popular appreciation of electric lighting and particularly the replacement of old-style carbon lamps.

The conditions of the contest provide that each entrant must be under 18 years of age, and live in or near a city or town having electric light, in which a distribution of the cards for crediting Edison Mazda lamp sales can be made. The contestant has to secure from the local lighting company or agent for Edison Mazda lamps an official contestant card and the number of printed order cards desired, on which the contestant's full name and address should be signed in the space provided. Next the cards have to be distributed by the contestant during the time authorized to users of electric light in homes, stores, factories, etc., who can be induced to replace old-style carbon incandescent lamps with modern Edison Mazda lamps, or who contemplate purchasing a new supply of lamps. The purchaser fills in his order for Edison Mazda lamps on the card, which can be returned to the local lighting company or Edison agent by the con-

Digitized by Google

testant, or mailed in or delivered personally by the purchaser during the stipulated period. Sales to individuals or firms holding contracts for Mazda lamps will not count, nor will free renewals.

The points of the contest are counted by watts, the current consumption of each new lamp being given in watts on the sticker. An order for one 10-watt lamp would credit the contestant with 10 points; four 25-watt lamps would make 100 points; and so on, the total number of points on the contestant's orders constituting his or her score.

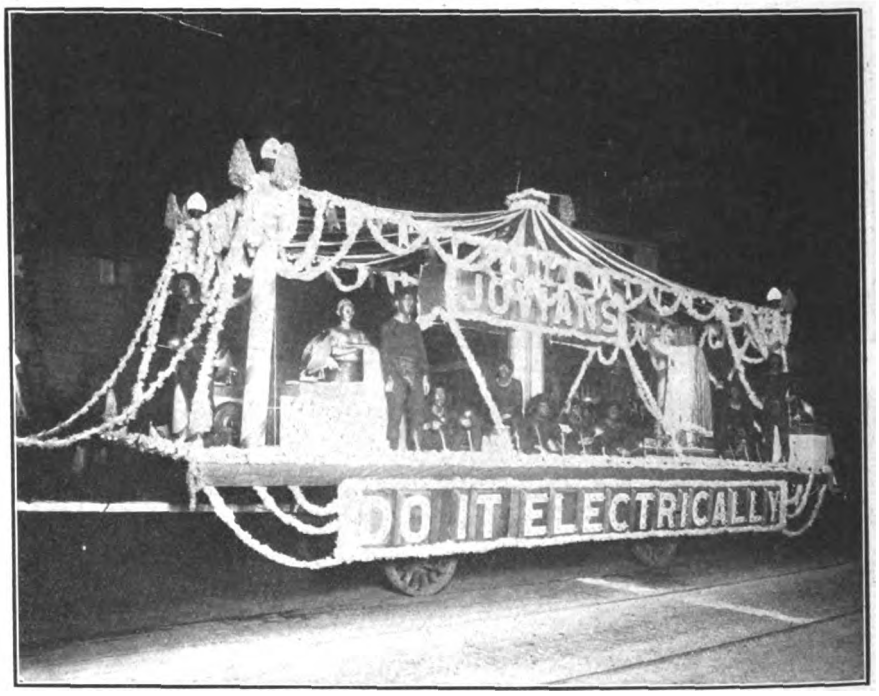
After the contest is closed, October 21, the lighting companies and Edison agents will total and turn in all the cards to the Edison Lamp Works of the General Electric Company, where they will be sorted and counted. The contestant, boy or girl, whose name appears on order cards totaling the highest number of watts, or points, in lamps sold will receive the first prize; the next highest, the second prize, and so on through the list. In case of a tie by two or more contestants, each one will receive the prize. This rule applies to all prizes except in the case of flashlights. The prizes will be distributed by the Edison Lamp Works of the General Electric Company just as soon as the cards are counted and the winners determined. Scores will be counted only on a basis of retail sales of Edison Mazda lamps through regular appointed agencies. Standard packages quantities will, however, count in such sales. No prize will be awarded to any employee of the General Electric Company, of any lamp agent or of any lighting company.

During the months of September and October the Edison Lamp Works of the General Electric Company will also conduct one of the most comprehensive campaigns of propaganda ever undertaken on Edison Mazda lamps, and for the purpose of popularizing electric lighting.

The educational value of the campaign will not be lost sight of. Through the mutual co-operation of the manufacturer of Edison Mazda lamps and the lighting companies and dealers, many interesting features in connection with the development of the electric incandescent lamp by Edison, as well as the possibilities for economy, safety and convenience through the general use of electric lighting, will figure prominently in the national message of Edison Day.

Many local campaigns of lighting companies and dealers, not only for lighting but also for house wiring, sign lighting, etc., will tie in with this great national movement. Some of the lighting companies may further stimulate activity by offering locally extra prizes to boys and girls for their efforts on Edison Day. The manufacturer has prepared for assisting lighting companies and dealers in launching the campaign great quantities of booklets, folders, blotters, posters, posterettes, signs, lantern slides, lectures, window displays, electrotypes for local advertising, etc. The extensive scope of this form of appeal is apparent when it is stated that over 10,000,000 copies of publications have been produced in advance for this work.

The entire campaign should result in a tremendous impetus in favor of electric lighting. The invention of the electric incandescent lamp by Thomas A. Edison is one of the world's greatest scientific achievements, and the development and perfection of this lamp today may be said to be one of its greatest industrial accomplishments. A broad national movement of this kind not only honors firstly the master inventor of one of the things that has increased so measurably the comforts of humanity, but it will also intensify the common interest of the electrical industry, public service and the general public.



Float of Columbus Jovians at Fall Festival.

Columbus Jovians Win Honors.

As a factor in local public-spiritedness Columbus, O., Jovians figured largely at the big Fall Festival held in that city under the auspices of the Chamber of Commerce, September 15-18. Not only was the whole scheme of special illumination taken in charge by the Jovians, but their float in the night parade was the most elaborate and attractive of the hundred or more in line. The theme was a tableau from the degree work of the order, showing Jupiter, Vulcan at the forge, etc.

About a million candlepower was represented in the lighting of the float. Flood lights at each corner of the tableau were made to flash upon buildings and spectators with sensational effects that won the applause of the throng all along the line of march. It was a splendid advertisement for the Jovians. Thousands of people who had been ignorant of the existence of such an organization received a lasting, as well as startling, impression of its enterprise and importance.

The float was 30 feet long, 12 feet wide and 15 feet high. It was designed by G. T. Evans, chairman of the float committee, who is a lighting expert for the Columbus Railway, Power and Light Company, and reflected great credit upon his skill. Jovians generally throughout the city contributed to the work and expense of construction. Harry E. Echhorn, superintendent of power for the same company, impersonated Jupiter, and W. E. Davis, of the Central Union Telephone Company, was the Vulcan. The float was drawn by an electric motor truck. A view of the float is shown herewith.

Chemists' Club Entertains Thomas A. Edison.

Thomas A. Edison was the guest of honor on September 22, at a dinner at the Chemists' Club, New York, given by William F. Hoffmann, sales agent for the new Edison analine dye products. A number of chemists interested in the American production of dye products from coal tar were present. The new processes of manufacturing dyestuffs were discussed. After the dinner the guests went to the Chemistry Exposition at the Grand Central Palace.

Digitized by Google

New Electrical and Mechanical Appliances

A New High-Capacity Pole-Type Cutout.

It is well known, although not universally admitted perhaps, that the cutouts available commercially for the protection of large distributing transformers on high-capacity lines are not satisfactory. They do not give the reliable and selective action required of them; their behavior and life are erratic, frequently opening at other than the right time and shattering when interrupting short-circuits. They are

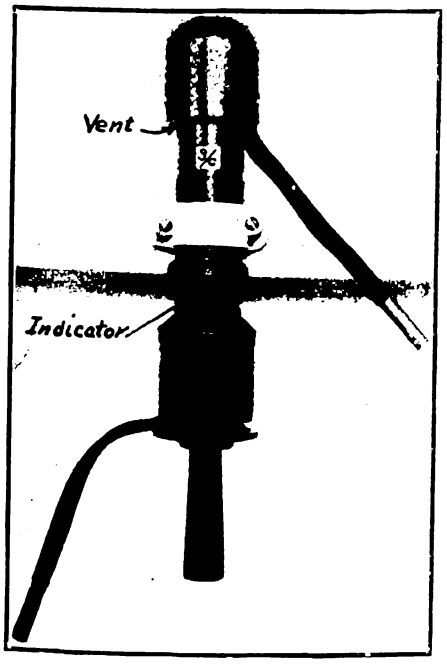


Fig. 1.—4,400-Volt, 200-Ampere Pole-Type Cutout Installed on Crossarm.

comparatively complicated to manipulate, especially under the unfavorable conditions existing on a pole, and are, to say the least, hazardous to handle.

There is urgent demand for a cutout which will give unfailing protection under all conditions without destroying itself, at the same time being simple and safe to handle, and it is this which prompted the firm of Schweitzer & Conrad, Incorporated, 1770 Berteau Avenue, Chicago, Ill., to adapt its well known high-potential fuse for use as a pole-type cutout. This fuse has a long positive break with enormous rupturing capacity and will open short-circuits with unlimited capacity behind them with absolute reliability. The cutout is perfectly safe to handle at all times and under the most unfavorable conditions; all live parts are amply protected, the fuse is locked in place before the circuit is closed, and the gases freed when the fuse operates on short-circuit are directed upward and away from the operator through a vent in the top instead of downward as is usually the case. A positive indication of the condition of the fuse can be obtained without disturbing the cutout, which greatly simplifies the location of trouble, blown fuses, etc. The cutout requires a minimum of crossarm space, which is valuable space.

The S. & C. high-potential fuse is already well known, having been in extensive use for many years on higher-voltage systems throughout the world. The fuse consists of a glass tube containing a spiral spring, the lower end of which is connected to the bottom ferrule. The upper end of the spring connects to the fuse wire which, passing through a liquid director, is connected to a short wire that in turn is soldered to the cap on the top ferrule. The glass tube is filled with a non-inflammable liquid having an extremely high dielectric strength, about 250,000 volts per inch. When the fuse blows the spring is released and instantly retracts, introducing a gap into which immediately rushes the liquid, quenching the arc. The action is practically instantaneous, within one-half cycle in fact, which is sufficiently rapid to clear the trouble before synchronous apparatus is thrown out of step or circuit-breakers have time to open.

To make the fuse adaptable as a cutout for pole use a casing has been designed in which the fuse is inserted, as shown in Fig. 1. This casing is made entirely of insulating material which is unaffected by extreme climatic conditions. A vent is introduced at the top, as seen in the illustration, its purpose being to allow the escape of any gas that may form at the time the fuse operates on short-circuit and, further, to prevent breathing and sweating due to atmospheric changes. A glass window, also shown in the figure, is available on two sides of the cutout, its function being to permit quick and easy inspection of the fuse at all times of the day or night without the necessity of touching the cutout or in any other way interfering with the continuity of power supply.

To charge the cutout, the handle is screwed to the fuse, as shown in Fig. 2, and the fuse inserted as far as it will go into the casing; the fuse is then given a turn and pushed in further to the limit, when it is given one more turn. The first turn is made before the fuse closes the circuit and serves to prevent the fuse from falling out or being kicked out should a short-circuit exist at the time the circuit is actually closed. The manipulation is seen to be of the simplest—four simple movements, requiring no tools, no screws, no doors to open and shut, nor other complications.

The housing is strong and plain, with nothing to get broken or become deranged. The unit is of neat appearance and extremely compact, occupy-

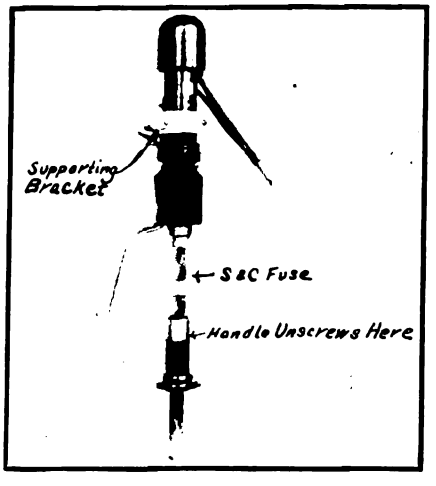


Fig. 2.—Pole-Type Cutout, Showing Fuse Ready to be Inserted.

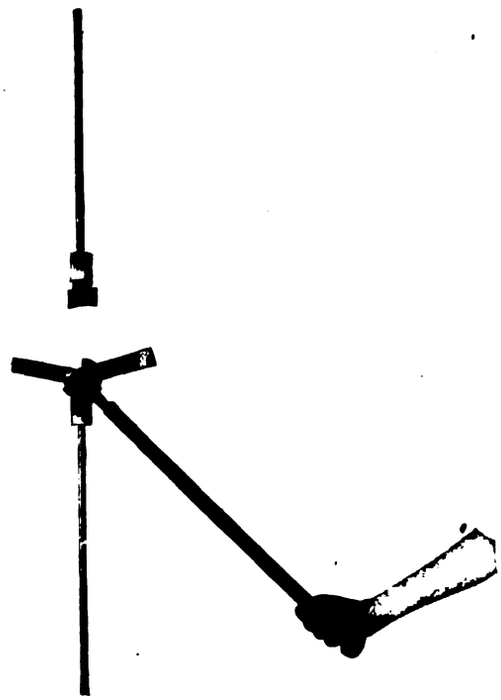
ing only 4.75 inches of crossarm space, a very valuable feature in view of the increasing use of jointly owned poles with their dense loading. No live parts are exposed to persons or the elements, it being impossible under any circumstances for anyone to come in contact with current-carrying parts. The unit is absolutely foolproof. The fuse may be put in place directly by hand or by means of a wooden rod from a distance, according to choice; a rod is furnished especially for this purpose when so specified. It might be pointed out here that even when inserting the fuse by hand the operator is well below and considerably further removed from the cutout than is the case with the majority of other cutouts.

The S. & C. pole-type cutout is made

Digitized by Google

in various sizes, but the one described here has a rating of 200 amperes at 4,400 volts. This cutout takes fuses from 1 to 200 amperes, the latter size meeting the requirements of the largest distributing transformer yet built.

While designed primarily to meet a condition which other apparatus had failed to meet satisfactorily, namely, the protection of high-capacity distributing transformers, this cutout is equally applicable to the protection of circuits and for sectionalizing and isolating branch lines in time of trouble; for the protection of underground services fed from overhead networks; as a fuse or disconnect in substations of the indoor or outdoor types such as are commonly served from rural lines. In those cases where the cutout is to be used as a disconnect only, instead of as a fuse, a "dummy" replaces the fuse.



Method of Operating Balanced Disconnect Switch.

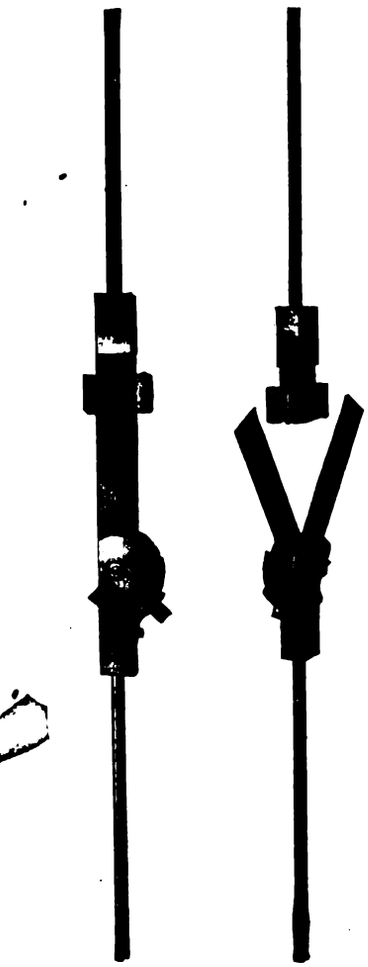
These dummies will be supplied when specified.

This cutout is of sturdy and strong construction and has been placed on the market to withstand the severest use to which any cutout can be exposed. Its use will result in greater reliability of service and lower cost for maintenance.

Balanced Disconnecting Switch.

The safety movement is calling for greater use of disconnecting switches in connection with high-tension apparatus so that any individual piece may be completely disconnected from the high-tension lines when it is to be inspected, cleaned or repaired. For this purpose it has been customary to use almost invariably a knife-blade type of switch arranged so that it can be opened from a distance by means of a long pole. In order to mount such switches it is necessary to have a rigid framework and supporting insulators.

In the effort to reduce the cost and space required for the installation of disconnecting switches, there has been developed and placed on the market a new type, which is shown in the accompanying illustrations. The construction of this switch is such that it has two knife blades opening in opposite directions. These are moved simultaneously so as to have a balanced motion, which is obtained by means



Two Views of Balanced Disconnect Switch, Closed and Partly Opened.

of gearing. The opening or closing of the switch is accomplished not by pulling or pushing on the knife blade, but by a twist upon a stud over which fits a socket in the end of the pole. This method of operation eliminates any strains upon the supporting structure and in fact practically dispenses with the need of elaborate mounting for these new switches. Consequently, they can be connected directly into the line without additional insulators or support to brace them against the wall, roof or other rigid surface.

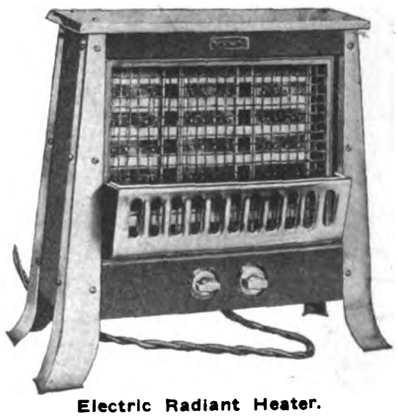
Another feature of this switch is that it is automatically locked in any position in which the operator leaves it. This eliminates the danger of having the switch blown open due to short-circuiting or violent surge. The switch may be installed in a closed compartment since all that is necessary to permit its operation is a one-inch hole through which the operating pole can be passed.

This switch is manufactured by the Minerallac Electric Company, 400 South Hoyne Avenue, Chicago, Ill.

A New Radiant Electric Heater.

The pleasure and comfort of the old-fashioned fireplace without its many annoying features is now possible with the advent of the so-called radiant types of electric heaters. Electric heating by radiation has proved to be the most successful in use up to this time. The efficiency of heating by electricity is dependent upon the directness of its application, as a rule.

A year or so ago the Hotpoint Electric Heating Company, Ontario, Cal.,



Electric Radiant Heater.

put out an open-coil, luminous radiant heater known as El Radio. Its gratifying success as a supplementary heater for small rooms, offices and bathrooms led this company to produce a similar heater on a large scale to fill the demand for electrically heating large rooms. The new heater now being placed on the market is made in two sizes, one consuming from 600 to 1,800 watts and the other from 600 to 3,000 watts; each of these, of course, requires special wiring.

The illustration herewith can but give a meager conception of the heater as it appears with its cherry-red coils sending forth their cheerful glow. This new appliance, known as the "Hotpoint Radiant Heater," is substantially built of pressed steel and handsomely trimmed in polished nickel. The copper reflector behind the heating elements is lacquered to prevent tarnishing. The large size is provided with five element and three indicating snap switches, allowing the use of either one, two, three, four, or all elements; the small size has three elements and two snap switches, giving a similar range.

Digitized by Google

New Sewing-Machine Motor.

A small but powerful electric motor that can be instantly attached to any type of sewing machine is the latest addition to the rapidly growing line of electric household appliances.

As shown in the accompanying illustration, the motor has neither clamps nor screws but is merely placed on the table of the machine with the pulley of the motor in contact with the handwheel of the sewing machine. No change is necessary in the machine itself, except to slip the belt off the flywheel.

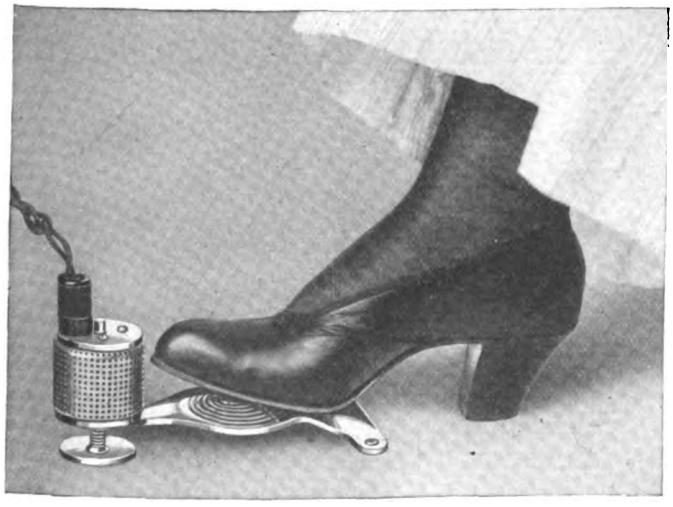
"Dumore" Sewing-Machine Motor in Use.

Current is taken from any convenient electric light socket, the motor winding being of the universal type that permits of operation on either direct current or alternating current.

With the motor is furnished a compact treadle-operated speed regulator, which is placed on the floor under the machine and operated by a slight pressure of the foot. Six steps of resistance are provided, making it possible to operate the machine at any desired speed from a single stitch at a time up to 800 stitches a minute.

The ease with which this motor is attached to any type of sewing machine is emphasized by the manufacturers as a strong point in its favor, since the dealer or central station selling it is not obliged to send a man to install it as in the case of motor designed for permanent attachment to the sewing machine. Although but recently placed on the market, more than 8,000 of these motors have already been sold.

The outfit is known as the "Dumore" sewing-machine motor, and is made by the Wisconsin Electric Company, Racine, Wis. It is sold to the trade at a price that enables it to be retailed at a good profit for $13.50, this price including motor, attachment cord and speed regulator. The manufacturers have an interesting proposition for dealers who intend to make special efforts to push appliances during Electrical Prosperity Week.



Simple Control Pedal for Sewing-Machine Motor.

A New Electric Safety-Razor Edger.

Every safety-razor user knows how difficult it is to have dull blades sharpened satisfactorily. The reason is that the majority of machines for doing this work sharpen the blade either by honing on a flat leather carborundum surface, or by flopping it between two sharpening rollers. It is a mechanical impossibility to sharpen a blade in this manner without wearing the blade down, and, as the ordinary safety blade is made to project past the guard only a very short distance, it is readily seen that a few sharpenings will wear the blade to a point where it will cease to be serviceable. Moreover, the edge is round and blunt when treated in this manner, as shown at the left in Fig. 2.

Fig. 1.—Electrically Driven Safety-Razor-Blade Edger.

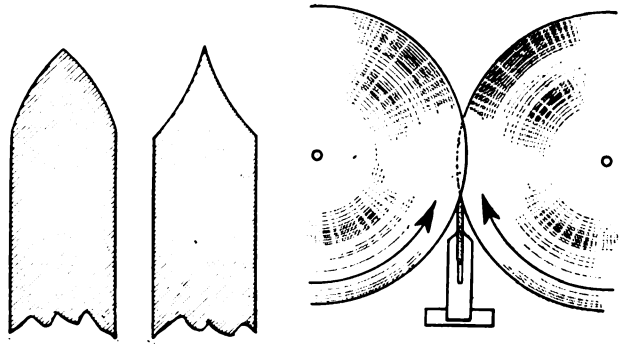


Fig. 2.—Old and New Methods of Sharpening Safety-Razor Blades.

The machine shown in Fig. 1 is interesting, inasmuch as it makes use of a new principle. It is not a grinder or a sharpener, it is a re-edger and is known to the trade as the "Lightning Safety-

Digitized by Google

Blade Velvet Edger," manufactured by Cochrane & Elwood, Seattle, Wash.

The operation is simple and speedy. The blades are clamped in a holder and inserted in the machine between revolving cylinders. The holder moves backwards and forwards while the cylinders are revolving, and the blades are edged by even pressure applied to both sides. The result is that the blades are given a concave edge, as shown at the middle and right of Fig. 1, and are not worn down appreciably. They can be re-edged over 100 times and will still be of the same width and will shave as well as when new. The right end of Fig. 1 gives an idea of the relative positions of the blade and the cylinder.

A Westinghouse Electric one-fourth-horsepower motor drives the machine at a speed suitable for re-edging in from 10 to 60 seconds the four to seven blades that the holders accommodate at one time. Where the number of blades to be sharpened is large, the machine is particularly suitable because of its speedy work.

The Dostal Dropout.

For many years a great deal of attention has been given to the crossing of various types of overhead electric circuits with other circuits and the rights of way of railway systems. This matter has been particularly considered as regards the crossing of high-tension line over railway tracks. Elaborate rules have been drawn up on this subject and various provisions are required to minimize the possible damage from the breaking of any high-tension line. At one time cradles were used to catch any broken wires, but various objections to it have almost entirely brought this practice into disuse. A frequent requirement of exceptional heavy construction at the crossing entails considerable expense, and is not an absolute safeguard.

Fig. 1.—Dostal Dropout, Top-Tie Type.

After careful study of the problem there has been developed what is known as the Dostal dropout. This is an automatic device which is applied on the crossing side of the insulators at both ends of the crossing span. The principle of this device is very simple, and can be readily seen from the accompanying illustrations.

Fig. 1 shows one type of the device itself, and Fig. 2 shows the manner in which it is connected to the line and one of the ways in which it may be secured to the insulator. In the latter diagram the crossing side is represented at the right end. The socket part of the dropout is shown in section; this makes very clear the ball and socket plan on which the device holds in place as long as there is normal tension in the crossing span. If a break occurs at the crossing the hooks in the dropouts at each end of the crossing span are instantly released, since the tension which holds them in place is removed.

Thus the two broken parts of the severed span are entirely removed from the circuit and the liability of grounding, closing or short-circuiting the line is eliminated. In fact, the service on the power-house side of the line may continue uninterrupted, if it is not a series circuit. This device, although so simple in principle and in application, is, therefore, very effective, and may be well classed among truly dependable "safety-first" appliances.

Among the advantages of the device are that it is not affected by wind, sleet or other weather conditions; it can be readily installed on existing lines at small expense; it does not require specially high poles, extra anchoring or extra heavy conductors; the electrical contact, on account of the large surface engaged between the ball of the hook and the socket is of very low resistance, which is said to be no greater than that of the equivalent length of wire replaced by the device.

The dropout is made in two types for attachment to either the side or top of the insulator. The one shown in Fig. 1 is of the top-tie type. The one shown in Fig. 2 is of the side-tie type. Both of these types can be secured with single end, as shown, or with a socket at each end, for use where a double dropout is desired. The ends of the device are tinned, and so arranged that they may be readily soldered to the line wire, so as to give a perfect joint.

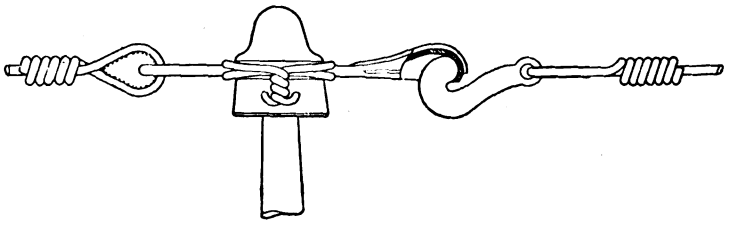


Fig. 2.—Method of Applying Side-Tie Dropout.

The Dostal dropout can be applied to any overhead electric circuits, whether they are for light, power, street-railway service, telephone or telgraph purposes. The device is made by the Mountain Electric Company, 1619 Glenarm Street, Denver, Colo.

New Bowl-Type Metal Reflectors.

The increasing use of high-efficiency lamps in industrial and commercial buildings is continually requiring a greater assortment of efficient and durable reflectors. In this line there have recently been placed on the market two new bowl-type reflectors of the six-inch size, manufactured by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn. These shades are designed particularly for bench work in shops, factories, etc. The maximum efficiency is obtained with them when they are used with 25 and 40-watt lamps.

The neck of the reflector is so arranged that when the lamp is inserted a considerable area is illuminated, while at the same time the strongest light is concentrated directly beneath the unit. This type of distribution has been found especially satisfactory for close bench work in that it provides the most intense light where the fine work is being done, and yet provides abundant light on the rest of the bench so as to avoid the sharp contract in illumination which is obtained when a concentrating reflector is used to throw a very strong light upon the small space where the most important work is done; in this case the remainder of the bench is usually in deep gloom, which brings about considerable eye fatigue when an effort is made to locate other tools or work in the relatively dark part of the bench.

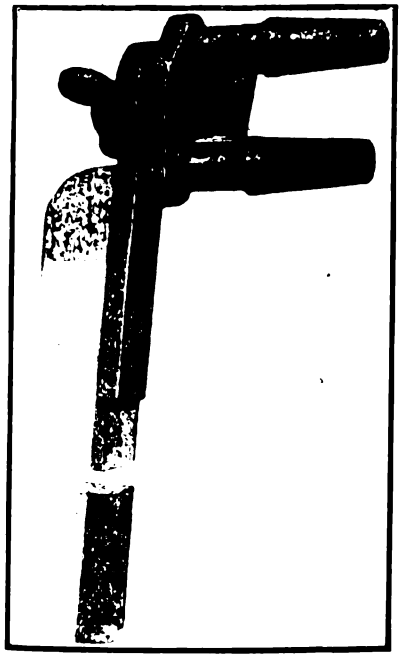
New Hubbell Steel Reflector.

The two new reflectors are identical in shape and construction, but one of them is finished with a heavy coating of porcelain enamel, which is green on the outside and white inside, thus providing a very effective reflecting surface. The other reflector is finished with green paint on the outside and aluminum inside; this particular shade is betted adapted for places where rough usage is likely to be imposed on the reflector. Both of the reflectors are made of a heavy steel body and are equipped with the Hubbell contractile collar, which makes the use of separate shade-holders unnecessary and at the same time assures center suspension under practically all conditions.

Digitized by Google

Safety Belt Shifter.

In a great many industrial plants considerable belting is still employed in driving machinery. This is true even where electric motor drive has been adopted on the group-drive plan, necessitating some overhead shafting with belts running from this to the individual machines. Since the use of tight and loose pulleys is by no means universal, the throwing on and off of belts is still resorted to in very many plants. This practice when followed without special devices is the cause of a very large number of very serious accidents. Where the operative has to climb up to the pulley and apply the belt by hand, a great deal of time is lost as well as serious hazard incurred. Where the plain belt stick is used the liability is not much less.



Safety Belt Shifter.

To meet the growing demand for "safety first" appliances in this line, there has been placed on the market the belt shifter shown in the accompanying illustration. The device is simple in construction. The stem is bolted or screwed to an ordinary pole or belt stick. This stem carries a swiveling block upon which are three rollers. The two standing out at right angles are tapered so as to prevent any possibility of the hook getting caught by the belt. This tapering of the two outer rollers also gives the belt a tendency to slide onto the pulley and for the fork to slide away, thus overcoming the liability to accident. The device is substantially made despite its low cost, and is said to be fully dependable for all except heavy main belts.

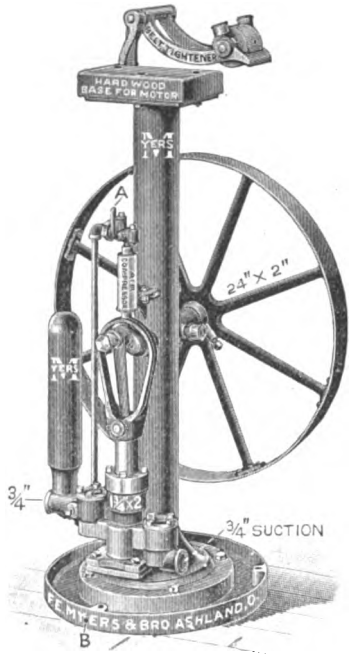
This new safety belt shifter is made by the Ready Tool Company, Bridgeport, Conn.

Electrically Operated House Pump.

The pump illustrated herewith has recently been designed for pumping to open or pneumatic tanks for residence and similar services. The pump is of the single-cylinder, single-acting plunger type, the plunger being 1.25 inches in diameter and the stroke 2 inches. The capacity is 160 gallons per hour.

The driving pulley and crankshaft are supported by a column which is bolted to a base that supports the cylinder and other parts of the pump. On the top of this column the motor is mounted. The motor, which is of Robbins & Myers manufacture, is connected to the driving pulley by a flat leather belt. A weighted idler pulley provides the necessary belt tension.

When for use in connection with pneumatic-pressure storage tanks, the pump is equipped with an auxiliary air cylinder for pumping the air into the tank above the water. This air cylinder is mounted above the water cylinder and is operated from the same crankshaft.



Electric House Pump.

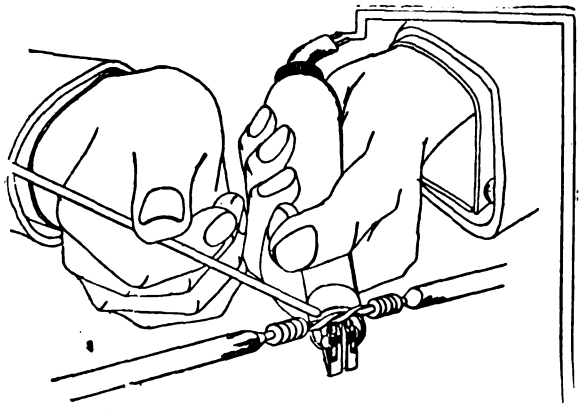
The whole outfit is mounted on a base which occupies a floor space of only 16 by 24 inches. This base has a receptacle for collecting oil and water, a drain pipe being provided for drawing off any water or oil so collected. The outfit is made by F. E. Myers & Brother, Ashland, O.

New Type of Electric Soldering Iron.

A unique type of soldering iron has been placed on the market, the object of which is to form or generate heat at the point of contact, and directly at the spot where the heat is needed for soldering purposes, whether it be electric wires, armatures or cable work. One does not have to wait for the iron to get hot, as the instant the object to be soldered bridges the two carbon or carborundum high-resistance heating points, these points glow with a white heat directly at the tips of the high-resistance material, therefore conducting the heat directly to the spot needed.

When the object is soldered and the moment the tool is taken from the work the current ceases to flow, as the circuit between the high-resistance points is opened. This results in a great saving of current, and also time. The iron is always ready for use; the high-resistance points will last indefinitely, and if they should become injured, can be readily renewed.

Where it takes from 8 to 20 minutes to heat the old-style iron, this new iron is instantly available. When in use it is always hot, when not in use it is always cold, and the danger of setting fire to any combustible material that the iron may come in contact with is eliminated. There is no loss of heat through conduction or radiation, as will be found in the old-style iron.



Monarch Electric Soldering Iron.

This new iron works in conjunction with a small transformer, and will solder from the smallest to the largest work, depending upon the amount of electrical energy that the iron and transformer are constructed for. Where it takes an ordinary electric soldering iron of the old style 10 seconds to solder a No. 14 splice, this new electric soldering iron will solder the same splice in from three to five seconds. In fact, it is said that any job can be soldered in less time with this iron than by any other means, whether it be a blow-torch, the old-style electric iron, or acetylene-gas outfit.

This iron is thoroughly covered by patents, issued and pending in all principal countries of the world. It is made by the Monarch Refillable Fuse Company, 1048 Jefferson Street, Buffalo, N. Y.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

WILMINGTON, DEL.—The Middle Georgia Power Company has been incorporated with a capital of $700,000, to supply electrical current for light, heat and power.

CHESTER, PA.—It is reported that the Board of Education is contemplating the erection of a new girl's high school or commercial high school.

CHESTER, PA.—The Stewart Distilling Company will erect a $500,000 plant here in the near future. The main offices are located at 254 South Third Street, Philadelphia. Wadleigh & Osborne, Philadelphia, are the architects.

PLEASANTVILLE, PA. — The Board of Education will shortly start the construction of a three-story school building here. S. Hudson Vaughn, Atlantic City, is the architect in charge.

NORTH CENTRAL STATES.

CINCINNATI, O. — In connection with the construction of the addition to the store of the H. & S. Pogue Company, contracts have been let for the installation of 10 elevators, by the Otis Elevator Company. A considerable amount of electrical work is involved in the building. Harry Hake, Cincinnati, is the architect. L.

CINCINNATI, O. — Architects Stewart & Stewart are preparing plans for the construction of a garage and machine shop for the use of the White Motor Car Company, on Gilbert Avenue, which will call for the installation of a large elevator and for other electrical work. Howard Fenker is manager of the company's Cincinnati branch. L.

LORAIN, O. — Advocates of municipal ownership are attempting to secure the calling of an election to pass upon a bond issue of $350,000 for the purpose of financing the construction of an electric plant by the city. An initiative petition requiring the submission of the question has been filed with the city council. L.

ROCKPORT, IND.—The Rockport Water Works Company is seeking a franchise which will permit it to supply Grandview, six miles distant, with electric service. The State Commission has not passed on the project as yet. G.

GALESBURG, ILL.—An ordinance is before the council providing for an issue of $95,000 in bonds for improving light and water system. Address the city clerk.

BIG RAPIDS, MICH.—Erection of a new $50,000 power plant at Morley, for supplying electric current to Howard City, Lakeview, Edmore, Morley and possibly Stanwood, is in prospect as a result of negotiations between Detroit capitalists and officials of the Little Muskegon Power Company. Sale of the power company's dam and flowage rights on the Little Muskegon, at Morley, is proposed.

CORINTH, IOWA. — Bonds have been voted for an electric light plant. Address the city clerk.

FORT DODGE, IOWA.—The city council will place additional lights in the northern part of the city. Address the city clerk.

FORT DODGE, IOWA.—A dam is to be built in the Des Moines River by the municipality, at a cost of $100,000, and a hydroelectric plant installed to develop current for lighting the city, and for sale for power and light. Burns & McDonnell, Kansas City, Mo., are drawing plans. M.

JOLLEY, IOWA. — The council plans the installation of a municipal electric light plant. Address the town clerk.

MARATHON, IOWA. — Electric light bonds to the amount of $12,000 have been authorized by vote. Address the city clerk.

SOLDIER, IOWA.—The council is planning to install an $8,000 light system. Address the city clerk.

BLUE SPRINGS, MO. — The ice factory and electric light plant owned by J. C. Waugh, which was recently destroyed by fire, will be rebuilt.

JEFFERSON CITY, MO.—The Jefferson City Light, Heat and Power Company has been granted a nine-year franchise, the old one having expired. Address William Irwin, representing the Jefferson City Light, Heat and Power Company.

KANSAS CITY, MO. — Henrici, Kent & Lowry are preparing plans for water works for Lee's Summit, Mo., in which the pumps will be driven by electricity. The total cost of the plant will be $45,000. M.

KANSAS CITY, MO.—The F. E. Newberry Electric Company, of St. Louis, Mo., was awarded the contract for the wiring of the St. Joseph Hospital, erection of which has begun, at $18,000. This includes wiring of the power plant. The Ridgway Dynamo and Engine Company, of Ridgeway, Pa., was awarded the contract for generator equipment at $9,000. M.

ATTICA, KAS. — The city council will probably advertise shortly for bids, for building an electric light plant and improving the water works, at a total expenditure of about $35,000. M.

GOFF, KAS.—This city has voted $6,000 in bonds for a lighting system.

KANSAS CITY, KAS.—The commissioners have sold a total of $124,000 of city improvement bonds, of which $60,000 will be spent on the electric light plant, completing plans already made and being carried out. There will be no more buying of equipment for the present. M.

KIRWIN, KAS.—The contract for building the electric light plant here, for which bonds were revoted, was let to the Freeman D. Martin Construction Company, of Fort Scott, Kan., at $9,585. The plans were drawn by E. T. Archer & Company, Kansas City, who have charge of the construction.

TOPEKA, KAS.—The Kansas Gas and Electric Company has filed with J. T. Botkin, secretary of state, a statement that it expects to increase its capital stock $300,000 for immediate purposes, and to increase the capitalization from the present $4,700,000, ultimately to $6,500,000, all of the increase to be spent on the company's Kansas properties. M.

SHELTON, NEB.—The city of Shelton has filed $8,000 of electric light bonds with the state auditor for registration. The state has agreed to buy the bonds. Address the city clerk.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—In an effort to bring its white way campaign to a successful conclusion, the Board of Commerce has appointed 19 teams which will undertake to close up the deal in one day. The campaign has been carefully mapped out and it is expected that it will meet with a generous response. G.

BIRMINGHAM, ALA. — City Engineer Kendrick was instructed by the city commission to ask for bids on an additional engine and generator for the North Birmingham electric light plant. The installation of the additional generator and engine will double the capacity of the plant, according to the city engineer. The estimated cost of the improvements is $11,000. Address Julian Kendrick, city engineer.

LITTLE ROCK, ARK. — The city council has appropriated $25,000 for the installation of 210 additional street lamps throughout the city. The ordinance was introduced by the finance and lighting committees. The amount appropriated is to pay for the 210 lamps, five transformers and other necessary equipment.

ATLANTA, TEX. — The Atlanta Electric and Ice Company has taken over and will operate for a term of five years the municipal water works plant. The company will add new equipment to its electric light and power plant and to the water works system.

CELESTE, TEX.—The electric light plant of T. J. Vines & Sons, which was recently destroyed by fire, will be rebuilt. D.

HIGHLAND PARK, TEX. — The city council has contracted with the Dallas Electric Light and Power Company to install a system of ornamental street lighting here to cost $9,500.

WESTERN STATES.

GLASGOW, MONT. — The city council is considering the installation of an electric light plant. Address H. Palmer, city clerk.

Digitized by Google

PLENTYWOOD, MONT. — The contract for the installation of an electric light and power plant at the Pierce & Wheeler coal mine northwest of this city, has been awarded by the Plentywood Electric Company to the Sheridan Electric Company. The plant to be constructed will be 52 by 50 feet, equipped with two 80-horsepower boilers, a 150-horsepower compound Corliss engine, one 125-kilowatt alterator generating 2,300-volt, three-phase, 60-cycle current. This new installation means that Plentywood will have continuous service.

ALBUQUERQUE, N. M.—The City Electric Company has been incorporated with a capital stock of $250,000, by George Roslington, Lloyd Sturges and E. L. Graze. The company is authorized to run a railroad system; also to operate trackless vehicles and to do a general electric power business.

MOGOLLON, N. M. — Earle C. Cleveland will build an electric power plant on Willow Creek. It will have a capacity of about 1,500 horsepower.

TUCSON, ARIZ.—The city council has under consideration the calling of an election to vote on a proposed issue of $100,000 bonds, part of which proceeds shall be used in completing the municipal lighting system. C. K. Clarke is city manager. D.

BLACKFOOT, IDAHO.—The construction of an electric lighting system, current for operation to be derived from a Diesel engine, is proposed by F. V. Riley, civil engineer, Idaho Falls. The city council has the matter under consideration, and it is reported that that body is favorable to the project.

POCATELLO, IDAHO.—The city council plans to completely rewire and make necessary repairs to the local lighting system in the subway and business districts, and to this end will ask various local electrical companies to submit bids and specifications for the work.

SHELLEY, IDAHO. — The town council, it is reported, is considering the installation of an electric lighting system.

CENTRALIA, WASH. — H. G. Fleishhauer, former manager of the Washington-Oregon Corporation, and who was recently given a contract to furnish current for street lighting to the city of Centralia (heretofore reported) at a rate considerably less than that being charged by the Washington-Oregon Corporation, the service to start October 1, has been granted a 60-day extension of time on his contract. Fleishhauer has been made the defendant in a suit filed in the Federal Court by the corporation, which seeks to prevent him from fulfilling the contract. Fleishhauer posted a $10,000 bond guaranteeing the fulfillment of his contract, but as an injunction restrains him from starting work on his plant until the suit is settled, the city has decided to extend the date of starting 60 days.

EUGENE, ORE.—The City Council has ordered the installation of an ornamental lighting system on Ninth Avenue from Olive to Pearl Streets. It is understood bids for materials and installation of same will be called for at an early date.

PORTLAND, ORE.—Commissioner Baker will recommend to the Budget Committee of the City Council this year, the lighting of several of the city parks, particularly Holladay and Selwood Parks. Several of the parks in Portland are electrically lighted, but a few of the more important ones are still dark.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,350. TELEPHONE WIRE.—An American consular officer reports that a Norwegian telephone company wishes to purchase 3,000 kegs (6,614 pounds) of silicium-bronze wire, the diameter of the wire to be 0.0512 inch with 40 per cent minimum conductivity, and 70 kegs (154 pounds), the wire being according to British post-office specifications. It is stated that the company is absolutely reliable.

NO. 18,363. LAMP PARTS.—A report from an American consular officer in Spain states that a firm is in the market for metal parts for electric light bulbs manufactured by American firms. Prices and catalogs are requested immediately. Correspondence should be in French or Spanish.

NO. 18,375. ELECTRIC CEILING FANS.—A report from a consular officer in India states that a firm desires to be placed in communication with American manufacturers of electric ceiling fans. It is stated that there is a very large market for this type of fan. Illustrated advertising matter, prices, discounts and terms of sale are desired. It would like exclusive representation on a commission basis, but if necessary will buy outright. Prices should be quoted c. i. f. Calcutta. References can be furnished. Correspondence may be in English.

NO. 18,387. STORAGE BATTERIES.—A commercial agent informs the Bureau that information and prices are desired by a business man in Central America relative to storage batteries suitable for use on tram lines and in the operation of motorboats. Prices should be quoted f. o. b. New York or New Orleans. Correspondence may be in English.

NO. 18,398. ELECTRICAL SUPPLIES.—A consular officer in the Netherlands reports that a firm in that country wishes to establish commercial relations with American manufacturers of electrical supplies. It states that first-class references can be given. Correspondence may be in English.

NEW INCORPORATIONS.

DETROIT, MICH. — International Electric Company. Capital, $25,000. Incorporators: Leroy C. Jolls, John Houghton and George McKay.

BROOKLYN, N. Y.—Glick Electric Company, Incorporated. Electrical contracting, etc. Capital, $500. Incorporators: T. Harry Glick, Bessie and Anna Glick.

EDMORE, N. D.—The Edmore Light and Power Company has been incorporated by H. J. Nyhus, M. M. Van Osdel and Charles C. Honey, with a capital of $10,000.

CORSICANA, TEX. — The Corsicana Electric Power and Light Company has been incorporated with a capital of $1,000, by F. N. Drane, J. W. Carpenter and S. M. Kerr.

EAST LIVERPOOL, O.—The J. G. Strauss Lighting Company has been incorporated with a capital of $5,000, by Jos. G. Strauss, Oscar A. Roush and others. The new concern will do business under the name of the City Lighting Company.

WELLINGTON, KAS.—The Western Sumner County Light and Power Company has been granted a charter. The company will furnish light and power to Mayfield, Milan, Argonia and possibly Wellington. Capital, $10,000. Incorporators: N. L. Jones, C. G. Williams, W. E. Stewart, F. M. Sumpton and E. T. Stewart.

CORNING, ARK.—The North Arkansas Utilities Company has filed articles of incorporation with the secretary of state. The company is capitalized at $75,000, and is authorized to build and operate power plants and railroads. The incorporators are: G. A. Booser, C. L. Daniel, Elizabeth Morrison and H. B. Hays.

IOWA FALLS, IOWA.—Articles of incorporation have been filed with the secretary of state for the Commonwealth Light and Power Company, capitalized at $250,000. The company will build and own power houses and transmission lines, and will sell electricity for light and power purposes. The incorporators are: Arnold R. Baar, Jacob Schwartz and Leo O. Levy.

FINANCIAL NOTES.

The Common Pleas Court has held that the Columbus, Delaware & Marion Traction Company cannot be held as guarantor on the $500,000 first-mortgage bonds and the $96,000 interest due thereon of the Columbus, Marion & Bucyrus Traction Company. When these bonds were issued, the Columbus, Delaware & Marion Traction Company guaranteed them as to principal and interest. On default by the Columbus, Marion & Bucyrus Traction Company, the Troy (N. Y.) Trust Company brought suit to enforce the guarantee, as trustee of the bonds.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Sept. 27	Sept. 20
American Tel. & Tel. (New York)	125⅛	123½
Commonwealth Edison (Chicago)	156	156
Edison Electric Illuminating (Boston)	239½	—
Electric Storage Battery common (Philadelphia)	74	74
Electric Storage Battery preferred (Philadelphia)	74	74
General Electric (New York)	173½	171½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	9	8
Massachusetts Electric preferred (Boston)	43	43¼
National Carbon common (Chicago)	140½	140½
National Carbon preferred (Chicago)	121	120¾
New England Telephone (Boston)	131	131
Philadelphia Electric (Philadelphia)	25	25
Postal Telegraph and Cables common (New York)	76¼	75¼
Postal Telegraph and Cables preferred (New York)	66½	66½
Western Union (New York)	77	76½
Westinghouse common (New York)	121⅛	118¼
Westinghouse preferred (New York)	140	131

Digitized by Google

Dividends.

Asheville Pr. & Lt., pf.	Q	1.75%	Oct. 1
Canadian Westinghouse.	Q	1 %	Oct. 11
Carolina St. & Pr., pf.	Q	1.75%	Oct. 1
Cen. & So. Am. Tel.	Q	1.5 %	Oct. 8
Chicago City Ry.	Q	2 %	Sept. 30
Colo. Spr. Lt., Ht. & Pr., pf.	Q	1.5 %	Oct. 1
Detroit Edison	Q	1.75%	Oct. 15
Elec. Utils., pf.	Q	1.25%	Oct. 15
Elmira Water, Lt. & R R., first pf.	Q	1.75%	Oct. 1
Houghton Co. Trac., pf.	S	$3	Oct. 1
Mass. Ltg., old com.	Q	$1.75	Oct. 15
Mass. Ltg., pf.	Q	$1.50	Oct. 15
Mass. Ltg., new com.	Q	$0.25	Oct. 15
Mexican Teleg.	Q	2.5 %	Oct. 15
New Eng. Tel. & Tel.	Q	1.75%	Sept. 30
Niagara Falls Pr.	—	2 %	Oct. 15
Pacific Tel. & Teleg., pf.	Q	$1.50	Oct. 15
Porto Rico Rys., pf.	Q	1.75%	Oct. 1
Pub. Serv. Corp., N. J.	Q	1.5 %	Sept. 30
Puget Sound Trac., Lt. & Pr., pf.	Q	$0.75	Oct. 15
So. Cal. Edison, pf.	Q	1.5 %	Oct. 15
Va. Ry. & Pr., com.	S	1.5 %	Oct. 20
West Kootenay Pr., pf.	Q	1.75%	Oct. 1
Western Electric	Q	2 %	Sept. 30
Westinghouse Elec. & Mfg., com.	Q	1.5 %	Oct. 30
Westinghouse Elec. & Mfg., pf.	Q	1.75%	Oct. 15
Winnipeg Ry.	Q	2.5 %	Oct. 23

Reports of Earnings.

DETROIT EDISON COMPANY.

	1915	1914
August gross	$ 548,563	$ 459,580
Net	169,819	126,414
Surplus	71,840	49,064
Eight months gross	3,894,817	3,314,395
Net	1,748,314	1,366,150
Surplus	1,046,296	805,168

NEW ORLEANS RAILWAY & LIGHT.

New Orleans Railway & Light Company reports earnings for the six months ended June 30, as follows:

Gross earnings	$3,520,748
Net earnings	1,368,637
Interest on underlying bonds	293,867
Interest on general mortgage bonds	394,740
Interest on refunding liens	89,525
Interest on debenture notes	92,067
Net income	498,439
Renewal and replacement reserve	75,166
Surplus	423,273

PERSONAL MENTION.

MR. F. ELLIS JOHNSON, instructor in electrical engineering at the Rice Institute, Houston, Texas, since its opening three years ago, has resigned from that institution to take charge of the dynamo laboratory at the University of Kansas.

MR. HARRY RHEINHARDT FRITZ has been appointed Research Fellow in the Engineering Experiment Station of the Department of Electrical Engineering of the University of Illinois. He is a graduate of the University of Texas, 1914, with the degree of Electrical Engineer. During the past year he has served as assistant in the alternating-current laboratory of the University of Texas carrying post graduate work.

MR. MAX L. SPAULDING has joined the sales force of the Trumbull Electric Manufacturing Company, of Plainville, Conn. He will assist the western manager, Mr. J. S. Jacobson, with headquarters at 15 South Desplaines Street, Chicago, Ill. Mr. Spaulding was formerly connected with Julius Andrae & Sons Company, Milwaukee, Wis., and previous to that connection was for a number of years with the Westinghouse Electric & Manufacturing Company.

OBITUARY.

MR. CORNELIUS J. FIELD, a well known electrical and mechanical engineer, died in New York, on September 21. Mr. Field was for some time chief engineer and general manager of the Brooklyn Edison Company. He was born in Chicago and was graduated from the Stevens Institute of Technology in 1886. He entered the employ of the Edison Company as a draftsman, and in 1889 was appointed chief engineer of the Edison United Manufacturing Company. Since 1891 when he left the Brooklyn Edison, he had devoted his attention to general construction work, building electric railroads and power stations in various parts of the country. More recently he had been engaged in the development of electric vehicles.

DATES AHEAD.

American Electric Railway Association. Annual convention, San Francisco, Cal., October 4-8. Secretary, E. B. Burritt, 8 West Fortieth Street, New York, N. Y.

New York Electrical Show. Ninth annual exposition, Grand Central Palace, New York City, October 6-16. George F. Parker, vice-president, 124 West Forty-second Street, New York City.

Empire State Gas and Electric Association. Annual meeting, Engineering Societies Building, New York City, October 7-8. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Association of Railway Electrical Engineers. Annual convention, Hotel LaSalle, Chicago, Ill., October 18-22. Secretary, J. A. Andreucetti, Chicago & Northwestern Railway Company, Chicago, Ill.

With the Electrical Manufacturers

The Cutter Company, Philadelphia, Pa., has ready for distribution wall calendars for the twelve months, beginning October, 1915, and ending September, 1916. As usual, each sheet is adorned with a cut of one of its I-T-E circuit breakers and a typical installation view showing that type in use.

National X-Ray Reflector Company, Chicago, Ill., has issued a new bulletin on its standard show-window reflectors. Data on the various types of these reflectors are given as well as valuable suggestions on how to plan window lighting to get the most effective results. A large number of illustrations of well-lighted show windows are given.

Metal Specialties Manufacturing Company, 730 West Monroe Street, Chicago, Ill., has prepared a folder illustrating and briefly describing the various types of its Presto electric hand lamp. This lamp is made both as a one or as a two-cell electric lamp, in each case ordinary standard-size dry cells being used. Copies of the folder can be obtained from the company.

The Mountain Electric Company, 1619 Glenarm Street, Denver, Colo., has sent out cards calling attention to the merits of the Dostal dropout as a reliable safety device for eliminating dangers from breaks in high-tension wires where they cross over other circuits or railway tracks. Copies of this and other literature dealing with this valuable device can be had from the company.

Holophane Works, of General Electric Company, Cleveland, O., has published "The Lighting Handbook," a convenient guide to those interested in illuminating engineering from the practical standpoint. The handbook contains a summary of the fundamental principles of illumination, hints on how to install Holophane products, practical applications in the lighting of various classes of interior, photometric curves and a mass of engineering data. By printing on thin paper the book is made up in handy size, although it contains 94 pages. A copy can be obtained on application to the Holophane Works.

Hess & Son, 1031 Chestnut Street, Philadelphia,, Pa., have published a new catalog of their Tinol solder products. The properties and advantages of Tinol solder are set forth. This material is now made up in tube form, containing two ounces of paste, that is a compound of solder and flux. Other products illustrated in the catalog are the Tinol alcohol blow torch, Tinol complete soldering sets of various types, Tinol wire and Tinol solder in can form. The catalog contains over ten pages of valuable suggestions for soldering various metals and materials. Copies of it can be obtained on request to the company.

National Lamp Works, of General Electric Company, Nela Park, Cleveland, O., through its Engineering Department, has recently issued bulletin No. 25, entitled "Street Series Alternating-Current Incandescent-Lamp Circuits," dealing with important factors in

Digitized by Google

the design and operation of incandescent series systems. This bulletin contains a mass of information on the means of securing the highest degree of satisfaction in the use of Mazda series lamps. Various types of regulators and their effect upon lamps are discussed in detail. A section is devoted to line considerations, and convenient formulas are given for engineering calculations. Bulletin No. 13E, "Multiple Mazda Lamps," is also now available. This bulletin is devoted largely to a discussion of the characteristics of these lamps. Engineering data on Mazda B, Mazda C, and Mazda B Coil lamps are included. Bulletin No. 20, "Industrial Lighting," a 64-page bulletin published on October 1, 1913, has been supplemented by a four-page folder which supplies new tables for the convenient calculation of operating costs, the latest data on lamps, and data on a typical Mazda C industrial installation.

Simplex Electric Heating Company, Cambridge, Mass., has recently secured some very noteworthy orders for electric ranges, etc. A 30-foot, eight-oven Simplex range has been sold through the Montana Power Company, to the Montana State Hospital, Warren Springs, Mont.; this range is to cook the meals for from 1,200 to 1,500 persons daily, and so far as known is the largest of its kind in the world; the purchase is made as a result of the excellent service given by Simplex ranges in other institutions, including one which does the cooking for 1,000 daily, at the Southern Indiana Hospital for the Insane, Evansville, Ind. The New Central Dormitory nearing completion at Wellesley College, Wellesley, Mass., is being furnished exclusively with a Simplex electric range and bake-oven equipment which will serve 250 students and the help; this equipment comprises a special three-oven, 12-foot range, and a No. 158 Simplex bake oven, which has a capacity of 90 one-pound loaves. A two-oven Simplex electric range for hotel use has recently been shipped to the Wyoming Electric Company, Casper, Wyo.; this range is a duplicate of a Simplex range installed some time ago in the restaurant of the Ford Motor Company's Administration Building, at Detroit, and is adapted to serve about 60 persons. A special Simplex range with two ovens and hot closets above it, intended for a large private residence, at Greenwich, Conn., was recently sold through the United Electric Light & Water Company.

Record of Electrical Patents

Issued by the United States Patent Office, September 21, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,153,879. Pneumatic Governor. B. S. Aikman, assignor to National Brake & Electric Co., Milwaukee, Wis. Details of pressure-controlled switch for motor-driven compressor.

1,153,888. End-Play Device for Rotary Engines. R. W. Bott, Minneapolis, Minn. Particular structure for causing endwise movement of shaft of rotary converters, dynamos, etc.

1,153,889. Carbureting Method. T. D. Bottome, Indianapolis, Ind. Includes electrical heater for heating fuel and air.

1,153,922. Toy Railway. F. J. Hummel, Pittsburgh, Pa. Electrically operated and includes a signal system.

1,153,937. Transmitting Telegraph-Relay. T. H. Mains, Dallas, Tex. Arrangement of windings and magnetic structure in polarized instrument.

1,153,942. Spark Plug. D. B. Mills, assignor to Pasha Spark Plug Co., Montclair, N. J. Simplified manner of securing outer metal shell and central insulated portion together.

1,153,944. Magneto Generator. T. W. Morgan, assignor to W. W. Marsh, Waterloo, Iowa. Detailed structure having arrangement for contact pins to engage in armature recess upon maximum armature current for either direction or rotation.

1,153,960. Lighting Fixture. E. J. Schweitzer and R. G. Wagner, Los Angeles, Cal. Arrangement of lamp socket, reflector and support for semi-indirect lighting.

1,153,969. Gas Lighter. E. H. Sturts, Philadelphia, Pa. Gas boiler heater has pilot tube and main supply valves electromagnetically and thermostatically controlled.

1,153,975. Electrically Insulating Compound. O. V. Thomas, Penang, Straits Settlements. Composed of ground mica washed free of salt or alkaline substances, resin and resin oil.

1,153,976. Mercury Vapor Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. W-shaped tube with mercury at lower angles and high and low potential leading-in wires automatically connected according to vapor pressure.

1,153,978. Electrical Controller. F. W. Van Ness, assignor to Richmond Radiator Co., New York, N. Y. Particular thermostatic switch.

1,153,987. Apparatus for Automatically Controlling Relative Humidity. F. D. Windell, Philadelphia, Pa., assignor of one-half to H. L. Williams. Admission of humidifying atmosphere to apartment thermostatically and hygroscopically controlled through electric means.

1,154,009. Apparatus for Producing Gases. R. H. Goddard, Worcester, Mass. Automatic, electromagnetically controlled electrolytic apparatus.

1,154,016. Dynamic-Braking Controller. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Motor connected with alternating-current source for running and with direct-current source for braking.

1,154,024. Automobile Direction Signal or Indicator. Z. Keough, Los Angeles, Cal. Arrows at front and rear of vehicle; each have different colored electric lights at head and tail portions.

1,154,025. Electric Meter. C. F. Ketteringe, assignor to Dayton Engineering Laboratories Co., Dayton, O. Mercury instrument normally has current pass through registering gearing which is protected from excessive current flow.

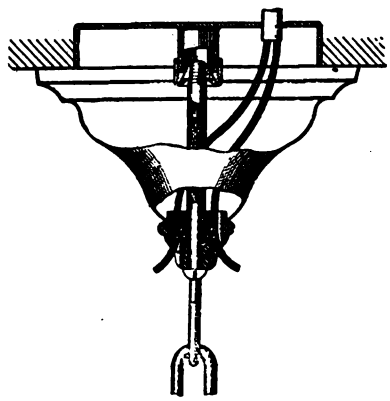
1,154,027. Automatic Electrical Wire Coupling for Cars. H. S. Kimmel, Tiffin, O. Particular structure for gripping bare conductor end.

1,154,030. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Pendent, multi-circuit, push-button, snap switch.

1,154,047. Railway-Crossing Alarm. G. Neville, Vancouver, B. C., Canada. Alarm circuit closed by train has dashpot delaying opening.

1,154,058. Rectifier. L. R. Rogers, Chicago, Ill. Arrangement of field, armature, commutators, collectors, etc.

1,154,069. Audiphone. C. Soret, Havre, France. Headpiece has receiver for each ear, each comprising receiving microphone and transmitting telephone.



No. 1,154,070.—Fixture Loop.

1,154,070. Electric Lighting Fixture. P. W. Sprecher, Milwaukee, Wis. Insulation and support in fixture loop. (See cut.)

1,154,075. Telephone System. J. A. Taggart, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Arrangement of cord circuits and automatic trunking switches.

1,154,081. Leading-In Conductor. E. Weintraub, assignor to General Electric Co., Schenectady, N. Y. Tungsten conductor is sealed in a magnesium boro-silicate.

1,154,082. Automatic Stop for Power-Driven Player Mechanisms. F. C. White, assignor to Wilcox & White Co., Meriden, Conn. In pneumatic piano-player, exhauster driven by electric motor which has its circuit broken when spool is empty.

1,154,091. Electrolytic Apparatus. J. B. Burdett, assignor to Davis-Bournonville Co., New York, N. Y. Structure of electrodes, chambers, porous diaphragm, etc. Container is one electrode and supply of electrolyte is automatic.

1,154,092. Electrode for Electrolytic Cells. J. B. Burdett, assignor to Davis-Bournonville Co. Pair of parallel metal plates secured to terminal rods extending between them.

1,154,093. Inclosed Flaming-Arc Lamp. T. L. Carbone, assignor to General Electric Co. Condensing chamber contains hose of wire gauze containing blocks of moisture-absorbing material.

1,154,099. Ground Connector. W. H. Curry, Lake City, Iowa. Particular structure for grounding point.

1,154,103. Automatic Steering Mechanism. K. Dougan, Minneapolis, Minn. For boats, torpedoes or other dirigible objects; controlled by magnetic needle having its oscillations damped.

1,154,111. Electric Heater. W. S. Hadaway, Jr., New Rochelle, N. Y. Cylindrical heater adjustable with relation to support to vary its inclination.

1,154,112. Socket for Electric Heater Units. W. S. Hadaway, Jr., New Rochelle, and J. Amon, New York, N. Y. Details of structure for connection with resistor and receiving plug.

1,154,113. Humidifier. W. S. Hadaway, Jr. Heater carried on float and liquid conveyed to it by wick.

1,154,114. Stove. W. S. Hadaway, Jr. Has high and low-temperature electric heaters.

1,154,115. Electric Heater. W. S. Hadaway, Jr. Removable plates carry zig-zag resistors connected with busbars supporting the plates.

1,154,117. Spark Plug. A. N. Hoagland, Oxford, N. J. Has removable spark head carrying number of spark points secured to central stem.

1,154,127. Apparatus for Neutralizing Electric Charges in Fibrous Materials. P. Rasehorn and G. Grossmann, assignors to Siemens & Halske, A.-G., Berlin, Germany. Charges neutralized by ionizing rays and collected by wire screen by means of the ionized air.

1,154,128. Apparatus for Indicating Fires in Compartments at a Distance. W. Rich, Liverpool, England. Electric fan sucks air, etc., from apartments to central station where products of combustion produce chemical change.

1,154,130. Circuit-Closing Device. F. M. Rosenfeld, assignor to Import Sales Co., New York, N. Y. Particular form of switch for portable battery lamp.

1,154,132. High-Tension Transformer. C. Schrader, assignor to Siemens & Halske, A.-G., Berlin, Germany. Magnetic sleeves on legs of primary coil and secondary outside the sleeves.

1,154,139. Telegraph or Telephone Relay. C. Stille, Zehlendorf-West, near Berlin, Germany. Electromagnet has suspended in its field two coils tending to rotate in opposite directions and carrying arms bearing upon microphones.

1,154,144. Thermoelectric Device for Therapeutics. J. B. Wagoner, Los Angeles, Cal. Special details of hand device for connection to lamp socket comprising transformer, electrode connected to one secondary terminal and other terminal adjacent to bottom having fabric constituting dielectric.

1,154,162. Signal Apparatus. D. Baker, Los Angeles, Cal. Alarm and warning signals electrically operated by float.

1,154,170. Trolley Wheel. C. M. Brennan,

Digitized by Google

Bridgeport, Conn. Special lubricating provision.

1,154,179. Method of Making Electrotype Embossing Dies. D. D. Evins, Waco, Tex. For imitating fabrics; wax cast of fabric surface is electroplated.

1,154,184. Electric Signaling Apparatus. F. B. Herzog, New York, N. Y. Central stations may be signaled from street boxes and one or more of the boxes may be signaled from the central station.

1,154,189. Rerolling Mechanism for Musical Instruments. J. F. Mackin, assignor to L. Maxwell, Cincinnati, O. Note sheet controls electrical means for rewinding.

1,154,193. Time-Controlled Switch for Electric Lights. W. C. Marrow, Narragansett Pier, R. I., and J. M. Biddle, Washington, D. C. Clock-controlled switch mechanism.

1,154,201. Spark-Plug Connector. A. H. Ochs, Louisville, Ky. Terminal for securing conductor to post of plug.

1,154,234. Trolley. G. O. Borwell, Salt Lake City, Utah, and C. M. Kurtz, Bellevue, Pa. Special structure of wheel contactor.

1,154,243. Adjustable Lamp for Beds. A. Goldknopf, New York, N. Y. Cylinder containing battery has clamp for securing it to bed support and carries adjustable tubular supporting arm for lamp.

1,154,244. Automatic Stop-Motion for Can-Body-Forming Machines. C. W. Graham, assignor to American Can Co., New York, N. Y. Clutch driving blank feeder is automatically controlled by electrical means.

1,154,250. Operator's Calling Device. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Impulse transmitter has spring-motor-driven impulse mechanism and a winding magnet controlled by keys.

1,154,252. Range Finder. A. M. Kennedy, West Orange, N. J. Indicator controlled by opposed electrical forces varied with position of finder.

1,154,257. Combined Removable-Key Single-Piece Shell and Automatically Interlocking Shell and Switch-Mechanism Socket. H. W. Lawrence, Denver, Colo. Unitary switch mechanism locked in integral shell automatically on insertion; operating shaft has quick-detachable key.

1,154,264. Rail Bond. G. A. Merkt, assignor to American Steel & Wire Co. of New Jersey, Hoboken, N. J. Terminals coated with iron having same composition as rails, are electrically welded to rails.

1,154,266. Circuit-Controller. E. J. Murphy, assignor to General Electric Co. Electromagnetically operated, rotary, switching device.

1,154,270. Electrically Heated Kitchen Range. O. Saelid and K. Pettersen, Sarpsborg, Norway. Arrangement of electrically heated bodies for supporting cooking utensils, forming oven, and heating water.

1,154,274. Limit Controller for Motors. G. J. Stuart, assignor to Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, Pa. Limit switch biased to open is held closed, the apparatus being reversible at will prior to release of switch.

1,154,278. Method of and Means for Reducing Line Capacity. E. H. Widegren and K. A. Widegren, Alby, Sweden. Influence of line capacity reduced where apparatus operates by impulses from a continuous-current source, by suitably arranging polarity, etc., of impulses.

1,154,279. Transmitter for Electric Writing Telegraphs. E. H. Widegren and K. A. Widegren. Arrangement of rotary commutator with brush thereon connected with writing pen.

1,154,293. Electrically Propelled Road Vehicle. E. Cross, Rotherham, England. Detachable connection for automobile whereby it may be placed in operative relation to a track rail to be steered thereby and receive current from it.

1,154,306. Vacuum-Indicator. G. F. Gray, assignor to General Electric Co. Impairment of vacuum causes mercury to close circuit of indicator.

1,154,311. Mechanical Interrupter for Electrical Ignition Systems. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Has means for damping excessive movements of rotary pivoted electrode.

1,154,319. Cable-Hanger. J. Kennedy, assignor to Clements Co., New York, N. Y. Hooked strip for attachment to messenger having punched-out device for securing band about cable.

1,154,320. Electric Welding Apparatus. O. A. Kenyon, assignor to J. Kjekstad and W. Schenstrom, New York, N. Y. Parallel circuits have adjustable resistance in series and respectively include the welding arc and an equivalent resistance, the latter automatically cut out when arc is struck.

1,154,339. Baker's-Oven Light. C. Robson, Philadelphia, Pa. Gas or electric light may be interchangeably used and electric switch controlled by oven door.

1,154,354. Electric Connector. E. F. Wakefield, Chagrin Falls, O. Stamped sheet-metal terminal.

1,154,356. Electrical Heater for Liquids. U. Wedge, Ardmore, Pa. Immersion heater has pivotal support so that it may be inserted in cups, etc., for heating beverages. (See cut.)

1,154,358. Device for Suspending Shades or Bowls in Lighting Fixtures. E. L. White, assignor to J. H. White Mfg. Co., Brooklyn, N. Y. Chain-supported bowl with lamp-supporting ring.

1,154,359. Protective Device. D. Basch, assignor to General Electric Co. Time-limit circuit-breaking device.

1,154,372. Battery Cell. A. P. Burritt, Ozone Park, N. Y. Structure of storage-battery jar with plate support.

1,154,377. Compression Rheostat. E. L. Clark, assignor to National Carbon Co., Cleveland, O. Comprises piles of specially corrugated carbon plates.

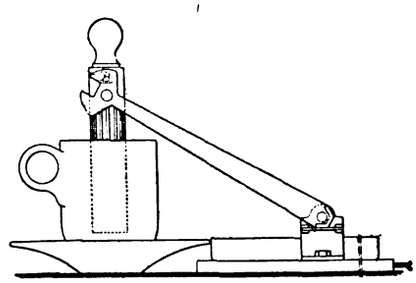
1,154,386. Means for Supervision of Machine and Tool Work. P. B. Delany, South Orange, N. J. Microphone on machine transmits vibrations to receiver in office while machine is in operation.

1,154,393. Electrode for Arc lights. C. W. Hill, assignor to National Carbon Co. For flaming arcs; outer shell of flaming material and core of pure carbon more resistant to arc than shell so that core protrudes as electrode is consumed.

1,154,394. Safety Connection for Electric Mains. M. Höchstädter, assignor to Siemens-Schuckertwerke G. M. B. H., Berlin, Germany. Fault detector for alternating-current cable systems comprising disconnecting means, including section switches operated by grounded auxiliary circuit connected with conducting layer in insulation of each cable conductor.

1,154,409. Electrical Heating Unit. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co., Detroit, Mich. Resistor, insulation and armor arranged in flat unitary heating unit.

1,154,410, 1,154,411, 1,154,412. Electric Heater. F. Kuhn and F. E. Shailor, Detroit, Mich., said Shailor assignor to said



No. 1,154,356.—Immersion Heater.

Kuhn. First patent, radiant heater having helical resistor coils suspended from horizontal grid frame. Second patent, similar to above with removable reflector plate beneath heater. Third patent, provision for connecting to heat element at different points to produce heaters of varying lengths.

1,154,413. Connector for Electrically Heated Instruments. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. Connecting structure secured to flatiron handle.

1,154,414. Electrically Heated Soldering Iron. F. Kuhn and F. E. Shailor, said Shailor assignor to said Kuhn. Special connections and resistors arranged in iron; overheating is prevented.

1,154,415. Handle and Terminal Connection for Electrically Heated Instruments. F. Kuhn and F. E. Shailor, said Shailor assignor to said Kuhn. Special structure for forming connections through handle of curling irons, etc.

1,154,416. Electrically Heated Oven. F. Kuhn, Detroit, Mich. Special arrangement of a naked resistor.

1,154,417. Electrical Heater. F. Kuhn. Coiled resistor is threaded through an alined series of insulator spools.

1,154,418. Electrically Heated Cooking Utensil. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. Heating unit secured to utensil bottom within depending skirt supporting same.

1,154,427. Dirigible Torpedo. M. P. Otto, Paris, France. For steering from a distance by wireless; torpedo is connected with a float carrying antenna and signals.

1,154,441. Transformer Regulation. E. O. Schweitzer, Chicago, Ill. Transformer has sufficiently high magnetic leakage to prevent disruption from short-circuit and leakage is corrected by overexcited rotary condenser.

1,154,449. Stop-Motion for Looms. J. J. Smith, assignor to W. Firth, Chestnut Hill, Mass. Comprises electromagnetically controlled vibratory shipper actuator.

1,154,461. Guide Signal for Automobiles. E. A. Walz, Jr., New York, N. Y. Arrangement of bull's eyes, reflectors, lights, coloring, etc., in automobile-direction indicator.

1,154,462. Wiring System. E. A. Walz, Jr. Vehicled-direction-signal system comprises front and rear pairs of lights combined with audible signal.

1,154,470. Electric Welding Machine. W. C. Winfield and A. C. Taylor, assignors to Winfield Electric Welding Machine Co., Warren, O. Resistance type; relates to structure and support of electrodes in spot-welder.

1,154,473. Electric Snap-Switch. J. Zakrzewski and J. Karasinski, Detroit, Mich. Details of structure wherein contacts are actuated by star wheel.

1,154,476. Filling Device. H. S. Benjamin, Rochester, N. Y. Float-operated electric signal warns when receptacle is full.

1,154,480. Fire Alarm. R. L. Brinkley, Winston-Salem, N. C. A phonograph announces to telephone location of fire, both phonograph and telephone being electromagnetically controlled

1,154,496. Slot-Closing Device for Dynamo-Electric Machines. W. L. R. Emmet, assignor to General Electric Co. Formed of separate magnetic laminations secured together by rods.

1,154,503. Radiator Thermometer Cap. D. P. Fraser, New York, N. Y. For automobile radiators; comprises automatically operated electric light for illuminating thermometer.

1,154,514. Incandescent Lamp. R. Jacoby, assignor to General Electric Co. Has mixture of argon and nitrogen about tungsten filament.

1,154,522. Means for Locating Submarine Boats. H. Lotz, Lawrence, Mass. Buoy has battery lamp circuit controlled by buoy line.

1,154,574. Repeater. C. D. Lanning, Dorchester, Mass. Particular structure of variable resistance; electrodes have pressure contact varied by magnet in receiver circuit.

1,154,576. Switch Box. C. C. Maison and R. H. Robinson, assignors to Allino Switch Box Mfg. Co., St. Louis, Mo. Details of two-part structure for wall attachment.

1,154,583. Binding-Post for Electrical Conductors. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Screw centrally secures cup-shaped washer of soft metal beneath which conductor is clamped.

1,154,587. Heating System. H. S. Williams, assignor to Peter Smith Heater Co., Detroit, Mich., and to Consolidated Car-Heating Co., Albany, N. Y. Circuit arrangements to control electrical air blowing and heating whereby the blowing may be thermostatically controlled and the heater and thermostat may be cut out to operate without heating.

1,154,588. Electric Signaling System. S. M. Young and F. Townsend, assignors to said Young, New York, N. Y. For electric railways; arrangement of inductive devices employing alternating signaling currents of different potentials.

Patents Expired.

The following United States electrical patents expired on September 27, 1915:

611,243. Safety Fuse for Electric Circuits. G. W. Gardanier, Nyack, N. Y.

611,258. Truss Frame for Electric Vehicles. K. Knudsen, Chicago, Ill.

611,271. Electric Railway. O. Preil, Washington, D. C.

611,332. Elevator Safety Attachment. W. C. Preston, Providence, R. I.

611,348. Igniting Device for Gas Engines. W. A. Bole and T. J. Hogan, Pittsburgh, Pa.

611,367. Trolley Pole. A. M. Meredith, Philadelphia, Pa.

611,391. Calipers. H. A. Pike, St. Louis, Mo.

611,448. Apparatus for Printing Telegraphic Messages. G. M. Gibson, Chulmleigh, England.

611,460. Electric Arc Lamp. T. H. Pettengill, Amsterdam, N. Y.

611,461. Motor Mounting for Electric Cars. S. H. Short, Cleveland, O.

611,465. Controller for Electric Motors. H. P. Davis, Pittsburgh, Pa.

611,466. Alternating-Current Measuring Instrument. H. P. Davis, Pittsburgh, and F. Conrad, Wilkinsburg, Pa.

611,501. Mechanism for Imparting Successive or Alternating Movements. E. Moore, Meductic, Canada.

611,558. Apparatus for Starting Motors. J. Burke, New York, N. Y.

611,559. Electric-Railway System. G. L. Campbell, Dushore, Pa.

611,581. Telephone System. G. Ritter, Stuttgart, Germany.

611,592. Alternating-Current Voltmeter. H. P. Davis, Pittsburgh, and F. Conrad, Wilkinsburg, Pa.

Digitized by Google

Electric Vehicle Section

New England Electric Vehicle Committee Report.

An interesting report was presented to the recent convention of the New England Section, National Electric Light Association, by its Electric Vehicle Committee. Covering New England conditions the committee presented a tabulated list of rates for charging in both public and private garages, which showed that in the former rates range from 3 to 6 cents and in the latter from 3 to 15 cents, a rate of 5 to 6 cents predominating. Rates in garages range from 5 to 10 cents, and in charging stations maintained by lighting companies from 3.5 to 10 cents, 5 and 6 cent rates predominating. A sub-committee has secured the suspension of a rule of the Massachusetts district police that no rectifiers be installed in gasoline garages except when installed in fireproof compartments. The provision now is that no sparking point is within 4 feet of the floor.

Attempts to secure a uniform charging rate have met with some success. A sub-committee on relations with central stations reported that the initiative in campaigns for popularizing the electric should be taken by the manufacturers, the station being ready to supply current free for demonstrations and make contributions for local advertising. About a dozen central stations in New England are carrying on especially effective propaganda. Others are willing to contribute time and money for definite objects in advancing vehicle interests in their territory. The secretary of the New England Section, N. E. L. A., keeps a list of garage and battery men, drivers, etc., for the use of central stations. The office at 149 Fremont Street, Boston, is a clearing house for vehicle information.

The report alluded to the electric mail-car fleet in Boston already described in these columns and stated that the electric is increasing in other lines of business, especially in connection with mills and factories. It was recommended that an electric-vehicle committee be continued, to advance the work started and to complete the plans already formulated.

S. Fred Smith, manager, Salem (Mass.) Electric Lighting Company, stated that his company is doing all its operating work with electrics. Garaging is furnished the public free, with a competent battery man in charge. A baking company which recently extended its business to Salem has substituted an electric truck for a gas car for transporting product from Boston, about 16 miles. The truck makes the run, exchanges batteries at Salem and returns, daily.

A. B. Lisle, Providence, R. I., stated that records of comparative costs show that of electrics to gasoline as being in the ratio of 7 to 12. A local department store recently invested $35,000 in trucks and will eliminate gasoline cars entirely.

E. P. Rowell, Plymouth, Mass., said the electric is increasing in his territory. His company furnishes energy to a public garage.

W. M. Thayer, Hartford Electric Light Company, presented the following record of costs for delivery by horses, gasoline and electric trucks used in the coal trade:

	Delivery Cost per Ton	Cost per Ton-Mile
Horse-drawn wagon	44.9 cents	15 cents
Horse-drawn log wagon	51.5 cents	14.1 cents
Two-ton gasoline truck	96.5 cents	14.8 cents
Two-ton electric truck	66.2 cents	13.8 cents
Five-ton gas truck	62.2 cents	12.4 cents

F. H. Smith, Worcester, gave the following daily costs of operation of electric vehicles employed by the Worcester Electric Light Company in various services in connection with operation. The figures include energy at 2 cents a kilowatt-hour, insurance, and depreciation at 20 per cent a year:

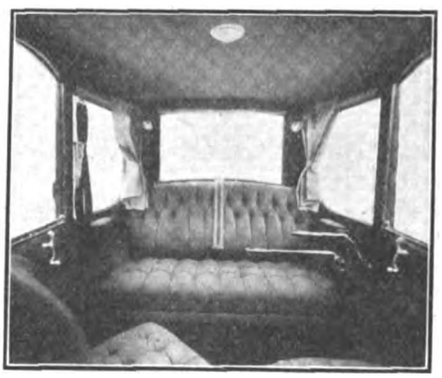
2-ton truck for freight hauling	$6.13 a day
1,000-lb. line truck	4.25 a day
750-lb. service truck	3.58 a day
Runabouts, for supt. of service	3.34 a day
1,000-lb. truck	3.35 a day
1-ton truck	4.10 a day
Runabout, for inspector	4.10 a day
Runabout, supt. of distribution	4.18 a day
Line trucks	$4.72 and 4.05 a day
7,000-lb. truck, with winch, for cable work	6.24 a day
Runabouts	$3.10 and 2.81 a day

Day Baker, superintendent of sales, General Vehicle Company, New York, told of a two-ton truck in Spokane, Wash., which is operated by a baggage-delivery company. Average mileages per day for 18 months have been 68 miles. At Hartford, Conn., an electric truck is successfully operated by a milkman who comes into the city from a considerable distance. Mr. Baker pointed out that the improvement in batteries and lessened weight of the chassis have resulted in greatly increased mileage capacities.

Chicago Electric Announces Price Reduction and Battery Rental System.

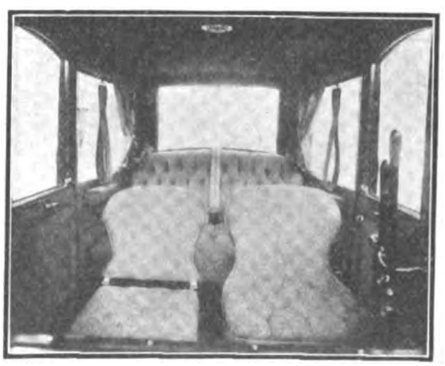
The Walker Vehicle Company, Chicago, Ill., maker of the "Chicago Electric," announces for 1916 some substantial reductions and a battery rental system.

The substantial growth of Chicago Electric sales the past season has convinced the Walker Vehicle Company that these new prices will make possible a most decided increase in their production for the coming season:



Rear Drive Four-Passenger Enclosed Chicago Electric.

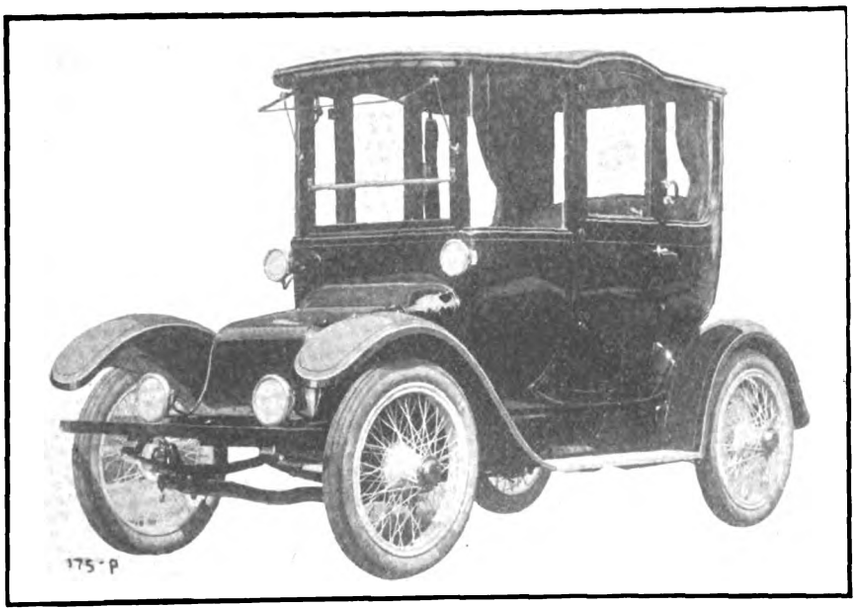
	Last Year.	1916.
Model 151, four-passenger rear drive, enclosed	$2,600.00	$1,985.00
Model 153, four-passenger rear drive, enclosed	2,600.00	1,985.00
Model 152, five-passenger front drive, enclosed	2,800.00	2,150.00
Model 154, four-passenger cabriolet roadster	2,600.00	1,985.00



Front Drive Five-Passenger Enclosed Chicago Electric.

The body design of the new Chicago electric has undergone several minor changes. The arched doors have been retained. The more extensive use of aluminum, particularly for all parts that are exposed to the weather, will add to

Digitized by Google



Five-Passenger Enclosed Chicago Electric.

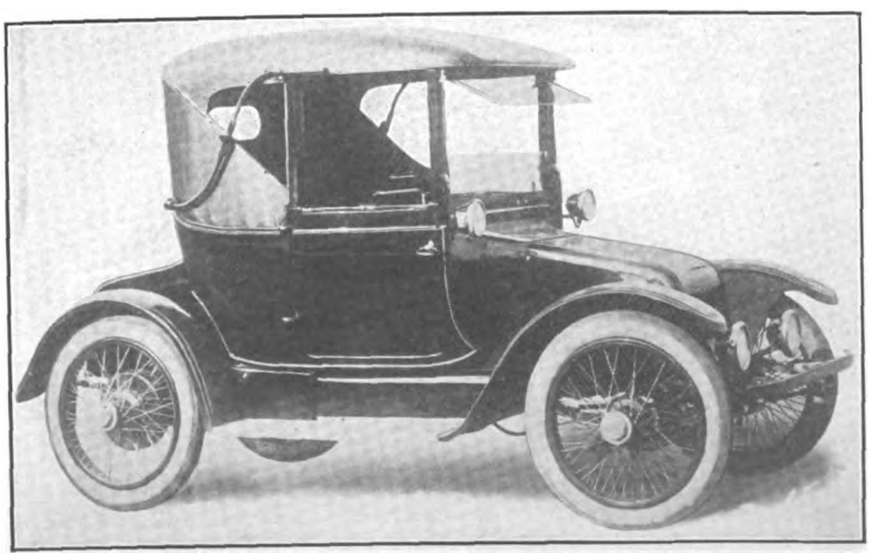
the durability of the body construction. A new fender design of the crowned type marks a decided improvement in the general outline of the car. They are fully skirted to the bodies to completely protect them from mud and water. Sashless windows will be used, operated by improved mechanical lifts, which through the touch of a lever, will open or close the windows. Improvements have been made in the mounting of the windows, the glass being set deep in the frame of the body proper in a special cement, doing away with the use of keep-stakes, overcoming any loose windows or leaks.

Every article that will add to the luxury and completeness of the interior will be found in these bodies, such as dome lights, reading lamps, arm rests, arm slings, the latest type concealed toilet case and smoking set, clock, recording instruments, etc. The same type of front window will be continued, which allows complete opening of the window in warm weather. In addition, an auxiliary rain shield will be furnished to give clear vision under all weather conditions.

No radical changes have been made in these models over those of the past season, with the exception of such body improvements as have already been described. Models 151 and 153 are four-passenger, rear seat drive. These models are spacious and will seat with comfort four passengers, as well as providing an emergency seat for a fifth.

Model 154 cabriolet roadster is designed primarily as a real utility car with all the frills left off. This model offers the combination of open roadster and closed coupe. The rear seat is wide enough to carry three passengers, while an auxiliary folding seat will carry a fourth. This car is specially constructed for power, speed and mileage.

These three models are all built on a wheel base of 96 inches, which combines qualities for riding comfort as well as the special feature of being able to turn completely in a very short radius, viz., 34 feet.



Chicago Cabriolet-Roadster.

This short turning radius is a very important essential in the ease of handling the car, particularly in congested districts. Horizontal control used which includes five speeds and a substantial mechanical brake operated by hand. In addition, the car is equipped with powerful foot brakes.

Model 152 is a front-seat drive, five-passenger limousine. Additional room is afforded in this model, the body averaging eight inches longer than the other models, and the seats a trifle wider. This model will offer ample room for the comfortable seating of five passengers. The wheel base of this model is 104 inches, and interior body length 78 inches.

The chassis follows very closely the successful principles which were established from the start. The frame is built into a rigid unit, which gives a foundation of great strength, particularly adapted to the use of solid tires. The most careful study has been given to proper weight distribution. The selection of steel used throughout has been given great attention. Marked improvements have been made in the lubrication of the car, particularly the steering, the number of places requiring grease being reduced to a minimum and equipped with large size grease cups, all accessible and within easy reach, making it unnecessary to get under the car.

The bronze bushings that have shown undue wear in the previous models have been improved by the use of types that will give greatest wear. The same type of slow-speed, series-wound motor is used. This motor is direct connected to a straight-line drive-shaft through double universal joints to rear axle. For hill climbing, this slow-speed motor has decided advantages.

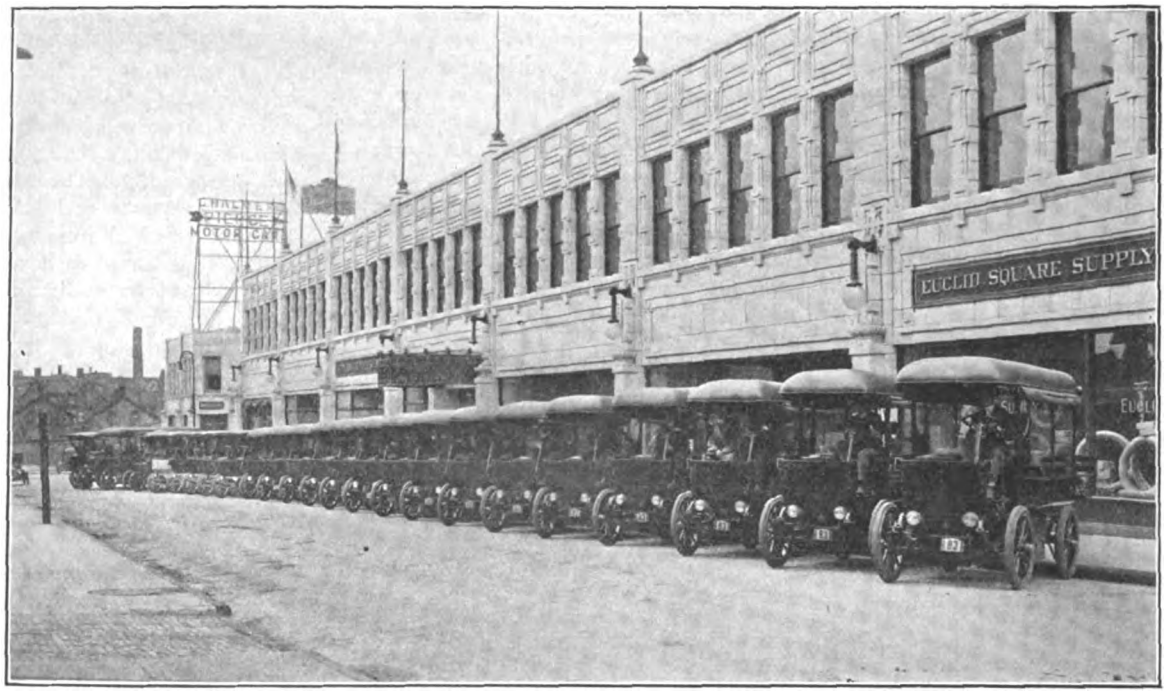
The control, continuous-torque type, with magnetic blow-out, remains practically the same with the exception of improvements made in its lubrication. The controller is situated in weather-proof metal casing directly against the motor, materially reducing the length of wiring and is readily accessible through a door in the floor of the car.

The controller system consists of five forward and reverse speeds, with brake operated by horizontal control lever, Yale locked. Speeds give a range of five, eight, 15, 18 and 22 miles per hour, except on the cabriolet roadster, which reaches a maximum of 25 miles per hour.

This same control lever operates a 10-inch contracting band brake on the propeller shaft and has proven so satisfactory that no changes have been made. Due to proper designing and the very liberal proportions, service records show a minimum average of 15,000 miles before relining is necessary.

The foot-brake system remains the same, one ratchet lever operating brake

Digitized by Google



The "Electric" Fleet of The Delivery Co., Cleveland, Ohio

HERE is a photograph of a fleet of electric delivery wagons and trucks operated by The Delivery Company of Cleveland, Ohio. Every electric in this fleet is equipped with an "Ironclad-Exide" Battery.

During the month of November, 1913, which was the first month The Delivery Company operated these trucks, they averaged 41 miles per day and carried an average of 181 packages per car per day.

Here is a letter received from the above company a few months ago:

> *"We are pleased to advise, that we are using some twenty-three sets of your 'Ironclad' batteries in our delivery trucks in Cleveland. The service required of this equipment is rather severe, as we operate upon schedule time for the majority of the Department Stores, and our general delivery system, which serves some two hundred customers.*
>
> *"A mileage of from fifty to sixty miles per charge is not unusual for some of the longer routes and we find the 'Ironclad' battery rendering a very faithful performance, even under the severe road conditions of this City and after ten months' usage we are very glad to report entire satisfaction with their record."*

Electric vehicles equipped with "Ironclad-Exide" Batteries offer a dependable and economical delivery system.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator" The "Tudor Accumulator"

The "Exide" "Hycap-Exide" "Thin-Exide" and "Ironclad-Exide" Batteries

New York, Boston, Chicago, Washington
Cleveland, Atlanta, Pittsburgh, Detroit

PHILADELPHIA, PA.
1888-1915

Denver, San Francisco, Seattle, St. Louis
Rochester, Los Angeles, Toronto

Digitized by Google

and emergency electric cut-off, the other foot lever operating without ratchet, as is customary with the ordinary service brake. These foot pedals operate 14x2½-inch internal expanding brakes on the rear hubs.

The worm bevel-gear axle construction has been continued for all 1916 models. Timken tapered roller bearings are used throughout the axles and wheels. The steering is the improved vibrationless lever operating on S. K. F. self-aligning ball bearings.

The battery equipment consists of 40 cells, 11, 13 or 15-plate Exide or Philadelphia, the number of plates furnished depending on the conditions the car will have to meet relative to mileage. In extremely hilly towns, the large capacity batteries are used. The battery weight is equally distributed, 20 cells rear, 20 cells forward.

Battery Rental System.

The company will offer the purchasers of electric cars the opportunity of adopting the new battery rental system, by selling to those who desire this system, all 1916 models at a reduction of $270 from the new list price and by this policy the purchaser of the electric car can rent complete battery service at a minimum charge per month and need not stand the investment that is necessary when he purchases a battery with the car. Furthermore, the new rental service which is now offered in Chicago by several battery concerns, covers the entire maintenance and repair expenses incident to the hardest use that batteries can be given. In other words, the owner of the electric car pays so much per month for the use of the battery regardless of upkeep or maintenance expense and regardless of whether the car is driven fifty or one thousand miles a month. When the mileage of the battery through wear fails to cover requirements, the old battery is replaced by a new one, thus keeping a constantly fresh battery in prime condition for the use of the car at all times.

Battery Vehicles as Tramways Adjunct.

Not long ago, in London, the subject of battery vehicles as a tramways adjunct came before the annual congress of the Tramways and Light Railways Association. The author, W. H. L. Watson, is trying to interest English tramway officials in the usefulness of electrics and he expressed the opinion that the battery omnibus would prove to be the most popular method of building up routes prior to the extension of a full tramway service, owing to its cheapness in installation and its greater mobility. Such electric buses are already in service in Southend, South Shields, York, West Bromwich, and Loughborough. Very gratifying results have been obtained in the first three instances; the vehicles have given highly satisfactory service and the anticipated low running costs have been conclusively proved. At Southend where one battery-driven bus was installed to run on equal terms with a fleet of petrol and petrol-electric buses, a saving of 4 cents per mile plus 1 cent profit to the electricity department, making a net saving of 5 cents per mile, had been shown in favor of the battery vehicle. At South Shields current consumption varied between 1.63 and 2.10 units, the variation being specially noticeable owing to the road surface conditions encountered, and variable weather. The maintenance charges had proved very slight and with such low average weekly revenue as 11.84 cents, the service covered expenses. At York, four Edison buses had run 13,600 miles with an over-all energy consumption of 1.1 units per mile. The following comparative costs of types of battery now available were given:

150 ampere hours, flat plate; 11-12 kilowatt-hours. List price, $425.
150 ampere hours, iron exide; 11-12 kilowatt hours. List price, $750.
150 ampere hours, Edison nickel iron; 11-12 kilowatt-hours. List price, $1,080.

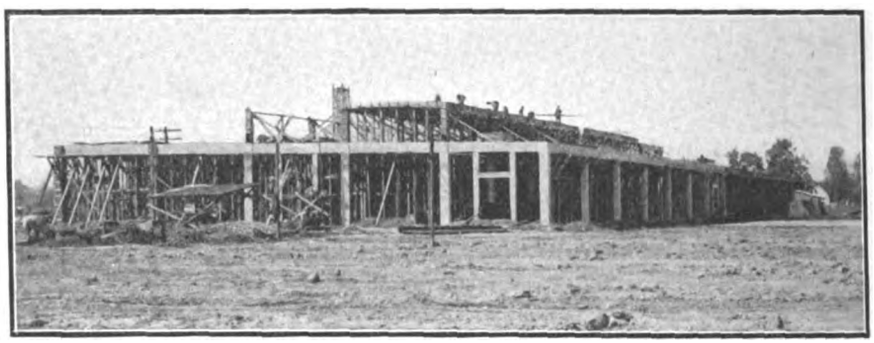
In regard to maintenance, the following total costs of operation for the three types for over 60,000 miles service were submitted:

	Lead.	Iron Exide.	Edison.
Guaranteed mileage	nil	18,000-20,000	60,000
Plate maintenance	3 cents per mile	.....	.....
Fair mileage to expect	6,000	20,000	150,000
Original cost	$425	$750	$1,080
Plate maintenance, 54,000 miles at 3 cents	$1,687.50	.....	.....
Renewal of plates at 70 per cent of original cost ($525) x 2, representing 40,000 miles	.....	$1,050	.....
Plate maintenance	.....	.....	nil
Total cost of battery at completion of 60,000 miles	$2,112.50	$1,800	$1,080

New Storage-Battery Plant of Prestolite Company.

Mention was made in these columns a few months ago of the organization of a storage-battery department by the Prestolite Company, Incorporated, Indianapolis, Ind. Temporarily the plant has been housed in the Murphy Building at Indianapolis where there are being turned out as many batteries as possible with the capacity available, which is about 400 batteries per day.

In the accompanying illustration is shown a construction view of the new building for the storage-battery department upon which the work is being pushed as fast as possible. This structure is of reinforced concrete and will have a floor space of about 45,000 square feet. This addition will increase the floor space of the company's Indianapolis plant by about 33 per cent. The cost of the new building is $60,000 and $25,000 additional will be required for its machinery equipment. It is hoped to have the new building ready for operation about December 1. The construction work on the new plant is being handled by the company's own engineers, with the exception of the roofing. The company is now busily engaged in establishing storage-battery service stations at all of its many branches throughout the country; 20 of these branches have already been so equipped and work on the others is being pushed rapidly. The work of installing these battery stations is being done by the company's own electrical department.



Storage-Battery Plant of Prestolite Company in Course of Construction.

Annual Meeting of Chicago Section, E. V. A., to be Held October 5.

The annual meeting of the Chicago Section, Electric Vehicle Association of America, at which the election of officers will take place, will be held on the evening of October 5, in the East Room of the Hotel La Salle. J. F. Gilchrist, president of the parent organization, will be the principal speaker and an entertainment program is being arranged.

At the meeting of the Chicago Section, held on September 21, it was announced that the Chicago Electric Garage Owners' Association has decided to disband as an independent organization and to merge with the Electric Vehicle Association of America. Most of the men were already members.

Digitized by Google

Horse Flesh Versus Electricity

Merchandise is now delivered by motor trucks to points 30, 40 and 50 miles away from the big city. This increased radius has automatically eliminated the horse.

But the bulk of deliveries are still within the 15 mile city zone. This "bulk"—which is from 70 to 85 percent in volume—is almost wholly within the economic field of the Electric truck. With gasoline trucks for the very long hauls with few stops and the Electric truck for the shorter hauls with many stops we have really no need for the city truck horse except in isolated cases.

Nearly $75,000,000 worth of fine American horses have gone to Europe within 12 months. Good horses will be higher than ever as a result. Trucking horses however good die by scores of thousands from the heat; others get broken legs on icy pavements; *entire stables are cleaned out by epidemics.* Hay, grain, straw and other supplies keep climbing in price. Why attempt to keep up delivery equipment so inefficient at constantly increasing expense?

We have some valuable figures involving the relative efficiency of horses and G. V. Electrics. We suggest that you ask for them and for our handsome and interesting catalogue.

General Vehicle Company, Inc.
Long Island City, N.Y.
New York, Chicago, Boston, Philadelphia

Copyright, 1915

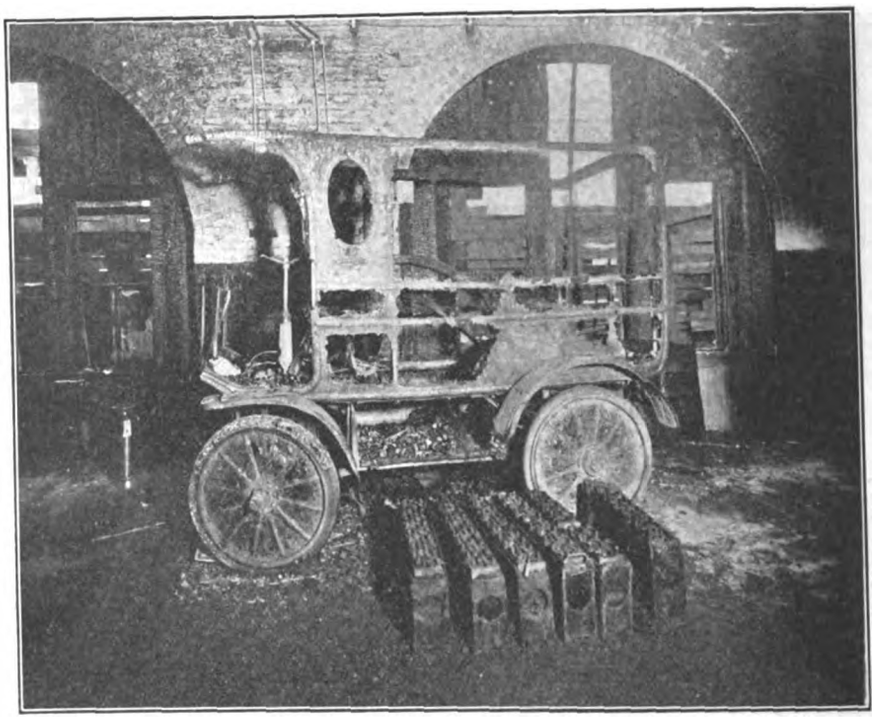
2620

Digitized by Google

Edison Storage Battery Ruggedness.

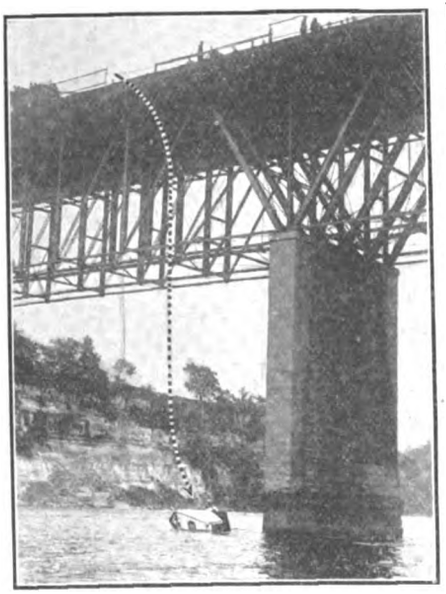
Some very interesting instances of ruggedness have been gathered recently in connection with rather remarkable service performnaces of Edison alkaline storage batteries.

On many occasions Edison batteries have passed through fires that have completely burned the wooden trays in which they were assembled, and have even melted some of the hard rubber insulation. Many of these experiences have resulted in only a temporary decrease in efficiency instead of complete annihilation, and after making the few necessary repairs the battery has been returned to work *better* than new. One instance of this was a fire in Indianapolis, a year or two ago, that burned a garage to the ground. The next morning an Edison-equipped electric was run from the ruins on power supplied from its Edison batteries even though the body of the car was burned and the wooden trays in which the cells were assembled were badly charred.



A Burned Electric Truck in the Garage of the Cambridge Electric Light Company. Note the Good Condition of the Edison Batteries.

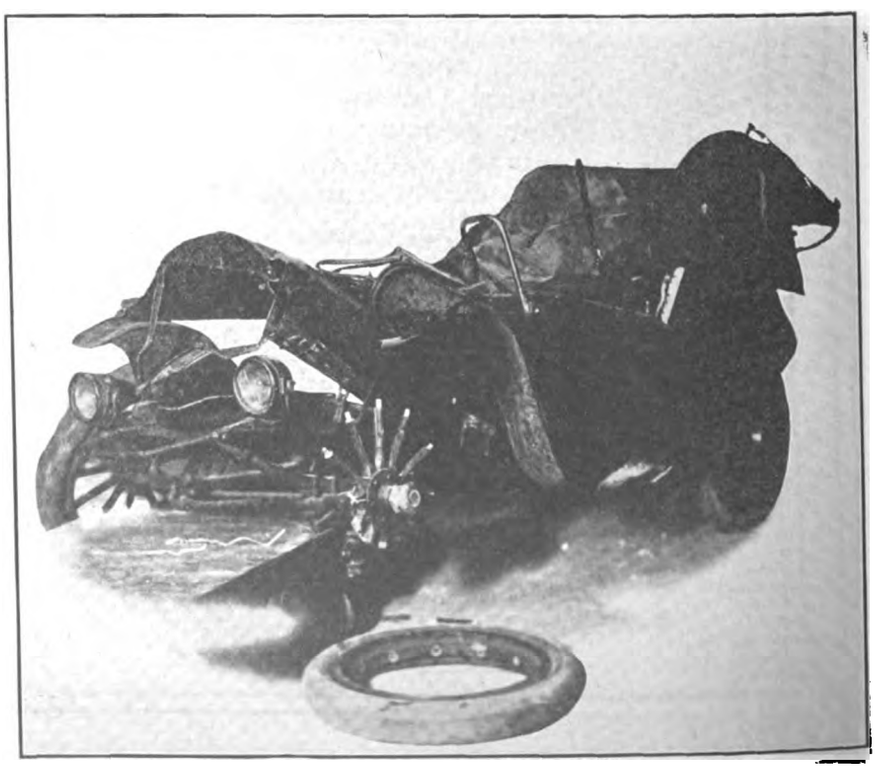
Another trial by fire occurred in 1913 when the garage of the electric light company of Cambridge, Mass., was burned and its contents practically destroyed. The remains of one Edison-equipped truck is shown in the illustration. With the exception of two cells in this Edison battery none were beyond repair—in fact, practically nothing had to be done except to insert new rubber parts when the cells were recanned.



The 100-Foot Plunge Made by a Delivery Wagon of the Purity Baking Company Gave One More Proof of Edison Battery Ruggedness.

Numerous instances are on record where the Edison batteries have demonstrated capacity to withstand severe vibration and concussion. They have passed through collisions with little more than a few dents in the steel containers and broken trays. An Edison-equipped delivery wagon owned by Bonwit, Teller & Company, New York, was jammed between a street car and the boulevard fence and curb at One Hundred and Eleventh Street. The wagon was smashed and the fence was bent but the only damage done to the Edison battery was to split the bottom slat of one wooden tray.

Its latest demonstration of ruggedness occurred recently at Minneapolis. One of the 36 electric delivery wagons built and owned by the Purity Baking Company, of St. Paul, and equipped with Edison batteries, left the roadway of a bridge, mounted the sidewalk, crashed through the iron side railing and plunged 100 feet into the Mississippi. After it had been submerged for about 12 hours, the Edison battery was removed. Some of the steel containers were considerably bent and dented and the wooden trays showed the effect of the fall, but before any repairs whatsoever were made the Edison bat-



This Edison Equipped Detroit Roadster was Buried Under Tons of Brick When a Cyclone Destroyed the Omaha "Electric Garage."

Digitized by Google

Books on Electric Vehicles

"The Electric Vehicle Hand-Book"

By H. C. Cushing, Jr. and Frank W. Smith

Fellow Am. Inst. Elec. Engrs. Publisher of "The Central Station," the official organ of the Electric Vehicle Association of America. President Electric Vehicle Association of America and Vice Pres. United Electric Light & Power Co., New York.

362 Pages, Fully Illustrated, Flexible Leather Cover, Pocket Size. **Price, $2.00.**

CHAPTERS

I.—Electric Vehicle Development. By William P. Kennedy, Consulting Transportation Engineer.
II.—Lead Storage Batteries; Descriptive Lead Batteries; Charge and Discharge Rates; Care of Storage Batteries.
III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
IV.—Commercial Types of Lead Storage Batteries.
V.—Alkaline Storage Batteries; Description and Care.
VI.—Charging Apparatus and Charging Stations; Alternating Current Apparatus; Isolated Plants.
VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Association and Publications Identified With the Development of the Electric Vehicle.
XIII.—Comparative Cost Data.

The Automobile Hand-Book

By L. ELLIOTT BROOKES, Assisted by Other Well-Known Experts

Revised and Enlarged 1911 Edition. 16mo, over 650 Pages and over 320 Illustrations. Full Leather Limp, Round Corners, Red Edges. Price $2.00.

The automobile hand book is a work of practical information for the use of owners, operators and automobile mechanics, giving full and concise information on all questions relating to the construction, care and operation of gasoline and electric automobiles, including road troubles, motor troubles, carbureter troubles, ignition troubles, battery troubles, clutch troubles, starting troubles. With numerous tables, useful rules and formulas, wiring diagrams and over 320 illustrations.

Power transmission is thoroughly discussed, and the various systems of transmitting the power from the motor to the driving axle are analyzed and compared.

The perusal of this work for a few minutes when troubles occur, will often not only save time, money, and worry, but give greater confidence in the car, with regard to its going qualities on the road, when properly and intelligently cared for.

PRACTICAL AUTOMOBILE DICTIONARY. By S. KRAUSZ

English-French-German; French-English-German; German-French-English. With an introduction by C. J. Glidden. Twelve thousand technical terms and other words employed in connection with motor cars and motoring. For use in office, factory, repair shop and touring in foreign countries. 16mo. Leather. 129 pp. Price $2.00.

SELF-PROPELLED VEHICLES. By JAMES E. HOMANS

A practical treatise on the theory, construction, operation, care, and management of all forms of automobiles. Seventh Edition, revised. 500 illustrations. 6x9. Cloth. 667 pp. Price $2.00.

The various theories and problems involved in the construction and operation of the prevailing types of motor road carriages have been stated as clearly as possible, in order that the involved situations may be readily comprehended by all readers. The fundamental principles of the several types of motor, particularly of the gasoline engine, which is the least understood of all, have been treated at considerable length, in order that the facts may be thoroughly comprehended in their new relations.

THE AUTOMOBILE. By P. N. HASLUCK

A practical treatise on the construction of modern motor-cars, steam, petrol, electric and petrol-electric. Three volumes. Special Edition, enlarged. 1,260 illustrations. 8vo. Cloth. 1,300 pp. Price $10.00.

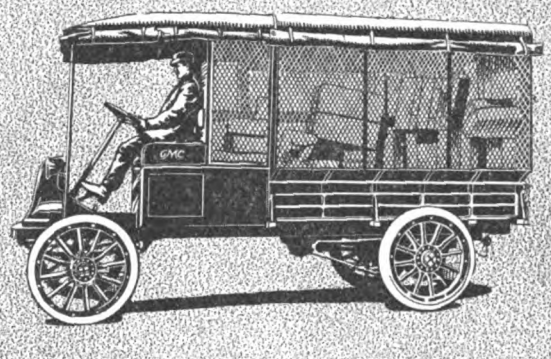
A very handsome set of instructive books brought up to date in the third volume containing many elaborate illustrations of cars now in use.

Electrical Review and Western Electrician

Western Headquarters for Electrical Books

608 S. Dearborn St.
CHICAGO

GMC
GENERAL MOTORS COMPANY
TRUCKS



Hard, practical service in scores of different lines of business—daily work in the Philippines, Calgary, hilly Kansas City, and dozens of American cities in all parts of the continent have demonstrated, beyond question, the decided advantages of GMC Electric Trucks.

Before deciding on either gasoline or electric trucks for your own use or recommending equipment to your customers, you'll find it decidedly worth while to have before you complete data on GMC trucks.

GENERAL MOTORS TRUCK CO

One of the Units of General Motors Company

PONTIAC, - MICHIGAN

Direct Factory Branches: New York, Boston, Chicago Philadelphia, St. Louis, Kansas City

(39)

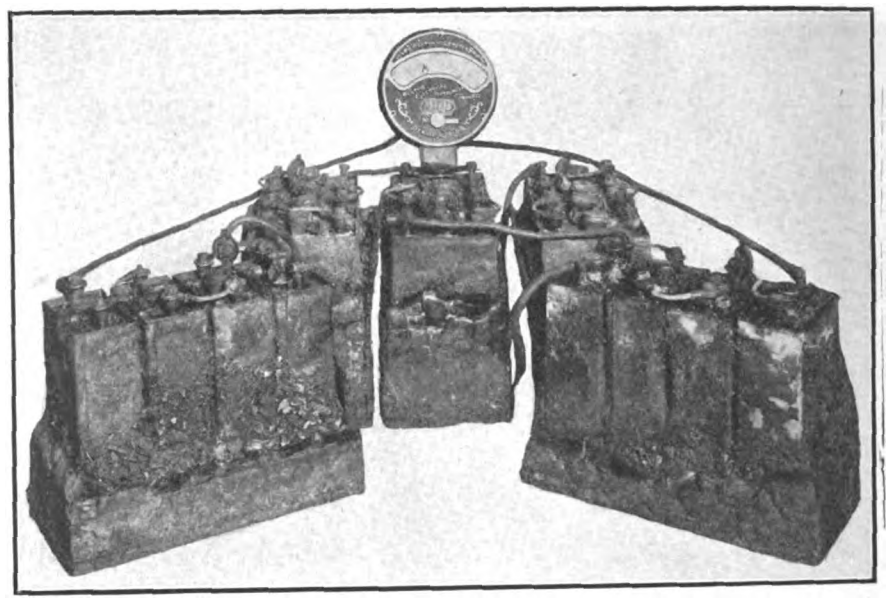
Digitized by Google

tery was put on "bench test" and every cell was well above rated capacity (225 ampere-hours) on a normal charge. The maximum capacity to one volt was 277 ampere-hours and the minimum capacity (with the exception of one cell) was 247 ampere-hours.

The experience of the Edison battery in the Omaha cyclone is another interesting incident. An Edison-equipped Detroit roadster was buried under tons of brick. The metal hood of the car was crushed down on the battery making a short circuit that burned off the "jumpers." When the report of this catastrophe was made and it was found that there was not one damaged cell in the lot, the customer said, "If a cyclone can't do it, what can?"

The Edison battery has been on sunken boats and lain for hours completely submerged in salt water, without injury. This feature is of very great value in submarine service and in combination with many other features led the United States government to specify it on the L-8, the first submarine to be built in the government yards. Also, it has been ordered to replace another make of battery on the E-2, a submarine which has given the government much trouble.

Fire totally destroyed the shipyard of the New York Yacht & Engine Company so that there was not a semblance of a boat or building left. Before the fire, there was a handsome 65-foot power boat in the shipyard about ready for launching, and it was equipped with 28 cells of Edison battery. The Edison battery was in a mahogany box, and owing to its non-corrosive characteristics, was located on the deck. After the fire, the first object to catch the eye as one approached the middle of the ruins were the 28 Edison cells standing up on top of a heap of ashes, twisted iron and debris. The heat in the immediate neighborhood had been so great that it had melted the brass manifolds on two engines. The slate switchboard and instruments which had been installed about three feet from the battery were totally destroyed. The slate was reduced to small pieces of flake and only the fronts of the instruments remained. All of the bushings and hard rubber insulators of the Edison battery were totally destroyed. However, the connectors had not become loose and there was sufficient charred insulation in place to permit a test. Twenty of these cells when so tested showed an average of 1.3 volts, and the current available in the battery was sufficient to turn a No. 14 wire red hot in a few seconds.



Twenty B4 Edison Cells Taken from the Ruins of the New York Yacht and Engine Company Fire. The Voltmeter Shows 26 Volts Left in the Battery.

Many visitors to the Edison plant at East Orange, N. J., have been impressed with the manufacturing and testing methods employed to establish this high degree of ruggedness. In this connection, the accompanying illustration of a group of visitors is interesting. This group represents lighting and power men from New York, New Jersey and Brooklyn, who visited with Mr. Edison in connection with his announcement of the Edison battery rental system last week. Reference to this announcement was made in last week's issue.

Electric Light and Power Men From New York, New Jersey and Brooklyn Visiting With Mr. Edison at Orange, N. J.

The Electrical Equipment of a Transcontinental Motor Yacht.

The motor yacht, which is en route to San Francisco from New York City with a party of ten, has achieved an enviable notoriety because of the novelty of its trip. It has achieved distinction because of its complete equipment in general and its electrical equipment in particular, which is without exception the most complete ever assembled on any motor vehicle.

Among the most interesting electrical appliances to be found on this unique land yacht, the *Western Electric News* reports a vacuum cleaner, two ten-inch fans, an electric soldering iron and an electric drill, all operating on 32 volts.

Rejuvenation at Dayton.

Former Governor James Cox was the principal speaker at a Jovian dinner at Dayton, O., on Tuesday evening, September 21, at which details of the local celebration of Electrical Prosperity Week were discussed. The meeting was presided over by Thomas F. Kelly, Jovian Statesman for Ohio, and among the other speakers were City Manager Waite, of Dayton, and J. M. Wakeman, of New York. Mr. Cox, referring to the fact that the city has been advertised as "the city of a thousand factories," declared that a recent careful census showed that it has over 1,400 factories employing 50 men or over, and that most of these used electricity in their operations. A rejuvenation followed the dinner, and about 25 new members were added to the Dayton league.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVII, No. 15. CHICAGO, SATURDAY, OCTOBER 9, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.
E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich.....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States.....$3.00
One Year, Canada.....4.00
One Year, Foreign Countries.....6.00
Single Copy, 10 cents. Back one month, each..25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Applications for Service.....649
Engineering Improvements and Publicity.....650
Transcontinental Radiotelephony.....650
Public Policy in Regard to the Bare Concentric System..651

DEPARTMENTS:
Commercial Practice.....657
Electrical Construction.....664
Public Service Commissions.....667
Questions and Answers.....669
New Electrical and Mechanical Appliances.....682
Current Electrical News.....687
Record of Electrical Patents.....691

LEADING ARTICLES:
Electricity for Municipal Pumping.....653
The Small-Customer Problem.....657
Business Hints for the Contractor and Dealer.—By G. D. Crain, Jr.....664
Electrical Papers at Manchester Meeting of British Association for the Advancement of Science.....672

BOOSTING ELECTRICAL PROSPERITY WEEK.....680

MISCELLANEOUS:
The Jovian Convention.....652
Details of a House-Wiring Campaign at Portland.....656
Parcel Checking in Appliance Display Room.....656
Henry L. Coleman.....663
Flood Lighting Proves Profitable in Louisville.....663
Houses Wired With Concentric System in Boston.....666
Contractors' Co-Operative Window Dressing in Boston.....666
City Inspectors Cover More Ground With Automobiles.....666
Among the Contractors.....666
Westinghouse Company Establishes Savings Fund for Employees.....671
Radio Tower Falls at Tufts College.....676
Edison and the Invention of the Electric Incandescent Lamp.....676
Conference on Electrical Safety Code.....678
American Institute Meetings.....678
Transcontinental Wireless Telephony.....679
Report on Electrolysis in Providence.....679
Civil Service Examination for Junior Electrical Engineer..680
Plans for Development by Ontario Hydro-Electric Power Commission.....680
Annual Meeting of Chicago Section, Electric Vehicle Association of America.....680

Copyright, 1915, by Electrical Review Publishing Company, Inc.

APPLICATIONS FOR SERVICE.

In a great many central-station companies an unnecessary amount of formality is required before a new customer is provided with service. Sewing up the relations of the utility company with the public in red tape is often a source of irritation to the new customer and, in addition, the signing of a long contract which contains a bewildering amount of legal verbiage is distasteful to the average citizen. It is not difficult to greatly simplify the operation of being initiated into the convenience and comfort of using electric service, and a number of central stations have given consideration to the best means of simplifying this operation.

A study of this subject comes down at once to an analysis of the necessary requirements for safeguarding the interests of the utility company and preventing, as far as possible, any imposition by unscrupulous consumers. It should be realized in the first place, however, that the average citizen is honest and quite ready to live up to his obligations. A formal contract is not only unnecessary in most cases, but is of little or no advantage, especially with reference to the usual residence consumer. A person who accepts service and consumes electrical energy becomes liable for payment for the same regardless of whether any definite contract has been signed. In most of the states public service commissions have been created and rates have been filed with them covering each class of consumer, so that there is no question as to what is the legal rate of payment for service. In a few communities where rates are still a matter of special contract with each customer it remains, of course, necessary to sign a contract specifying a definite rate for service.

Since in general no written contract is necessary, the principal requirement is to place responsibility for payment for service. This involves the signing of an application for a service connection. The wording of such application should be brief and the formalities should be as simple as possible. Upon a telephone or mail request the application should be supplied by messenger or by mail, and the irksome requirement which some companies now make of having the applicant come to the company's office might well be abandoned in the interest of good feeling. In large cities a written application seems highly desirable, both in order to fix responsibility and for accuracy in the name and address of the applicant. In

Digitized by Google

some small communities even such written application may be superfluous. This has been demonstrated by certain companies which are prepared to make service connection upon the basis of a telephone request or other verbal communication.

Attention to small matters of this kind is one of those things which often has a marked effect in producing cordial relations between a utility company and the public. Slight sources of irritation often create bad feeling and it is well to remove causes of this kind, in line with the general policy of pleasing the public which has been adopted by most of the progressive companies. This is but one line of approach to the ultimate object, but there are many others in small matters of detail which will readily suggest themselves to the central-station manager.

ENGINEERING IMPROVEMENTS AND PUBLICITY.

One of the most interesting things about the transcontinental telephone service now available in the United States on the Bell system is the extent to which this famous achievement has been turned to account by the publicity departments of the telephone companies. Without being able to support the statement by figures, we venture to guess that the advertising value of the ocean-to-ocean line is quite as great so far as the actual revenue derived from it. Through the co-operation of the telephone organization a good many meetings and dinners of commercial associations on the Atlantic slope have been enlivened by special "set-ups" connecting the members and guests with their brethren on the Pacific coast, and the thrill of listening for the first time to words and music thus transmitted across the land is not one easily to be forgotten. Thousands of visitors to the Panama-Pacific International Exposition have had the same experience.

One of the most notable of these exhibition transmissions was recently carried through in connection with a meeting of some 5,000 employees of the New England Telephone & Telegraph Company at Boston, Mass., and a similar meeting at San Francisco of the employees of the Pacific company. Besides the usual official greetings between executives, the New Englanders sang "America" for the benefit of their compeers on the Coast, who returned the compliment with the "Star Spangled Banner" a few moments later. The enthusiasm "uncorked" at such occasions has a legitimate place in the celebration of this great engineering triumph, and whether turned to account in stimulating company loyalty or in demonstrating to groups of representative business men the capabilities of modern electricity in an unusually inspiring field, it is well worth developing from the standpoint of public relations.

On a much smaller scale, the central-station man asks himself: "Why shouldn't our company capitalize popular interest in its progress?" Even if the achievements of the local management in safely and efficiently providing an important extension of plant lack boldness, it should not be forgotten that there are many people even in small cities or towns who like to know and see the latest developments in generating equipment, substations, etc., and when these are accomplished, what is easier than to invite the local board of trade to visit the plant under skilled guidance, to prepare a simple illustrated "story" upon the improvements for the local press, and to set forth for the popular interest the points wherein such an installation excels previous equipment or neighboring plants? It often occurs that engineering improvements of the very first order are installed initially in some little steam or hydroelectric plant remote from the great centers of industry, and that expert engineers from all points of the compass make pilgrimages to the plant to see the apparatus in operation. Now the local public may not be capable of realizing the technical fine points of such equipment, but it is always possible for the local management to give out in a fairly simple form some of the reasons why the improved equipment is attracting attention or is worth a visit from the electrically and mechanically minded.

Local pride is a very real force in America, and whenever an improvement of engineering significance is accomplished in a community of small or moderate size, a genuine opportunity comes to the front to add to the company's stock of public good-will.

TRANSCONTINENTAL RADIOTELEPHONY.

The year 1915 is notable for two great achievements in telephony. It has seen a commercial line between New York City on the Atlantic seaboard and San Francisco on the Pacific coast opened for regular business and devoted to daily demonstrations at the Panama-Pacific International Exposition. It has also witnessed the successful achievement of telephony across the American continent with wireless apparatus. As described upon another page, telephonic communication has been carried on between the radio station on the bank of the Potomac and the navy yard on San Francisco Bay. The message has even been received at a third station at Honolulu, thus setting a much longer record for the transmission of radiotelephonic messages. This achievement has been accomplished by the engineers of the Navy and the Bell telephone system.

An announcement of almost equal interest which has been made at the same time is that the radiotelephonic message need not originate at the sending station, but may be transmitted to it by wire. This possibility will greatly enhance the usefulness of radiotelephony and points to the likelihood of its becoming a commercial reality within a reasonable time. Its accomplishment probably hinges upon the use of the telephone repeater, or amplifier, which was the dream of inventors fo so many years, and whose eventual realization was so large a factor in the achievemen of transcontinental telephony by wire.

Digitized by Google

PUBLIC POLICY IN REGARD TO THE BARE CONCENTRIC SYSTEM.

The introduction of the bare concentric wiring system of installation in existing houses is arousing considerable interest in various parts of the country. While we recognize the advantages of a more economical means of providing service, thus hastening the day when electric lighting shall be universal, there are some practical considerations which we feel should be taken into account before entering upon a systematic propaganda for the concentric method.

Granting that installations of bare wire would be entirely free from liability of danger to property or person, a point we are not ready to concede, there remain some questions of public policy which should be weighed by a public service company which supplies any community.

First, the public's attitude as regards safety. When the proposition is put to the average layman, immediately the objection arises that a bare wire carrying current is in itself a source of danger. This is a notion which the central station itself has not discouraged, but rather cultivated. In "Safety First" campaigns the idea has been steadily advanced that any wire in the public streets was liable to be a menace, when out of its proper relation, and best left to the rubber-gloves men. Whenever a fallen wire was encountered, the public was taught to let it alone; even innocent-looking guy wires might be charged with high voltage by chance contact with transmission lines.

Now the public cannot be expected to discriminate between harmless low-tension circuits and those contact with which is deadly. Every central-station man will acknowledge that the public's wholesome fear of "live wires" saves thousands of dollars of damage claims, yearly.

The point, in connection with the concentric plan, is that if people, and especially children, become habituated to the view that bare wires which light their house lamps are harmless, they will come to hold the same opinion of wires on the street, and nonchalance and bravado will take their toll of victims, soon or late.

A second aspect of the proposition is the division of homes into two separate classes for purposes of lighting services. The advocates of the concentric system base their arguments mainly on the lessened cost, which places the concentric-wire service within reach of the smaller householder and even the least well-to-do, the standard code system being recognized as best suited to larger houses, as well as business blocks.

This division is repugnant to popular sensibilities. Every American wishes to have as good and as complete an equipment as his neighbor enjoys. The argument that the new plan is precisely as safe and efficient fails to satisfy the layman. Even where the lighting company does not wire houses, the public is inclined to look upon the installation indoors and upon the street as parts of the same system, and this view is strengthened where lamps are freely supplied and renewed by the company.

Hence it follows that a householder or a tenant would likely regard a basic difference in the character of lighting equipment as discrimination. Furthermore, he argues, if one person's wiring is supplied at a lower cost than another's, why should not the actual illumination of his home be obtained at a differential rate? The plea might go to such lengths as to ask whether electricity delivered to one house through concentric cable should not cost but one-half as much as electricity supplied through two parallel wires. No less absurd an argument has at times turned the scale in favor of gas lighting.

The Stannos concentric system, being an importation from Europe, might suggest to some customers that lighting rates ought likewise to conform with those abroad: in England, about 75 per cent of those here, in Germany, perhaps 50 per cent, and in some parts of Italy the modest sum of one lire—20 cents—an outlet per year. That economy in house wiring is practicable leads logically to the query whether economies in station and line equipment, and in operation, are not forthcoming. Thus the whole situation is complicated and beclouded.

If the savings of the proposed system were large, it might be worth while to combat and overcome all opposing fancies. But it is conceded by those who have put the matter to the test that the sole advantage is derived from economy of materials. This is a smaller factor here than abroad, labor being more expensive and materials a little cheaper than in Europe. Contractors reckon the labor cost in wiring existing houses at from 50 to 60 per cent of the contract. In a recent house-wiring campaign conducted by an eastern central station the average contract amounted to about $80. Eliminating overhead and labor leaves not more than 40 per cent, or about $32, for stock used in a house. Assuming a saving of 25 or 33 per cent, the difference in cost would be about $10, or a matter of $1 to $1.25 a year for depreciation and interest on the difference in investment. Surely not a large item to a householder who can afford an outlay of $70 to $80 to procure good lighting! And on smaller installations the saving is less.

These suggestions are thrown out for consideration by those interested in the concentric system. They are by no means conclusive arguments, but are worthy of consideration in discussing the subject, as they bring out points of view that are commonly ignored by enthusiastic advocates of a cheaper system of wiring. Every possible viewpoint of the situation should be considered before final action is taken, and the trial installations already made in Chicago, Boston and other cities will aid in achieving this result.

Digitized by Google

The Jovian Convention.

All signs point to a banner meeting in connection with the thirteenth annual Jovian convention, which will be held at the Hotel Sherman, Chicago, Ill., October 13, 14 and 15, 1915. The Reigning Jupiter, Homer E. Niesz, as chairman of the General Convention Committee, has spurred on his active lieutenants in Chicago and the preparations which have been made guarantee that with regard to both the serious business meetings of the convention and entertainment nothing will be left undone to make the visit of attending Jovians one of great profit and pleasure.

The program has been arranged so that from Monday morning until Friday evening every moment will be engaged. The speakers have been drawn from the leaders in great activities both within and without the electrical industry. The following topics will be discussed: "Extending the Utilization of Electrical Energy," by E. W. Lloyd, president of the National Electric Light Association; "A Clearing House for Electrical Associations"; "The Relation of the Jobber to the Electrical Industry"; "Safety in Electrical Installations," by Ernest McCleary; "The Relation of Technical and Non-Technical Men In the Electrical Field": "The Progress of the Electrical Industry," by F. M. Feiker; "Contingent Benefits from Promotion of Electric Vehicle Sales," by John F. Gilchrist, president of the Electric Vehicle Association of America; "The Making of a Man"; "Electrical Properity Week"; "The Public Utility as a Factor In the Development of a City," by Henry M. Byllesby; "Merchandising Methods"; "Thrift Among Employees of Electrical Companies."

Homer E. Niesz,
Reigning Jupiter of the Jovian Order.

The degree team competition will bring out all the fine points of the presentation of the ritual, and the elaborate arrangements made for staging the competiton and also the initiation in connection with the big rejuvenation on Thursday evening, will afford the Jovians an unusual opportunity for viewing in all of its austerity the story of the fundamentals of Jovianism.

While primarily the annual meeting of the Jovian Order is for the purpose of preparing for the benefit of the entire membership a recapitulation of the work of administration and the election of officers for another year, it also affords quite properly a chance for the active men of the industry to exchange experiences and to listen to the presentation of important addresses for improving both personal and business efficiency.

In addition to this serious purpose, the Jovian is a jovial spirit, and the entertainment features that have been provided recognize the splendid spirit of good-fellowship which permeates the Order. So that all may enjoy every feature of the entertainment the wise decision has been made to preserve to as great a degree as possible a spirit of informality in connection with every feature.

So that the visiting ladies may enjoy to the full the hospitality of Chicago Jovians, arrangements have been completed and a host of Chicago ladies will be available to escort the visiting ladies to various points of interest. The shopping tours will be personally conducted and the luncheons will be real homey affairs. The program for the ladies is so arranged that they will not be segregated and held to an inflexible schedule, but may elect to attend the sessions at will or to participate in other activities.

Under the direction of Oscar Dane, of St. Louis, what is expected to be the most brilliant and altogether remarkable program ever witnessed as a private entertainment, will be presented on Friday evening as the culminating event of the convention. The entire first and second floors of the Hotel Sherman will be reserved for the Jovians, and over 200 costumed performers, assisted by eight or ten orchestras, will provide the entertainment. The attending Jovians will progress from one scene to another, and it is conceded that there will be so much to be seen that it is hardly possible that all that is available will be witnessed. There will be music and singing and dancing and vaudeville galore. During the progress of the entertainment a supper will be served and after the entertainment is concluded the dancing will continue until very weariness sounds the signal for lights out.

Much interest is being manifested in the contests for Congress and other elective offices. Large delegations are promised from St. Louis, New York, Cincinnati, Dayton, Memphis, Chattanooga and other outlying points. Over 500 members of a big committee of promotion and publicity are exerting every effort to spread information respecting the development of the program and a committee of 50 transportation experts is completing arrangements for the provision of special cars and the facilitating of travel to Chicago from outlying points.

The Avo Club to Celebrate Edison Day.

The Avo Club of the School of Applied Industries, Carnegie Institute of Technology, Pittsburgh, Pa., is planning a program for the celebration of Edison Day. The club is composed of students in the electrical courses in the above school, its object being to promote interest in electrical work and to bring the fellows together socially. The custom of celebrating Edison Day in the school was inaugurated last year by the Electrical Equipment Department, and as it was very successful, the club hopes to make it even more so this year. Papers will be read on appropriate subjects by different members of the club and liberal use will be made of stereopticon views and possibly of motion pictures. Models of Edison's early inventions as well as of some modern ones will probably be shown.

Although no official statement has been made of the fact, there is every probability that the newly constructed branch of the Canadian Northern Railway to Lake Winnipeg will in the near future be electrified, as well as the terminals at Winnipeg, Man., the company installing the current which the street-railway company is developing on Winnipeg River.

Digitized by Google

Industrial Power Series—Article No. 141.

ELECTRICITY FOR MUNICIPAL PUMPING.

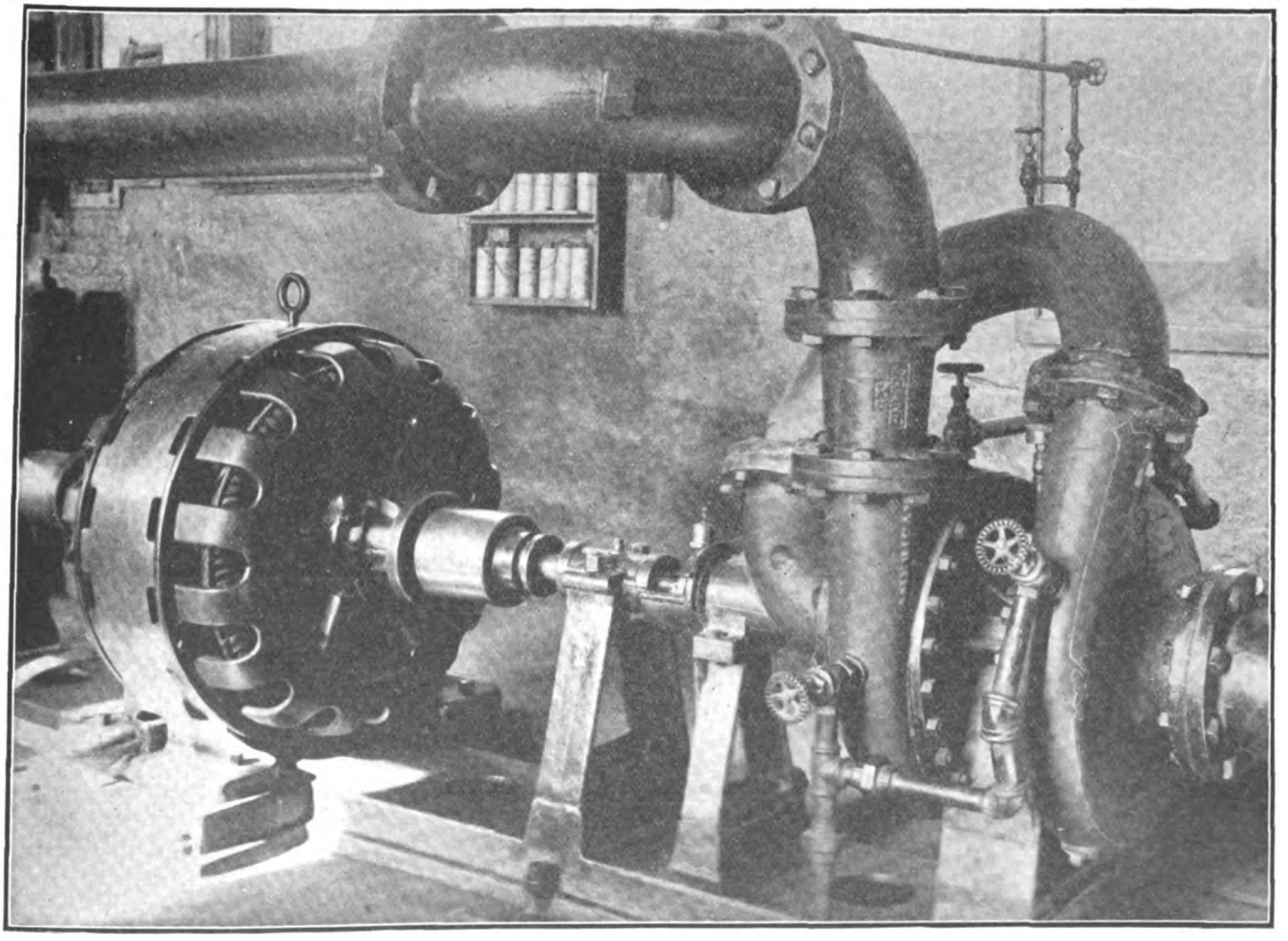
Water-works pumping represents one of the most profitable fields for new business among central-station companies, principally because of its off-peak characteristics. This article discusses pump and motor characteristics and presents data on tests made at three typical installations.

Water-works pumping represents one of the most profitable fields for new business among central-station companies, although it is seldom given the consideration it deserves. Perhaps the difficulty in overcoming adverse political situations, or the belief on the part of the municipality that steam pumps are more reliable, has accounted to a considerable extent for the seeming lack of activity in this direction. It is true, however, that because of the off-peak characteristics of the pumping load, a rate for energy can be offered the municipality that will effect considerable savings over steam operation and in this age of centralization, the reliability of central-station service cannot be questioned.

A municipality, no matter how friendly toward the local utilities, is one of the most difficult prospects to sell to, and the manager or power agent desiring to introduce central-station service for water pumping must be well fortified with sound arguments and have available results of operation in other communities.

In a general way there are two kinds of water-works systems in use in this country, one a direct system where no reservoir capacity is provided, the rate of pumping varying directly as the demand for water, and the reservoir system, where a reservoir is provided so that water may be supplied after the pumps are shut down. Of the two systems, the most attractive and the easiest to get on a profitable basis is, of course, the reservoir system. With such a system the pumping can be very largely done at such times as best suits the load conditions of the central station and so can be made practically off-peak business. For such business the central station can offer very low rates and still make a profit.

In a direct system, of course, the reservoir feature is lacking and for this reason this pumping business does not offer so great an attraction for the central station. It must be remembered, however, that the greatest demands for water are during the months from April to October, when the demand for electric energy is least; and the demands for water are least from October to April, when the demand for energy is greatest. There is thus an annual diversity-factor offered, even in direct systems, which is most attractive. Practically all new systems being installed have the reservoir feature, so that there is an opportunity for the



Two-Stage Centrifugal Pump Driven by 100-Horsepower Motor.

Digitized by Google

central stations of the country to secure most of this business as off-peak business. For the direct systems that are already installed, probably the best method of securing this business is by advocating a combined station, the old steam equipment to operate during peak months, etc., and motor-driven pumps to carry the summer pumping peaks. This arrangement gives the central station a diversity that should be most acceptable.

In many cities the suburbs are built upon hills that are often considerably above the city proper. In many cases the water pressure which is suitable for the main portion of the city is entirely too low for the suburbs, so that the pressure of the water furnished the suburbs has to be boosted. Sometimes special high-pressure mains are provided for such suburbs, but a simpler way is by installing local motor-driven boosting stations in the suburbs.

Pump and Motor Characteristics.

Two types of pumps may be considered for driving by electric motors, the plunger type in its various forms and the centrifugal type in several forms differing only slightly. Usually the plunger type considered would be triplex and either single or double acting.

The plunger type has the advantage of being a little more efficient than the centrifugal, but it is essentially a low-speed machine, limited to thirty revolutions per minute or thereabouts. It therefore requires speed reductions, as by gearing, for connection to driving motor, thus increasing cost and adding complexity.

The centrifugal pump, on the other hand, is suitable for direct connection to motors operating at their normally high speeds, up to say 1,500 revolutions per minute. Such pumping units are low in first cost, compact and easily operated. Further, centrifugal pumps are suited to direct-pressure service, that is, they may be used to supply water direct to city mains without requiring a standpipe, which is not true of the plunger type, these requiring by-pass and relief valves as they are naturally constant-quantity pumps when driven by a constant-speed motor.

There have been many improvements in centrifugal pumps within the last few years, and standardized product can be obtained from the best manufacturers, with pump efficiencies of 60 to 70 per cent and over, even in small sizes, and with characteristics suited to direct-pressure service. Motor and pump should be mutually adapted, as there is possibility of danger of overloading the motor when pumping against too low a head.

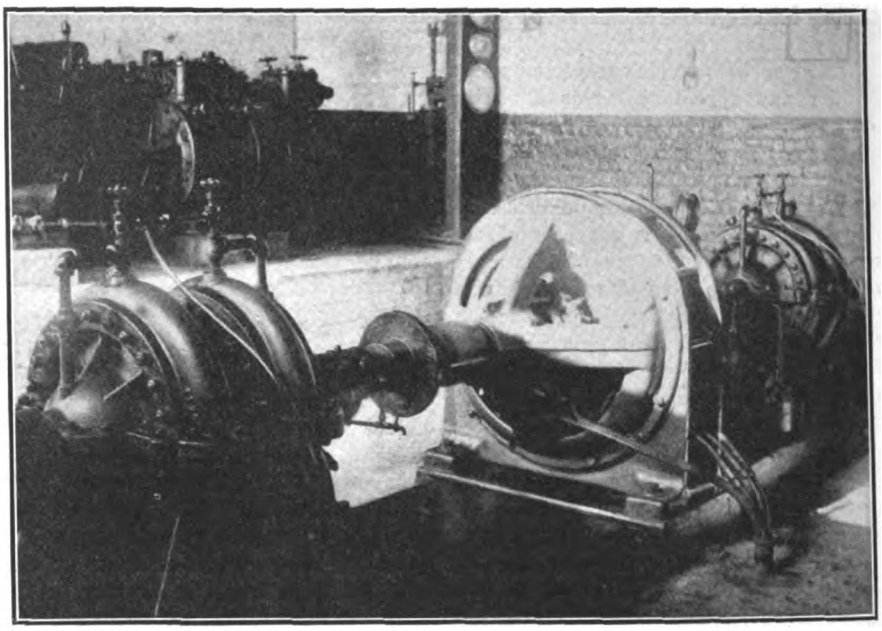
Both types give reliable and satisfactory service under conditions to which they are essentially adaptable; they appear to be remarkably free from troubles, and expense for maintenance and repair is low.

The opportunity for measuring power electrically is of advantage in analyzing costs and separating plant wastes.

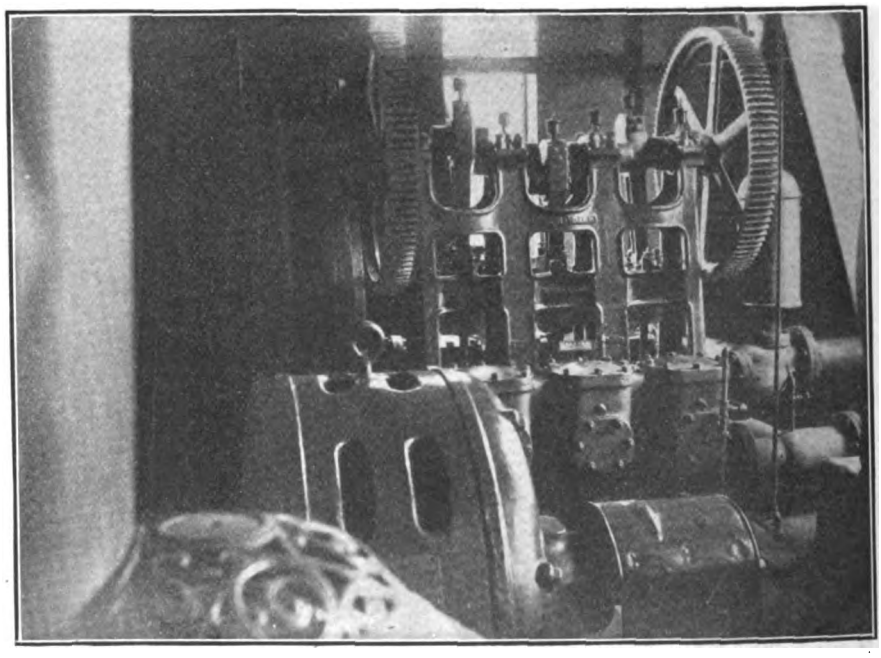
In the large city pumping stations where the efficient or high-duty pumping units have held the field for years, it is possible that only some exceptional local condition will give the preference to electrically driven pumps. This is especially true since the advent of the steam-turbine-driven centrifugal pumps.

However, in the smaller plants where the inefficient duplex direct-acting steam pumps are in use, considerable improvement in economy can be secured by changing to electric pumping.

For a specific example let us assume that the water supply necessary is 300 gallons per minute on the average, at a pressure of 60 pounds per square inch. The water horsepower will average about 10, and with ordinary direct-acting steam pumps the steam consumption will probably approach 150 pounds of steam per delivered horsepower-hour, whereas an electrically driven centrifugal pump, with efficiency as low as 60 per cent, would require a motor input of 16 kilowatts.



Two-Stage Pump Driven by 100-Horsepower Motor.

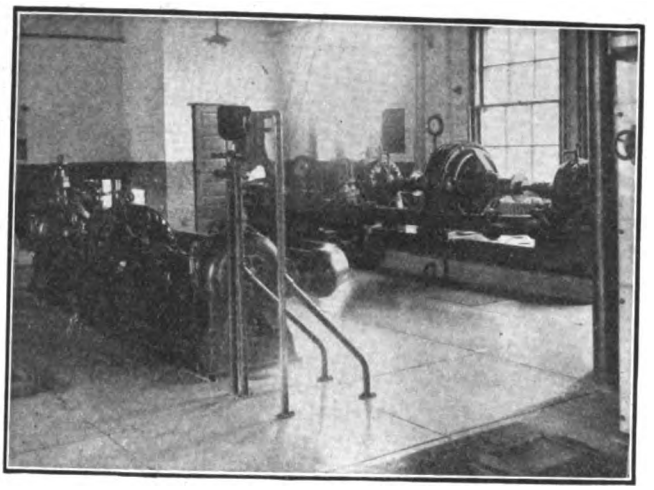


Triplex Pump Driven by 50-Horsepower Motor.

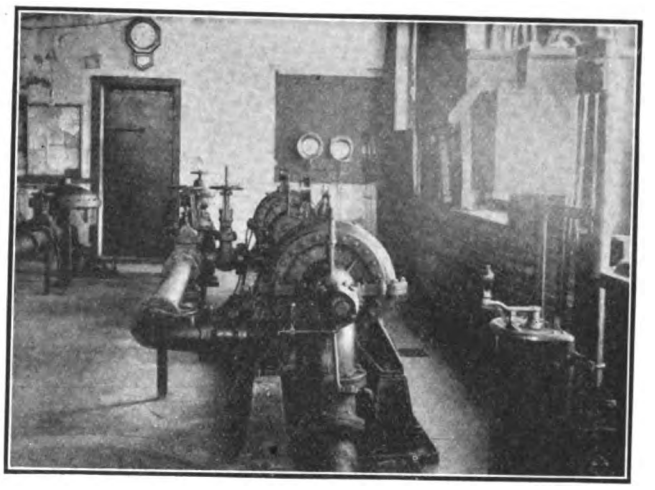
In a crooked deep-well hole of small diameter the air lift appears to be the only practicable method, but the extra cost of drilling a larger diameter of straight hole for the first 250 to 300 feet is by no means prohibitive and often warrants consideration.

The deep-well centrifugal pump is generally of considerable capacity and requires a large bore of well. There is usually one stage for each 50 feet of lift and a five-stage centrifugal for a lift of

Digitized by Google



Two Sets of Motor-Driven Pumps.



Two Centrifugal Pumps Driven by One Motor.

250 feet would probably have an efficiency of about 40 per cent.

Power-driven pump heads with single-piston and double-piston lift pumps have been used for many years for pumping deep wells. When operated by steam such lift pumps generally show low efficiency on account of slow speed and perhaps long lengths of steam pipe, whereas power heads driven by steam engine, gasoline engine and by electric motors show high efficiency. The motor-driven double-piston pump shows on test efficiencies in the neighborhood of 80 per cent from power input of pump to water horsepower, and efficiency of 70 per cent or more including motor.

Data on Typical Installations.

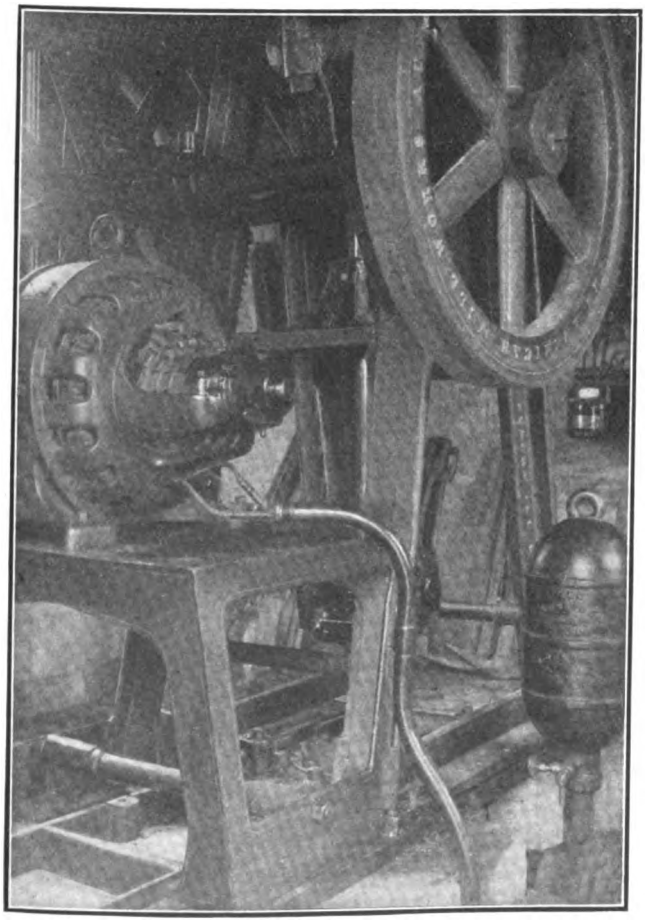
Some interesting figures on city water pumping are contained in reports of tests made on three installations by the Keystone Driller Company, of Chicago. At Gas City, Ind., there is installed one No. 34 Downie double-stroke deep-well pump head, in connection with an 8-inch by 7-foot brass working valve, fitted with Downie conical plunger valves. The depth of the working barrel is 150 feet; the suction below the working barrel is 20 feet, making a total depth to bottom of suction of 170 feet. The pump delivers water into a surface reservoir.

During the month of May 3,830,000 gallons of water were pumped with an energy consumption of 1,500 kilowatt-hours. The total cost for pumping this amount was $46, or 1.5 cents per 1,000 gallons. The pump delivers 225 gallons per minute. Energy is supplied by the Marion (Ind.) Light & Heating Company.

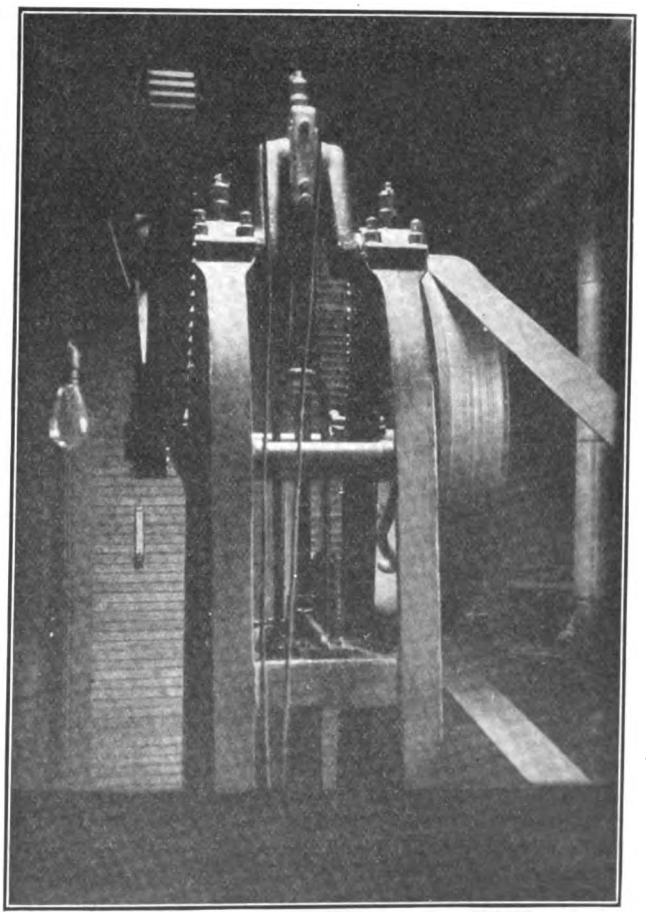
At the water works at Waseca, Minn., a Downie double-stroke pump, No. 34 head, has been installed for some time with excellent results. The working barrel is 5.75 inches in inside diameter and 250 feet long. The following are the results of a test recently conducted on this unit.

Amount of water pumped in May, 2,757,120 gallons.

Amount of energy consumed, 3,590



Plunger Pump Operated by 25-Horsepower Motor.



Plunger Pump Belted to Motor.

Digitized by Google

kilowatt-hours at 1.5 cents per unit.

Total cost for month, $53.85.

Amount of water pumped in June, 2,419,200 gallons.

Amount of energy consumed, 3,150 kilowatt-hours at 1.5 cents per unit.

Total cost for month, $47.25.

The working barrel at first was placed at 200 feet at which point it got some air; was then lowered to 250 feet, at which point pump just about gets a sufficient amount to supply it.

This pump takes just 15 horsepower and has an efficiency of at least 75 per cent.

A third test was made on an installation at Platteville, Wis. This city has two wells located adjacent to the waterworks station. An 8-inch well adjacent to the pumping station is 1,700 feet deep and is equipped with air lift. The other well, about 40 feet further south, is a 16-inch hole cased to a depth of 300 feet, beyond which the hole continues 9 inches in diameter to 1,000 feet. The latter has been fitted with a No. 36 Keystone double-stroke pump head, 18-inch strokes, and 11.5-inch working barrel located at a depth of about 195 feet.

The pump is operated by a three-phase, 60-cycle, 220-volt, 35-horsepower induction motor, running at 900 revolutions per minute. Electric power for pumping is purchased by the city from the Interstate Power Company, of Galena, Ill. The pump discharges water from the well to two interconnected circular storage reservoirs close at hand.

A 40-minute test of the installation was made with a view of determining power consumption and pumping capacity. The quantity of water discharged was determined from the computed capacities of the two storage reservoirs. The current consumption was read from the station watt-hour meter supplied by the power company, and serving this motor installation only. During this test, pumping from the surface reservoir was discontinued. An ammeter and voltmeter were also connected at the main switch in the motor circuit.

During the 40-minute period, 19,388 gallons of water were pumped at a rate of 484.7 gallons per minute. The power consumption during this period was 15,000 watt-hours, or 773 watt-hours per thousand gallons pumped.

Rate Reduction at Easthampton.

The town of Easthampton, Mass., has accepted the offer of the Easthampton Gas Company, a combination gas and electric company, and withdrawn its petition for a hearing by the State Electric Light Commission on a reduction in rates. The reduction which the company offers will bring the maximum net price down to 11.7 cents, the rate heretofore having been 13.5 cents per kilowatt-hour, for a monthly consumption of 100 kilowatt-hours or less.

Details of a House-Wiring Campaign at Portland.

The Cumberland County Power & Light Company, Portland, Me., began a systematic campaign for the wiring of houses and other buildings September 20. Four propositions are offered to householders, as follows:

(1). Exposed wiring, 6 drop cords, porcelain shades, $17.00. Terms, $2 with order, $2 a month.

(2). Concealed wiring, 7 fixtures, $42.00. Terms, $3.50 with order, $3.50 a month.

(3). Concealed wiring, 7 fixtures, $48.00 Terms, $4 with order, $4 a month.

(4). Concealed wiring, 7 fixtures, $58.00. Terms, $4.83 with order, $4.83 a month.

Fixtures with proposition No. 2 include a pendent hall fixture with bell shade, three-light dining-room pendent chain chandelier, chamber and bath wall-bracket, three-lamp living-room shower, drop tube kitchen light with shade, and porch globe with wall switch. Propositions 3 and 4 call for more expensive glassware, the fixtures being of the same general types. An additional light, with either drop tube or wall bracket may be added for $4. A flush wall switch is installed for $4, and a cellar light and switch for $4.

All work is divided among ten local contractors who have already agreed upon unit prices after having gone over the matter among themselves. The central station gives each householder accepting the offer a handsome portable table lamp gratis.

Solicitation of the business is done by the lighting company's three salesmen, besides a power agent who devotes part of his time to the work. A canvass is first made of all houses not wired, and "lead memos." are filled in by the salesmen as the result of each call. These blanks provide for the householder's name, business, address, etc., and have spaces below for entry of dates of calls, with final blank space to be filled in when the contract is closed.

These memoranda are turned in to the business office daily. Here they are assorted, and the memos. which indicate that the prospect was absent from home, not yet ready to talk business, or willing to consider the proposition on a certain day, are placed in pigeon holes labelled with the days of the succeeding week and month. Each day's work on prospects already solicited and partly convinced of the desirability of an installation, is thus cut out for the salesmen, who take the memos. for the day and call again, as arranged at the previous interview.

In the office is a blackboard 5.5 feet long and 3 feet high, lined off in red, with vertical columns for residences, apartments, other buildings, total and total kilowatts. Horizontal lines provide for the entry of daily, weekly and monthly contracts secured, with their kilowatt capacity, and footings under each of the time periods.

Another blackboard is for the entry of contracts gained for commercial business and appliances. This board is 12 feet long and 6 feet high, ruled in red, with divisions for four salesmen, and each division provides spaces for sign lighting, front lighting and office sales, showing number of each type of unit sold or contracted for, with their connected load and totals.

This board is ruled by days, weeks and months for the year and the figures show at a glance just the amount of business that has been secured the last full week and month, and for the year.

A third device for indicating graphically the progress of business, is a clock face about 3 feet in diameter with dial marked off in spaces of 10 kilowatts each. One hand indicates the total motor load in horsepower at the present date, and the other hand the load one year ago on the same date.

A campaign of nine months recently conducted by the company resulted in securing 715 new contracts, and only three salesmen were employed.

The company's net lighting rate is 8.5 cents a kilowatt-hour, with a minimum charge of $12 a year.

Parcel Checking in Appliance Display Room.

A checking room for parcels, at the display room of the Cumberland County Power & Light Company, which controls the Portland Railroad Company, the traction system of Portland, Me., has been recently introduced, and has been found a source of revenue to the company as well as a great convenience to the traveling public.

The first floor of the company's office building on Monument Square, the point of departure and intersection of street car lines, is utilized as a waiting room and also a display room for lamps, electric appliances, etc., an information counter and a place to pay bills, engage service, and secure renewals of lamps also being provided in the one room. The checking convenience is the most recent feature.

The room is about 15 by 20 feet and is provided with racks for bundles, valises, etc. The place is open from 6 a. m. to 12 midnight, a day man and a night man being in charge. Five cents is charged for the checking of a package for 24 hours or fraction. Shoppers and other visitors to the city make good use of the convenient place of deposit for baggage.

Digitized by Google

Commercial Practice
Management, Rates, New Business

THE SMALL-CUSTOMER QUESTION.

System for Reducing Cost of Billing, Collecting and Accounting.

Comparatively little effort has been made in this country to secure the business of the very small customer because of the high customer costs inherent in present-day practice. At the recent convention of the Northwest Electric Light and Power Association, H. E. Eisenmenger, who has made a careful study of European practice, presented considerable data on cheaper wiring, flat rates and a feasible billing, collecting and accounting system which he has devised to enable central stations to serve customers with as low a maximum demand as 50 watts at a profit. The latter system is described herewith.

The central stations in this country do not generally have as many small customers as the central stations abroad. They are not soliciting them and where small consumers are coming in without being solicited they are generally not welcomed but rather considered as a burden.

The cost of service to a certain customer depends on the number of kilowatt-hours consumed by him and on the number of watts which he draws from the central station at the time of the central station's maximum demand, thereby necessitating the company keeping a corresponding amount of capacity and investment for his exclusive use. There is, however, a third part of the expenses which is independent of the customer's demand or the energy consumed by him. This part, in other words, is independent of the total cost of the very small customer who is using less than 10 or 20 kilowatt-hours per month. It is evident, therefore, that any efforts to materially reduce the cost of serving the small customer must tend to lower these customer expenses by simplifying the methods just as has been done in the letter-carrying and other businesses.

One of the most important steps in the case of the letter-carrying business was the simplification of the method of charging by introducing a uniform flat rate of one penny (two cents) per letter to be carried within the country regardless of the distance carried, of the number of sheets and (within certain limits) of the weight, thereby reducing the cost of weighing the letter and computing the charges. In the same manner, we will have to do away in the central-station retail business with expensive methods of measuring the energy consumed and computing the amount paid therefor.

This means a flat rate, that is a rate which charges the customer only according to his maximum demand (measured by watts or by candlepower or by the number of lamps, etc.) and takes no cognizance whatever of the number of kilowatt-hours used. The customer pays for a certain load for which he has contracted and is charged a certain pre-arranged amount for that load per month (or any other period), no matter how long he uses that load during the month in question. His bill is quite independent of the number of kilowatt hours he has used and consequently the number of kilowatt-hours used need not be ascertained.

Consequently the flat rate does away with all the expenses incident to the use of an integrating meter, that is with a substantial part of the expenses as mentioned above under (a) and the total of the expenses as under (b). The third part of the customers' expenses as under (c), such as billing, collecting, bookkeeping and accounting, etc., can be very considerably reduced by the department-store methods,

(a) The cost (interest, depreciation, amortization, taxes) of the capital invested in the house connection and in the meter.

(b) The cost of meter reading, meter repairs and meter calibrating.

(c) The expenses for billing, collecting, bookkeeping, accounting and handling complaints.

These "customer expenses" are essentially selling expenses and may be estimated roughly as being somewhere between 50 cents and $1.00 or more per month per customer, according to local conditions. This expense is, therefore, of very little consequence with the large customers but it constitutes the bulk

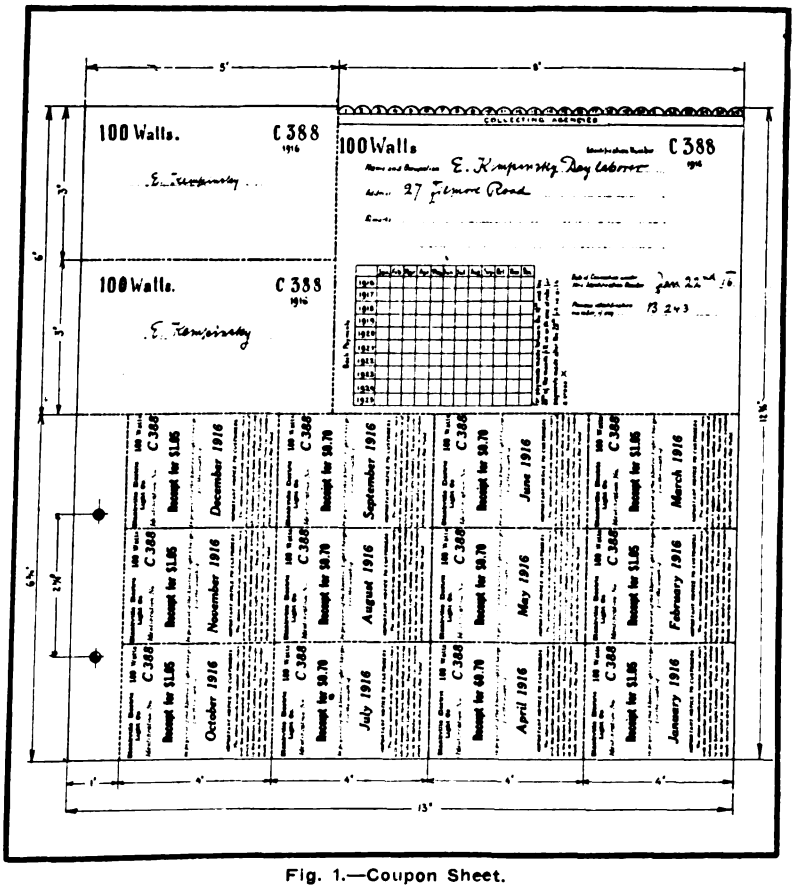


Fig. 1.—Coupon Sheet.

Digitized by Google

mentioned above and to be described in the following paragraphs.

The principle of the system proposed is that flat-rate customers get no individual ledger accounts and are not treated individually, but collectively in large groups. Instead of getting a page in the ledger the consumer simply gets a card in a card file printed with an identification number and from then on he is treated as a number only, collectively with other consumers. The company knows that every one of these "numbers" has to pay a fixed amount every month. All receipts are printed in advance for the whole year on a cardboard sheet consisting of 12 detachable monthly coupons which serve as a receipt for the customer. Everything is printed on these coupons, even the amounts payable and the identification number of the customer, so that no handwriting or typewriting whatever is necessary on these receipts. The company is not interested in the customer's name, address or other particulars which distinguish him from other consumers, except in emergency cases, for instance if he fails to pay or if he changes the wattage of his maximum demand, etc. It is only in such cases that reference is made to the index card of the customer. No collectors are sent out and the flat-rate customer has to see to it himself that his payment reaches the company's office in time. The system is so devised as to show up automatically the identification numbers of those customers who have failed to pay, by the last date of the period assigned for paying the monthly bills, for instance by the tenth of the month. The customers who have failed to pay are then disconnected. It seems preferable, however, to first mail them a printed note that their payment is overdue and that in case of non-payment of their flat rate plus a fixed extra charge for making out and mailing the notice in accordance with the provisions of the rate schedule they will be disconnected within a certain period.

The principle is here to reduce to a minimum the cost of serving the regular consumer. Every consumer who necessitates individual treatment by not paying regularly, is charged individually the expenses of individual treatment.

In large cities it would work a hardship on the small consumers of this class if they were required to go down town to the central-station's office every month in order to pay their bills. (Payment by mailing checks is, of course, out of the question with this poor class of people and besides would cause the electric company an increased expense for clerical work, postage, etc.) To overcome this difficulty a system of collecting agencies is suggested which are to be spread all over the city in those parts where these small consumers are living. The collecting agency receives every year the printed receipt coupons for the customers in its districts and has to return to the central station every month either the face value of that respective month's coupons in cash or the coupons themselves, of those customers who have failed to pay. The accounting of these coupons is almost automatic and causes very little work so that the collecting agency can be kept by a drug store or some other little store in residential quarters. It can be expected that, as in Germany, these collecting agencies will do the work either for a trifling fee or gratuitously, acting on the same principle as our druggists do when they sell postage stamps. The idea is that by drawing the people into their store they get them acquainted with and accustomed to the store. A man who once is inside of a store is half a purchaser for something he may see there.

Fig. 1 shows a sample of the sheets which are printed for every one of these customers. They are printed on thin cardboard and consist of one large and two small index cards and twelve receipt coupons. All these different parts are easily detachable from each other as they are separated by perforations or a similar method. It is seen from the illustration that the amount payable every month and also the corresponding amount of watts for which he has contracted are printed on the coupon. In the illustration the monthly amounts for the six winter months are higher than those for the six summer months. Full particulars about this detail appear later. It is possible to print the amount of the bill on the coupon, as contracts are not made for any odd wattages, but only for certain standard wattages. Consequently there will be only a certain limited number of coupon cards necessary. If, for instance, the schedule requires that the number of watts contracted for must be a multiple of 25 and that the wattages for which the flat rate applies be between 50 and 200, there would be only seven different kinds or series of coupon cards necessary, viz., 50, 75, 100, 125, 150, 175 and 200-watts. The sheets of each one of these series are imprinted with consecutive identification numbers starting with "one" independent of the other series. This identification number is printed on each coupon and on each one of the three indexing cards. The different series are distinguished from each other by prefixing a different letter of the alphabet for each class of sheets to the identification number. Thus, for instance, "A" might indicate 50-watt consumers, "B" 75-watt consumers, "C"

.....11th, 19....

In case of the 11th occurring on a Sunday or holiday, to be sent on the next following work day

BLANKVILLE ELECTRIC LIGHT COMPANY
Blankville

Gentlemen:

Enclosed pleased find the following coupon sheets containing all coupons beginning with this month and ending with December of this year. Payment for this month's coupons on these sheets has not come in.

.....pcs. Series A: No.....
..... " " B: No.....
..... " " C: No.....
..... " " D: No.....
..... " " E: No.....
..... " " F: No.....
..... " " G: No.....

.....pcs.

The corresponding indexing cards are also returned herewith.

The coupons from all the other coupon sheets held in this collecting agency have been cashed in this month as follows:

			SUMMER.	WINTER	
Series A:	.....pcs	@	$-.50	$-.75	$.....
" B:	..... "	"	-.60	-.90	$.....
" C:	..... "	"	-.70	1.05	$.....
" D:	..... "	"	-.80	1.20	$.....
" E:	..... "	"	-.90	1.35	$.....
" F:	..... "	"	1.00	1.50	$.....
" G:	..... "	"	1.10	1.65	$.....
	.....pcs.				$.....

The total of ..... $..... is being turned over to you herewith.

Yours very truly,

.....
Collecting Agency No.....

Fig. 2.—Printed Form Used by Collecting Agencies.

Digitized by Google

100-watt consumers, etc. (Instead of this every series might start with another 1,000 or 10,000.) It is also advisable to print the different series on cardboard of different color. In all other respects, apart from their showing different amounts payable and different wattages, the different series of coupon sheets are exactly alike.

The main index card (the large one) is the company's record of the individual customer and is made *out once for all* at the time when the customer is connected. It is not renewed at the beginning of every year, but stays in the company's files. The same applies to the small indexing cards. The printed coupons on the left half of the big sheet have to be renewed at the beginning of every year as they are used up. Besides the main index cards two smaller subsidiary index cards are printed on the same sheet, which are also detachable. One of these subsidiary cards is for use in the company's office for cross indexing, so that if a customer's identification number is known, his name and address can be found from the main card file, which is arranged by series and numbers, or, if his name is known, his identification number can be found from the subsidiary card file, which is arranged alphabetically. In the ordinary course of events, if nothing extraordinary happens, such as non-payment of bills or change of contract, etc., reference need never be made to the individual customer. The second small (subsidiary) card is used only in case of payment through collecting agencies and is sent out to the respective agency to enable them to find out the identification number of an individual customer in case the latter when paying should have forgotten his number.

Every flat-rate consumer has to select the collecting agency where he wishes to make his payments. The semi-circular tabs shown on the upper edge of the main index card indicate the respective customers' collecting agency, each agency being designated—for the company's reference—by a number. The collecting agency to which the respective customer belongs is indicated in the card file by cutting off all the other semi-circles. It is then easy to find at a glance from the company's card file the cards of all those customers who are assigned to one certain collecting agency, should this be desired.

At the beginning of the year the collecting agency receives from the central station the coupon cards for all the consumers assigned to it. As is seen from the illustration, the coupon card has attached at its edge a strip of cardboard of such size and shape that the collecting agency can file the coupon sheets in a Shannon file. Every coupon card represents a certain value receivable in twelve monthly payments, and the collecting agency is charged in the books of the Company with the respective amount, in the same way as if the cards were merchandise which the collecting agency has received on consignment from the electric light company.

The collecting agency, together with the coupons, receives a printed receipt form, properly filled in, which the agency signs and returns.

The customers are advised to mention their identification number rather than their name, when paying their bills at the agency, but it will not be an infrequent occurrence that a customer when paying does not remember his number. For that reason the collecting agency, together with the coupons, receives the third index card (second subsidiary card) mentioned above, which the agency keeps in an alphabetical file for reference in case

Month of.....19....

First semi-monthly statement: White paper.
Second semi-monthly statement: Pink paper.

..... Collecting Agency No.....

Blankville.

Semi-Monthly Statement

of

Cash and Coupon Sheets

The first semi-monthly statement is sent out by the Electric Light Company to the Collecting Agency on or about the 15th, and the second on or about the 26th of every month. The first statements are printed on white and the second statements on pink paper.

	DEBIT $	DEBIT c	CREDIT $	CREDIT c
1. Balance brought over from the last semi-monthly statement				
2. For coupon sheets returned to Electric Co. since the last semi-monthly statement (1) or for new coupon sheets turned over herewith to the Collecting Agency (2) resp. as follows: (Indexing Cards are enclosed with the new coupon sheets)				
Series A .....pcs.				
Series B ..... "				
Series C ..... "				
Series D ..... "				
Series E ..... "				
Series F ..... "				
Series G ..... "				
Total .....pcs.				
3. Cash turned in to the Electric Light Co. (1) since last semi-monthly statement				
4. Balance to be brought forward.....				
Total.....				

Returned (1) — Turned over to Collecting Agency (2) — Value per coupon sheet (3)

Please take the following Coupon Sheets from your files at once and return them to us with your regular communication on the 11th of next month (2):

A. Replaced by other identification numbers for which coupon sheets are enclosed herewith:

.....
.....
.....

B. Dropping out of your accounts entirely:

.....
.....
.....

(1) To be filled in on the first semi-monthly statements only (white paper).
(2) To be filled in on the second semi-monthly statements only (pink paper)
(3) From the following table of values of coupon sheets, closing with month of December:

	STARTING WITH MONTH OF											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Series A...	7.50	6.75	6.00	5.50	5.00	4.50	4.00	3.50	3.00	2.25	1.50	.75
B...	9.00	8.10	7.20	6.60	6.00	5.40	4.80	4.20	3.60	2.70	1.80	.90
C...	10.50	9.45	8.40	7.70	7.00	6.30	5.60	4.90	4.20	3.15	2.10	1.05
D...	12.00	10.80	9.60	8.80	8.00	7.20	6.40	5.60	4.80	3.60	2.40	1.20
E...	13.50	12.15	10.80	9.90	9.00	8.10	7.20	6.30	5.40	4.05	2.70	1.35
F...	15.00	13.50	12.00	11.00	10.00	9.00	8.00	7.00	6.00	4.50	3.00	1.50
G...	16.50	14.85	13.20	12.10	11.00	9.90	8.80	7.70	6.60	4.95	3.30	1.65

THE BLANKVILLE ELECTRIC LIGHT CO.

....
Tear off along this line.

Month of.....19....

Blankville Electric Light Company,
Blankville.

Gentlemen:—I receipt, herewith, for your semi-monthly statement, which was attached to this slip. I have examined it and found the balance of $..... (value of Coupon Sheets) to your credit to be correct, as well as every single item.

Yours very truly,

.....
Collecting Agency.

Fig. 3.—Printed Form for Semi-Monthly Statement.

Digitized by Google

a customer desires to pay by name rather than by number.

All index cards are made of a size to fit into standard file cabinets and the coupon cards to fit into a standard Shannon file.

Payments are to be made in advance by the flat-rate customers each month and a certain time limit is fixed for the payment in every month, let us say, for instance, the tenth of every month. The collecting agency then on the eleventh of every month takes the receipt sheets and subsidiary index cards of those customers who have not paid their monthly charge for that month, and returns them to the electric light company's office, together with the amounts paid by those customers from whom the charges have been collected for that month. It is a very easy matter for the collecting agency to pick out from the coupon sheets piled up in the Shannon file, at a glance, the cards on which payments have not been made, without inspecting the individual cards, since on the sheets where the payments have been made, the coupon of the respective month is missing, whereas on the other sheets the coupon is still attached.

The collecting agency is then credited on the company's books with the amounts returned, as well as with the amounts corresponding to all the remaining coupons on the receipt sheets returned, in the same manner as a consignment merchant will be credited with money returned and consignment goods returned.

Fig. 2 is a suggestion for a printed form which the collecting agencies are to use in accounting with the electric light company when on the eleventh of the month they turn in the money collected together with the coupon sheets on which the bills have not been paid. Series "A," Series "B," etc., on the form indicates, as explained above, the wattages of the respective flat-rate contracts.

The values of the coupons printed in the form shown on Fig. 2 are stated, merely as an example, on the basis of a certain set of prices which are computed under certain arbitrary assumptions.

If it is considered necessary to allow a commission to the collecting agency either per coupon collected or as a percentage of the sum collected, the simplest way will be to charge the agency not with the face value, but with the net value, that is, with the commission deducted. In that case the prices in Fig. 2 will have to show net values of the coupons.

The electric light company once a month sends out to every collecting agency the coupon sheets which are to be added to the files of the collecting agency. The electric light company in addition issues periodically statements to the agency about the standing of the mutual account and receipts for money and for coupon sheets received from the agency. The following is to be said concerning these confirmations and statements:

The "Department Store Methods" necessitate a very high degree of standardization and therefore it is necessary that new customers be taken on only by the first of every month and at no intermediate dates unless they pay for the whole month. The same applies to a change of wattage. A few days before the first of the month, the central station sends to the collecting agency the new coupon sheets of all such customers as have applied during the month for payment at that agency or who have changed the wattage of their contracts and belong to that agency. The electric light company charges the agency with the value of these coupon sheets, which, of course, contain only the coupons for the rest of the year and not those of the preceding months of the year.

The account between every collecting agency and the central station changes therefore twice a month at two definite periods and at no other time.

First. Shortly after the eleventh of the month when the collecting agency is credited for cash and for coupon sheets returned.

Second. Shortly before the first of the month when the collecting agency is debited for the new coupon sheets turned over to them by the electric light company.

It is therefore necessary to send out two semi-monthly statements which in the following will be called the first and the second semi-monthly statement.

Fig. 3 shows a suggestion for a printed form which serves for the requirements of both the first and the second semi-monthly statement. If these forms are printed on two different kinds of paper, for instance white

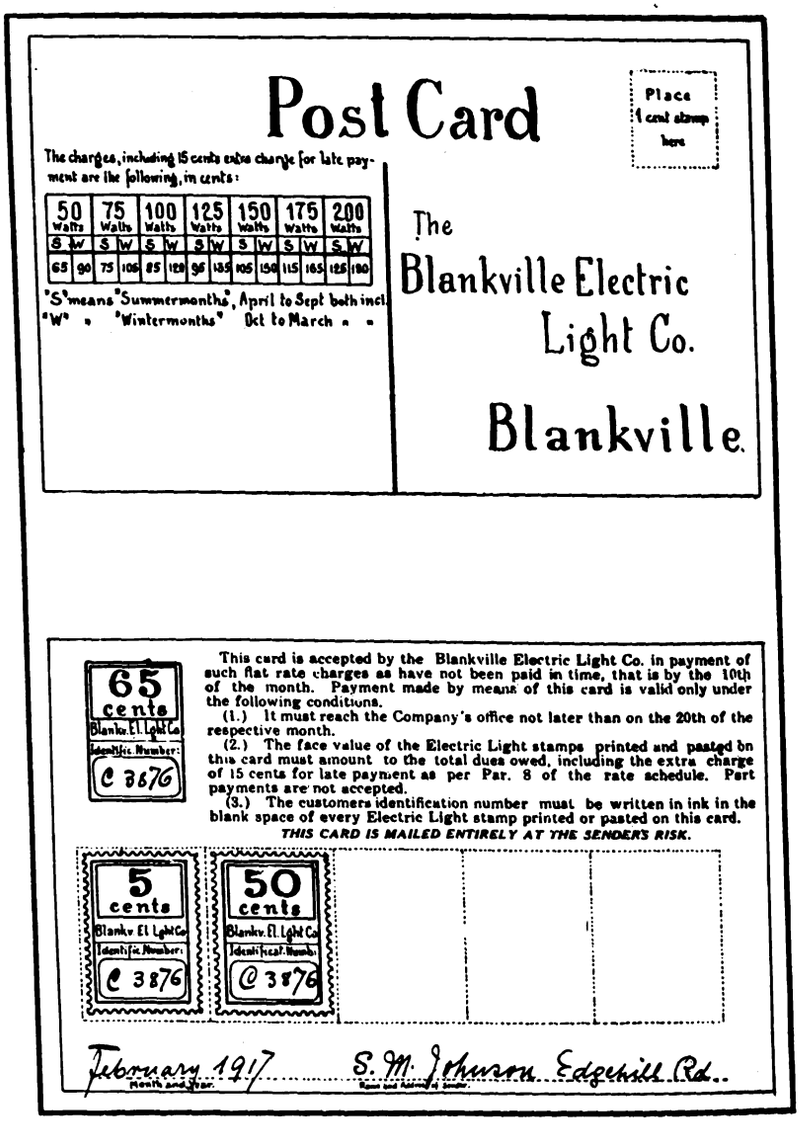

Post Card
Place 1 cent stamp here
The charges, including 15 cents extra charge for late payment are the following, in cents:
50 Watts 75 Watts 100 Watts 125 Watts 150 Watts 175 Watts 200 Watts
S W S W S W S W S W S W S W
65 90 75 105 85 120 95 135 105 150 115 165 125 180
"S" means "Summermonths", April to Sept both incl.
"W" " "Wintermonths" Oct to March " "
The Blankville Electric Light Co.
Blankville.
65 cents
Blankv. El. Light Co.
Identific. Number:
C 3876
This card is accepted by the Blankville Electric Light Co. in payment of such flat rate charges as have not been paid in time, that is by the 10th of the month. Payment made by means of this card is valid only under the following conditions.
(1.) It must reach the Company's office not later than on the 20th of the respective month.
(2.) The face value of the Electric Light stamps printed and pasted on this card must amount to the total dues owed, including the extra charge of 15 cents for late payment as per Par. 8 of the rate schedule. Part payments are not accepted.
(3.) The customers identification number must be written in ink in the blank space of every Electric Light stamp printed or pasted on this card.
THIS CARD IS MAILED ENTIRELY AT THE SENDER'S RISK.
5 cents
Blankv. El. Light Co.
Identific. Number:
C 3876
50 cents
Blankv. El. Light Co.
Identific. Number:
C 3876
February 1917
Month and Year.
S. M. Johnson, Edgehill Rd.
Name and Address of Sender.

Fig. 4.—Back-Payment Postal Card and Stamps.

Digitized by Google

and pink paper, one color may be used for the first semi-monthly statement and the other color for the second.

The table given at the foot of the form shown on Fig. 3 as a help for making the computations of the values of the coupon sheets, has been figured out, merely as an example. It does not mean to recommend that these figures should actually be accepted, regardless of local conditions. This table gives the aggregate value which the coupons represent on a coupon sheet beginning with a certain month of the year up to and including December and excluding all previous months, in other words, the amount to be charged (or credited respectively) per coupon sheet sent by the electric light company to the collecting agency (or vice versa) in a certain month. In case of commissions being paid to the collecting agencies the values are to be reduced from face values to net values by deducting the commission.

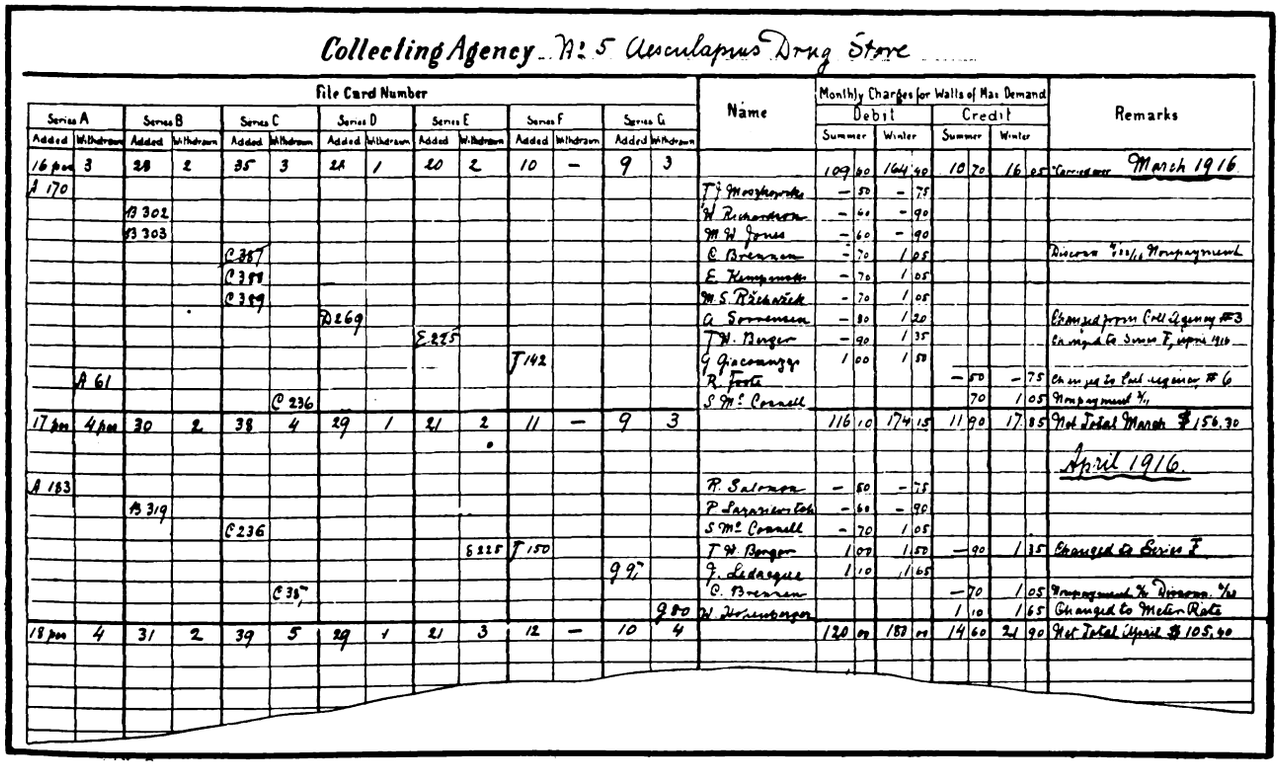
The account between the collecting agencies and the electric light company is settled by these semi-monthly statements, but the electric light company still has to take care of those customers who have not paid their advance bill within the respective time limit set therefor (in our example the tenth of the month). The procedure with regard to these customers is as follows:

When the coupon sheets of the customers who have failed to pay reach the company's office from the collecting agencies, the names and addresses of these customers are found out from the company's card indices and to each one of these customers is sent a printed postal card (or letter) from the company, informing him that his payments have not been made by the time specified and that the rate schedule calls for disconnection of his service if he does not pay within, let us say, ten more days. The customer is also reminded on that communication that in this case, as per rate schedule, the payment must be made at the company's office and not at the collecting agency, and that—also according to the rate schedule—an additional charge of, say ten or fifteen cents, will have to be paid by the delinquent customer. The reason for this additional charge is the fact that collecting in this case requires extra office work, the cost of which is not covered by the regular rate.

Even in the case of a customer neglecting to make his payments in time at the collecting agency, he may be saved the trouble of going down town to the company's office and it can be made possible for him to pay at the collecting agency. The electric light company would in that case have to issue stamps after the fashion of the postage stamps which represent a certain value printed thereon and are for sale at their face value at the collecting agencies. The customer buys the necessary amount in "electric light stamps," pastes them on the text side of a postal card and mails them to the electric light company. The postal card itself can have an "electric light stamp" imprinted with the minimum value payable and it will then be sold at the corresponding price at the collecting agency. (See Fig. 4.) The postal card has the company's address printed on the address side and may or may not have a government one-cent stamp imprinted so as to be ready for mailing. Space is provided on each stamp for the customer to inscribe his identification number in ink, before mailing it. This serves the double purpose of informing the electric light company by which customer the payment is made and of preventing theft of stamps and cards after they have been mailed. This parallels the cancelling of government postage stamps, rendering them useless for any other customers.

A customer who has not paid by the twentieth of the month is liable to disconnection without further notice. He should be allowed the option, however, even at that late date, to retain his electric service if he pays his back bills plus another extra charge, of let us say 60 cents, for the expense of sending out wiremen to disconnect his installation, and for the incidental clerical expense.

Customers who are habitually late with their payments are undesirable customers. In order to avoid the appearance of discriminating against the individual customer who is frequently delinquent the rate schedule should contain a clause that such customers who have neglected in a certain number of months during the year to pay in the regular way at the collecting agency will be disconnected without notice at the next following failure to pay at the regular time. Failure of payment at the regular time is indi-


Collecting Agency No. 5 Aesculapius Drug Store

File Card Number														Name	Monthly Charges for Watts of Max Demand				Remarks
Series A		Series B		Series C		Series D		Series E		Series F		Series G			Debit		Credit		
Added	Withdrawn	Added	Withdrawn	Added	Withdrawn	Added	Withdrawn	Added	Withdrawn	Added	Withdrawn	Added	Withdrawn		Summer	Winter	Summer	Winter	
16 pm	3	28	2	35	3	28	1	20	2	10	—	9	3		109 60	164 40	10 70	16 05	Carried over March 1916
A 170														T. J. Murphy	— 50	— 75			
		B 302												W. Richardson	— 60	— 90			
		B 303												M. H. Jones	— 60	— 90			
				C 387										C. Brennan	— 70	1 05			Discon. 4/11/16 Nonpayment
				C 388										E. Kingsman	— 70	1 05			
				C 389										M. S. Richards	— 70	1 05			
						B 269								A. Sorensen	— 80	1 20			Changed from Coll Agency #3
								E 225						T. W. Berger	— 90	1 35			Changed A. Series E, upon 4/10
								—		J 142				G. Giacomazzo	1 00	1 50			
	A 61													R. Foote			— 50	— 75	Changed to Coll Agency #6
					C 236									S. Mc Connell			70	1 05	Nonpayment 4/11
17 pm	4 pm	30	2	38	4	29	1	21	2	11	—	9	3		116 10	174 15	11 90	17 85	Net Total March $156.30
									•										
																			April 1916
A 183														P. Salmon	— 60	— 75			
		B 319												P. Sarasweteh	— 60	— 90			
				C 236										S. Mc Connell	— 70	1 05			
									E 225	J 150				T. W. Berger	1 09	1 50	— 90	1 35	Changed to Series F
												99		J. Ledesque	1 10	1 65			
					C 390									C. Brennan			— 70	1 05	Nonpayment 4/11 Discon. 4/12
																	1 10	1 65	Changed to Meter Rate
													80	W. Hemmingson					
18 pm	4	31	2	39	5	29	1	21	3	12	—	10	4		120 09	187 05	14 60	24 90	Net Total April $105.40

Fig. 5.—Sample Page of Standing Ledger Account with Collection Agencies.

Digitized by Google

cated on the customer's main index card in the space allotted therefor. The receipts of customers who do not pay at the proper time should be perforated in a certain way or should otherwise be made to show the back payment, so that a customer can always prove from his receipts when he has paid in time.

If a customer has failed to pay at his agency within the time limit and has to receive a dunning card, as described above, this is noted on his main filing card by making a pencil or ink mark in the space allotted for that purpose on the card. This space is shown in the illustration, in the left hand lower corner of the main index card, where a small square is set aside for that purpose for each one of the twelve months of a number of years. (The slight cost of this extra clerical work is also to be covered by the above mentioned extra charge made to the delinquent customer.) This enables the company to disconnect such undesirable customers without being unnecessarily severe on such flat-rate consumers as make their payments late only occasionally on account of forgetfulness, temporary money tightness, etc.

At the end of the business year it will become necessary to provide the collecting agencies with new coupon sheets for the old customers. It is not necessary to exchange the index cards. The issue of new coupons to the collecting agencies at the end of the year is the only periodical office work concerning the individual customer in the regular course of events. It happens only once a year and, as will be seen from the following description, is performed in a few seconds per customer, without necessitating any handwriting or typewriting whatsoever.

The sheets of a certain series (that is, for a certain wattage), for the new year, are piled up in front of the clerk entrusted with that work in numerical order as they come from the printer. One sheet after the other is drawn off from that pile and it is ascertained from the respective index card in the main file (also arranged in numerical order), which collecting agency is in charge of the customer with the respective number. The coupon sheets are then arranged in groups according to the collecting agency to which they shall go.

Certain numbers will be missing in the main index card file either because the customers have dropped out or because the cards may have been spoiled originally in making them out. New sheets bearing such numbers as are not contained in the card file are thrown away; their numbers are not to be used over again. This has the following advantage:

Let us assume that of a certain series up to the end of a certain year the numbers 1-500 have been used. The printing of the complete coupon sheets as shown in Fig. 1 is then necessary only for all numbers above 500; numbers 1-500 are printed without the three indexing cards. This saves the work of tearing off and throwing away the index cards of 500 coupon sheets.

A check may be obtained on the accuracy of this work by finally counting the coupon sheets to be sent out to each collecting agency and comparing it with the number of index cards which are made out for the respective agency. (This latter number can be ascertained from the tabs on top of the main index cards.) The two figures must check for every one of the collecting agencies.

A further check can be obtained by making joint ledger accounts for all customers paying at a certain collecting agency. Fig. 5 shows a sample page of this account. Before entering into the description of the system, it should be emphasized that the same principle is maintained here as with the card file, viz., that periodical entries for the individual customers are entirely avoided. The individual customer is entered only once when his name is added to the respective group and then no more cognizance is taken of his name or card number, etc., until he, maybe after many years, leaves the group by being disconnected or by being transferred to another group.

Every collecting agency has an account of its own and this account is split up according to the series, that is, to the wattage of the flat-rate customers. This is shown in the left half of Fig. 5 under the heading, "File Card Number." The identification number of every customer added is entered in the column "Added," under date of that month. No further reference is made to this customer until he ceases to belong to that series. In that case his identification number is entered in the respective column under "Withdrawn," as shown in a few examples. A total of all the columns is made just before the "first statement" is sent out, about the middle of every month, in such a way that the number of customers in every column is counted up and added to the respective balance carried over from the previous month, as shown in Fig. 5. Since it is exactly known how much every customer has to pay every month these figures alone would be sufficient for an account with the collecting agency. For instance, at the time of sending out the first March statement at the middle of March, a total of 17 identification cards of Series A had been sent to the collecting agency, a total of four had been withdrawn and the collecting agency must, therefore, have sent in the money for 13 customers of Series A on the eleventh of March. In the same manner the amounts due from the customers of the other series are figured out and added up to give the total payable by the collecting agency in that month. This total must check with the amount that had been turned in by the collecting agency on the eleventh of the month, which amount is to be receipted for by the "first statement."

To make accounting easier and to avoid mistakes, it seems advisable to enter the charges in dollars and cents for every customer in the same line of the ledger where his identification number is mentioned. This is shown on the right hand side of Fig. 5 in column "'Monthly Charges for Watts of Maximum Demand." The amount payable by the respective customer is entered on the debit side at the time his identification card is added to the cards held by the collecting agency, and on the credit side when his coupon sheet is returned from the agency to the electric light company. The difference between the monthly totals on the debit side and the credit side give the net amounts payable by the collecting agency. The winter totals are to be used in the winter months and vice versa. It is theoretically unnecessary to add the names of the customers as shown in Fig. 5, as the names are shown on the index card anyway, but the entering of the names will help to avoid errors and if such errors do occur, it may oftentimes help to find them out.

If every card number in the "Added" column is crossed out by a light stroke in the place where it was originally written as soon as the corresponding entry is made on the "Withdrawn" side (which may be many months later) this will be a further help to find out any errors if discrepancies should occur. One has then only to run down every "Added" column, leaving out those numbers which have been scratched out and one can read off in consecutive order the numbers of all the coupon sheets which the collecting agency is holding at that partiular time.

Appliances Used in Canal Zone.

The Electrical Division of the Panama Canal is arranging so that employees of the canal can purchase electric irons and other household electrical appliances for use in their residences, which are supplied with electric current from the hydroelectric system of the canal. As a rule, flat rates are charged for energy used by each appliance, the rate being determined from estimated average consumption.

Digitized by Google

SUCCESSFUL COMMERCIAL MANAGERS.

Henry L. Coleman.

Public utility corporations operating in thickly populated localities, outside of the larger cities, encounter many difficulties in management and in engineering development that requires exceptional ability to overcome. It frequently occurs that one utility company will serve a number of cities and many rural communities where the conditions and requirements are totally different in each case. How such conditions have been brought to a successful culmination by individual perseverance, and ability in business and engineering affairs is well illustrated by the subject of this sketch, Henry L. Coleman, who has been general manager of the Empire Gas & Electric Company since 1910 and has served in various other capacities for the past fifteen years.

This company furnishes light and power to ten cities and towns as well as to many rural communities through the central part of New York State. The main office is located at Auburn, N. Y., and nine other offices are distributed throughout the territory served by the Empire company, all of which are under the direct supervision of Mr. Coleman. Not only all of the offices, but the entire business staff and engineering department are under the direction of the general manager. New-business departments are mantained in the district offices, which are responsible for the solicitation of business of an ordinary nature. These departments as well as the engineering, constructon, meter departments, etc., have department managers.

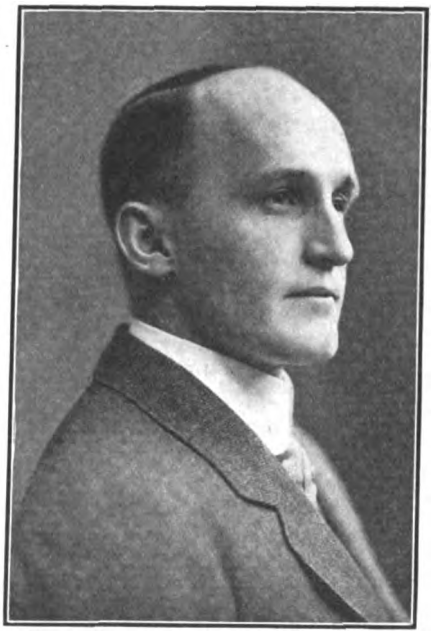
The Empire company has eight sources of power, including four steam generating stations, two hydroelectric plants, and Niagara Falls and Salmon River power, which are all more or less interconnected by means of transformer stations and frequency changers. It can be readily realized that the upbuilding of such a system, in addition to the gas end of the business, covering several hundred square miles of territory has required the services of a man with exceptional executive and engineering ability and the general manager has been the "power behind the throne."

Mr. Coleman's ideas on the conduct of a large public utility are best explained by quoting his own words:

"I believe it is the first essential of a utility corporaton to gain public favor and confidence by its integrity and I always insist on my employees keeping their promises regardless of the cost to the company. The department managers have full authority to close business propositions and settle complaints unless something of unusual importance transpires. Under ordinary conditions I never ask them to consult with the main office as I have known of cases where such conditions obtain, to cause much delay and the loss of respect of the customers.

"It is further my belief that utilities corporations should be factors in every community and that employees should have sufficient individuality and prestige so that each one is recognized and the company as a unit forgotten. We have no private offices and in every department there is always some one present whose duty is to direct callers to the proper person without delay and confusion."

Mr. Coleman has inaugurated many features connected with the company's service, one of which, the Information Clearing House, is maintained in the main office for the especial benefit of patrons. Here a complete technical library is maintained and leading engineering magazines are kept on file. The engineering department is always at the disposal of customers for any advice, either connected with electric or gas service, or on any other engineering subject. For example, a customer can seek advice on heating and ventilating systems, building construction, sewers, or even get an abstruse mathematical problem solved. This service is absolutely without charge. It may be further said that a prospective customer who wishes two 20-watt lamps or a sewing-machine motor installed in his home receives the same courtesy as a manufacturer asking advice on the equipment needed for an installation of 1,000 horsepower in motors.



Henry L. Coleman,
Manager Empire Gas & Electric Company.

Another feature that receives a great deal of attention is telephone calls. All inquiries are transferred by the switchboard operator to a man who keeps posted on all activities of the company and who can answer all questions at once without the annoyance to the customer of being connected in turn to various departments.

Especial attention has been given to the power development and such concerns as the International Harvester Company, Columbian Rope Company, American Can Company and others of equal importance have electrified their plants and are on the Empire Gas and Electric service. Some of these plants have been described in recent issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

Mr. Coleman is active in civic matters —takes great interest in educational movements and has organized an engineering club for the benefit of his employees. He is a member of several prominent clubs and despite his strenuous duties will receive an acquaintance at any time and friends are always more than welcome in his office.

Flood Lighting Proves Profitable in Louisville.

The Louisville (Ky.) Gas & Electric Company has had a number of projector lighting installations made in the city, the first in Louisville and in that section of the country. As a trial order the Louisville Gas & Electric Company purchased seven units and solicited the business. These have been disposed of in installations made and more have been ordered. By the time these are put in the electric company will turn the business over to the contractors.

The first of these installations, consisting of five of the General Electric Type C projectors, focusing, and five 500-watt lamps, has been erected on the top of a Fourth Street building, and the light is so directed as to illuminate the front of the Bernheim Building, opposite. It is faced with tile with rather elaborate designs carried out and the illumination serves to call more attention to it at night than it gets in the day time. The installation represented an outlay of $125 and the current bill runs to about $18 monthly. A tire-service house has similarly lighted up one of its signs along Eastern Parkway, a much traveled motor road, and the usefulness of the sign has been much increased. The cost of the installation was about $25 and the light burns until about midnight. The same company is preparing to illuminate the remainder of its bill boards in the same manner and the system is attracting a great deal of comment in Louisville.

New Boston Edison Contracts.

New contracts for power and lighting have recently been secured by the Boston Edison Company as follows: Edward T. Ward Company, steel workers, 120 horsepower and 600 lamps; Riker-Jaynes Company, Roxbury, 100 horsepower and 700 lamps.

Digitized by Google

Electrical Construction

BUSINESS HINTS FOR THE CONTRACTOR AND DEALER.

By G. D. Crain, Jr.

Price Goods on Display.

Although most dealers in electrical merchandise fail to do so, there seems to be no really good reason why items on display in the show windows should not carry price-tags, as well as other information. The man who stops to look in a window at a small motor intended for use on a sewing machine, for instance, undoubtedly thinks of its possibilities in connection with relieving the work of his wife at home; but before he can make up his mind as to whether he ought to buy it, he must know what it costs, for in 99 per cent of the cases, his purchasing capacity is limited.

The theory of not pricing is that the customer will be so interested, through the display, that he will come into the store, ask for a price, and give the salesman a chance to mesmerize him into purchasing, even if the figure is more than he had intended to pay; but, as a matter of fact, the average person hesitates to go into a store, ask a price and then walk out without buying. Most men are that way, though there are many women who do not hesitate to inquire about goods they see in the window.

The man looking at the sewing-machine motor, and knowing nothing of the cost of such goods, is more likely to err in overestimating the cost than in fixing it too low. If this is the case, the store loses sales that might have been made had the price been given, for he will go away, assuming that it is too expensive for his purse, instead of giving himself and the store the benefit of the doubt on this score. Had the price been given, the store could have lost nothing, even if he did not respond; whereas if the quotation seemed to be attractive, a sale would have been created, and it would have taken little or no effort to have sold the goods. The purchaser who sees something in the window that he wants—and this description applies to most items of electrical merchandise—is held back from buying only by the consideration of cost; and hence if the price is immediately put within his limitations, he will walk in and buy.

Some dealers take the ground that it is good business to quote a price only when a reduced quotation is being offered, as at the end of the electric fan season. But while this might be true of a lot of staple articles the prices of which are familiar to the general public, it is not true of electrical goods, for the reason that the man in the street seldom knows the cost of a sewing-machine motor, an electric toaster, a vacuum cleaner or anything else. These things are relatively new.

The window display is intended to give information about the goods, and to arouse interest as much as possible. The price is the most important piece of information there is, because it determines whether the customer is going to buy or not; and hence leaving it out is illogical, and bars the way to many sales that might be made easily, were it to be given.

Fans in the Off Season.

How do you handle your fans during the off season, so as to insure their being in tip-top condition when warm weather comes again?

Do you take good care of them, or do you merely shove them away out of sight, with the chances favoring their appearance being below par next year, and a reduction necessary in order to move them?

A successful fan dealer—who, like most others, is carrying over a good-sized stock this season because the weather has been cooler than usual—makes a point of going over his entire stock, and putting every fan in good shape. It is cleaned and oiled, and is then covered with a paper sack, of the sort used for hats. The ends are twisted tightly, so as to keep out the dust and dirt, and the name and size of the fan are marked on the outside. They are then put away, but if there should be a late-season call for a fan, the one wanted can be located without having to open the packages.

The advantages of this method are also that the fan can be sold and started up at the beginning of the next season with a minimum of delay. It will still be necessary to test it before putting it into use, but it will take only a fraction of the time that would be needed if repairs and adjustments had to be made.

The time spent in putting the fan stock in good shape now will be well repaid by the greater ease in handling fan business next summer.

Popular Motors.

Supply and demand determine the value of most things, or at least the range within which the price moves. The dealer does not want to tie up his capital in a line of goods which do not move readily, and, conversely, he can afford to be content with a smaller margin on those which sell promptly, and on which there is a rapid turnover and a consequent multiplication of profits.

These considerations are largely the guide of the most successful used-motor dealer in a large city of the Middle West. He has a good many thousand dollars tied up in second-hand machines, which he overhauls and rebuilds before putting into use again, and his experience is suggestive to others.

"The most popular motor sizes in this market are 3 to 5 horsepower," he said, "and consequently we make more money on these than on larger or smaller sizes. We turn our money over fast, and for this reason we are able to pay more for motors of that capacity. A big motor, say over 10 horsepower, is not a good buy unless it can be secured at a low price, because it will have to be held longer before a sale can be made. The same considerations apply to alternating as against direct-current equipment, the latter seldom being in strong demand.

"If the dealer will consider the supply and demand in the selling market when he goes out to buy motors, he will run less risk of getting dead stuff into his shop, and will be surer of having a stock that he can keep turning over rapidly and making some money out of all the time."

The Right Kind of Advertising.

Everybody in the electrical business is familiar with the tremendous creative effect of the right kind of publicity; and hence every dealer and contractor is ready to spend some of his own money for advertising. The usual trouble is that he does not know exactly how to advertise, or what to say after he has bought the white space in which to put his announcement. Some of the manufacturers furnish copy and cuts, and even electros, mortised for the dealer's name and ready for use; but, frankly, a great many small dealers find these ads too ambitious for

Digitized by Google

their use. What they would prefer would be a larger number of small ads, which could be inserted in their local newspapers at a reasonable charge.

A successful dealer and contractor has decided, however, to spend $750 during the next twelve months for advertising. That is a considerable amount for a comparatively small establishment. At the rates which are quoted in his town, this amounts to 15,000 lines, divided among three papers.

. The first of his ads, which struck a new note in local electrical advertising, was run recently, and attracted considerable attention. It was really a news item, as far as style was concerned, only the head-line and the name at the bottom being displayed. The remainder of the announcement was a straight-away description of an interesting installation in a new retail store, special reference being made to the new-type fixtures which had been provided. There was no exaggerated claim made regarding the ability of the firm, but just an interesting, "newsy" statement of fact about this particular store.

The head of the concern plans to run a series of these ads, telling about the interesting work which his company is doing. He believes that this will be more suggestive to the readers of the papers, and will bring in more inquiries, than simply using big type to announce that the concern is in the electrical business, without saying anything specific, or offering any suggestion on which the prospective customer might hang an inquiry.

Co-Operation Between Contractors and Central Stations.

One of many important topics considered at the recent convention of the New England Section, National Electric Light Association, was co-operation between contractors and central stations. A joint committee of central-station men and electrical contractors of Massachusetts presented a series of recommendations that were read by Walter L. Mulligan, of the United Electric Light Company, Springfield, Mass.

These well considered and important recommendations were, briefly, as follows: 1, that central stations be urged to arrange local get-together meetings with contractors, at which business methods and business getting would be discussed; 2, that central stations should confer together on the adoption of more uniform working rules affecting their relations with contractors, so that differences in requirements for the same class of work be standardized; 3, that the Contractors' Association have lists of its members who are licensed contractors printed, to be distributed by the central stations to all inquiring for available contractors; 4, that where business is being developed by a contractor on his initiative, and the co-operation of the station is necessary in locating services and meters or furnishing information, etc., the contractor should feel free to ask the help of the station without fear of disclosing his prospect, all inquiries to be treated confidentially; 5, that central stations prepare a list of unwired houses for use in their campaigns for business, and that they be open to contractors, also that central stations employing wiremen and appliance solicitors work in harmony with contracting interests without partiality; 6, that conferences on prices and methods for house-wiring campaigns by held by the two parties; 7, that contracts for additional wiring after the original central-station-financed contract has been performed be left for adjustment between contractor and customer; 8, that on business financed by the contractors, the lighting company work with the contractors to ascertain the credit of prospects, furnishing information in hand; 9, that when contractors secure new business which means an unusually expensive line extension, stations canvass the locality to secure added business to warrant the extension; 10, that a permanent committee be established, of two members from each interest and a fifth selected by the four, to be arbitrators in matters needing adjustment; 11, that it is recognized that the province of the station is properly to sell current and that of the contractor is to wire buildings and sell supplies and appliances; should the dealers not take proper initiative, the case is to be referred to the arbitrators.

The recommendations were satisfactory in the main, except the last one. F. H. Smith, Worcester, Mass., said that unless the contractor can demonstrate his ability to handle the applance situation, the lighting company should continue in the business. R. P. Ingalls, of the Simplex Electric Heating Company, Cambridge, Mass., disapproved of any plan to keep central stations out of the appliance business. If goods are sold at or near list prices, there would be no difficulty between the interests, he thought.

L. J. Chase, Concord (N. H.) Electric Company, approved the recommendations except the last. He said it is hard to harmonize the differences with contractors because of jealousy among the contractors themselves. J. A. Hunnewell, Lowell, Mass., told of a plan by which harmony has been secured. All local contractors met weekly with the central-station management. Here the former found ready adjustment for moot questions. All work originating with the company is distributed as equally as possible among the contractors, only those not having a fixed place of business, with telephone, being eliminated.

E. R. Davenport, Narragansett Electric Lighting Company, Providence, R. I., did not blame contractors for objecting to the free supply and renewal of lamps. His company is selling this year 200,000 Mazda lamps at list prices. In working out a house-wiring campaign contractors presented bids which when checked up with prices in other cities were accepted. He did not approve of the lighting company engaging in wiring. "Give the contractor a show, and you will get co-operation from him," said Mr. Davenport.

Mr. Smith, of Worcester, stated that the lighting company there is wiring 100 old houses a month. Local contractors submitted their standard prices and the central-station salesmen proceeded to get the business. When secured, the work is advertised by being posted at the office and is given to the lowest bidder for the job. At the end of the year, the difference between the two sets of contracts is refunded to contractors pro rata, less five per cent for soliciting.

A. T. Page, supply dealer, Hartford, Conn., held that appliances should be sold by the central station, providing they are sold at a fair profit. It is easy, he said, to get 50 cents on an iron, or the 10-per-cent margin on a motor, rather than give away the profit. He did not approve of making a central station's customers pay for lamps through the necessary advance in the kilowatt-hour rate that is charged for lighting.

C. H. Carpenter held that the small central station has a different problem from that of the city company.

C. R. Hayes, Fitchburg (Mass.) Gas & Electric Company, advocated get-together meetings, with the local wire commissioner in attendance, and the discussion of present-day problems rather than old scores. The contractor, though an excellent adjunct to the central-station business, and excellent as a solicitor, exists only because of the central-station industry and should not be accorded favoritism as a class.

Eugene Carpenter held that it is vital to the central station that appliances sold be of the highest efficiency. He believed that dealers should handle them, but lighting companies supervise their quality. He thought it might be of mutual advantage for the central station to aid contractors to procure wiring jobs in slack seasons.

C. R. Hayes advocated the proposed lower-cost methods of wiring, but held that contractors should be enabled to do it at a profit.

Digitized by Google

Houses Wired With Concentric System in Boston.

The Boston Edison Company has completed the installation of three houses in its territory, on the Stannos or bare-concentric-wire system. Some time ago the company secured a special dispensation from the Boston Wire Commissioner and the Boston Board of Fire Underwriters to wire three houses as an experiment. The understanding was that they should be single-family homes.

Two of the houses are in Dorchester and one in the Jamaica Plain district. All are occupied by their owners, one being a single wooden cottage house, and two brick houses in a block.

Service was entered in the usual manner through service and meters on the standard wiring system. From the meter on, concentric wire is used.

The conductor is No. 14 rubber-covered, tinned-copper sheathed, with cotton braid between sheath and rubber insulation. An order for 5,000 feet was placed last spring.

The conductor has a diameter of 7/32 inch.

"Twistons," sections of tinned copper wire with a spiral of tempered metal at one end, were used to make the connections at switches and outlets. These devices were obtained from abroad.

The method of making connection was to strip a section of the wire, cutting away the sheath and insulation, securing the copper strand to one terminal, and the twiston, with spiral securely hugging the sheath, to the other terminal. The wire was secured to the wall of the room by means of small brass clips with two screw eyes in one end and a rounded clamp at the other. These were either screwed or nailed. Where two conductors were run parallel to one another, as was the case in connecting wall brackets, a double clip of the same sort was used. These clamps were of the type used in automobile wiring, and were procured from the automobile supply houses.

Each of the houses was wired with about 25 outlets, regular ceiling fixtures, wall brackets and receptacles. All wiring was run on the surface of walls, so far as possible over door casings, baseboards or picture moldings.

The policy was to avoid low wires, subject to mechanical or mischievous injury. Protection at the angle of baseboards, where a wire came up through the floor to a wall bracket, was afforded by a section of brass tubing inclosing the wire.

Standard fittings were used in every case, no other fittings being as yet available, though a special line is soon to be offered by manufacturers.

Special attention was given to the bonding and grounding of the sheath by ground connection in addition to the regular service ground on the water pipe back of the water meter.

The outward aspect of the work is simple and unobtrusive. The single wire is carried down the wall to wall connections and either returns in a parallel line or else is carried down to the baseboard, continuing thence to a point below the next outlet and carried thence directly up and through this connection to the picture molding. As above stated, care was taken to avoid low wires, within reach of chairs or other movable furniture. The shell, being thin, is liable to injury, disfiguring the installation.

Contractors' Co-operative Window Dressing in Boston.

Beginning October 15, an expert window trimmer will be employed by joint subscription of a number of dealers in electrical goods, and contractors, in Boston (Mass.) territory.

The trimmer will make his headquarters at the office of the Boston Edison Company and his work will be co-ordinated with the company's window dresser, in that displays of the same goods from week to week will appear in all the dealers' shops and also in the windows of the Boston Edison Company's 15 stores simultaneously.

Each contractor will be assessed for the dressing of his own windows on the basis of size of windows, but the smaller dealers will have the same service performed for them free of charge for one month.

The project involves a year's advertising campaign. Supplies will be procured by the contractors from their regular jobbing connections, except that the same goods may be procured, by smaller dealers, from the Edison Company if advantageous.

City Inspectors Cover More Ground With Automobiles.

A series of complaints which have been received by the city administration recently from people who have been forced to pay for inspection of electrical installations in their homes in order to get the current turned on promptly, has resulted in Louisville, Ky., supplying two electrical inspectors it employs with automobiles which enable them to get over the ground much more rapidly. In this way many people have been enabled to save the $1 fee which inspection by fire insurance underwriters' men has cost them. The Board of Public Safety, which controls this department, has made an announcement explaining the manner of operation and the fact that city inspection is free, while inspection by the underwriter's representative involves the charge.

C. C. Childers, president of the Electrical Clearing House, reported that the city, the contractors' association and the Kentucky Acturarial Bureau have succeeded in putting in force in Louisville virtually every provision of the Code. This is an item which is working out to the material benefit of the contractors and is serving to net them more than where the Code is enforced in a more or less lax manner. The more rigid inspection has resulted in numerous orders for removal of old portions of installations and their complete replacement.

Among the Contractors.

The Keokuk Armature Works has moved its shop from 413 Johnson Street to 1001 Johnson Street, Keokuk, Iowa, thus increasing its floor space about two and one-half times. This firm, of which W. G. Carney is the enterprising manager, has built up an excellent business in the repair of all kinds of electrical equipment, and the manufacture of armature coils. In addition, the firm will now be enabled to undertake the repair of automobile starting, lighting and magneto equipment. It is also expected to handle electrical supplies, and do general electrical contracting.

The Blumenthal-Kahn Electric Company, of Baltimore, Md., has recently been awarded some very important business. The concern will wire the new Parkway Theater, on West North Avenue, Baltimore; J. B. Scott is consulting engineer. This installation includes, along with the regular wiring, a storage-battery plant for the operation of a talking-machine device to be used in connection with the moving pictures. There is also a motor-generator set and several dimmers. The job is conduit work throughout. The firm has also been awarded the contract for the wiring of the Delmar Theater, at Delmar, Del. The company is just completing the wiring of the Easton Emergency Hospital, at Easton, Md. The feature of this work was the installation of the latest Holtzer-Cabot silent nurses' call system.

Great Increase in Cost of South African Electrical Supplies.

Electrical supplies used in the mining districts of South Africa have heretofore been obtained from the continental countries of Europe, chiefly Germany. The war having practically stopped all these shipments, the South African electrical needs are being supplied from England and America at greatly increased cost. The increases in price vary from 20 to 300 per cent for different classes of goods. Their quality, however, is greatly superior to that of the cheap supplies formerly imported.

The American consul at Santiago, Cuba, reports a constantly increasing demand for electrical apparatus and supplies in that city and throughout the interior of the island, particularly on sugar plantations, where many improvements are being made.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

Pacific Telephone & Telegraph Company. An investigation into the rates of the Pacific Telephone & Telegraph Company covering the entire state opened with the hearing held October 5. A complaint was filed with the Commission by the city and county of San Francisco, and subsequently the company asked the Commission to conduct an investigation and fix rates for its entire system within the state, alleging that it would not be fair to consider rates for one exchange separate from its system, which is state-wide.

Hollister Water Company. The Commission reaffirmed its former holding, that it has power to fix utility rates regardless of contracts and refused to grant the application of the town of Hollister for a rehearing of its complaint against the water company. The Commission recently ruled that Hollister must pay the water company $100 per month for fire service. The town contended that the franchise of 1875 granted to the company provided for the use of water for fire service free forever.

IDAHO.

Swan Creek Electric Company was authorized to enter territory served by the Utah Power & Light Company. The latter company entered an objection to the application and showed that it is furnishing adequate service in the territory in question, and that the revenue to be obtained is insufficient to sustain one company, much less to sustain the business of two companies. This statement of the situation is practically admitted by the Commission, but it gives more weight to the present difficulties of the applicant. The applicant, some time prior to the passage of the Utilities Act, made an expenditure of $3,000 in constructing a plant and system, intending to extend its service into the territory it now seeks to enter. The income from the field now served by applicant is insufficient to pay expenses, and unless it is permitted to make the extension into other territory, as desired, it will be compelled to abandon its operations entirely.

The Commission says: "We have no desire to impair in any way the investment of the existing utility, but it is a matter of the existence of the petitioner company, as the evidence shows clearly that unless petitioner is permitted to make its proposed extensions, it must cease operations, and this will deprive Fish Haven, Laketown and Garden City of the service they now enjoy, and which the testimony shows they are using very extensively. If the granting of the certificate herein applied for would deprive anyone of a service which he now enjoys, such as we believe would result from a denial of this application, we should not hesitate to deny this application, but we believe it to be our duty to view this application from the standpoint of all the parties in interest, and so viewing it, we are constrained to find that the certificate should be granted as prayed for."

NEW YORK—First District.

The Bronx Gas & Electric Company. By a vote of four to one, Commissioner William Hayward voting in the negative, the First District Commission granted the application of the Bronx Gas & Electric Company for authority to repay to its treasury $16,880.05, previously expended upon the improvement of its plant, and to withdraw this amount from the proceeds of the sale of $200,000 in bonds previously authorized by the Commission. As the company prior to 1909, when the Uniform System of Accounts prescribed by the Commission went into effect, had not kept its books in sufficient detail to afford definite information as to the cost of its property, the Commission made an appraisal, which fixed the reproduction cost, less depreciation, at $998,860.53. On the recommendation of Commissioner Robert C. Wood, who held the hearings on the application, this amount was fixed as the value of the company's plant on December 31, 1908. This total, however, included an allowance of $160,243.71 for overhead charges and incidentals. Commissioner Hayward objected to the extent of this allowance, and in a minority opinion argued for a smaller amount. The majority of the Commission adopted Commissioner Wood's recommendations as above.

Second District.

"Jitney Bus" Law. Supreme Court Justice Hasbrouck has filed an order upholding the "Jitney Bus" law in all its principal phases. Among the classes of vehicles which must secure the consent of the local authorities and a certificate of public convenience and necessity from the Commission, are those carrying passengers in competition with another common carrier, which is required by law to obtain the consent of the local authorities before beginning operation.

OREGON.

Pacific Telephone & Telegraph Company. After an investigation on its own motion, the Commission has issued an order prescribing rules and regulations pertaining to deposits, termination of contracts, advance payments and short-term contracts. The advance deposit of five dollars required by the company for flat-rate service is abolished, and this class of service may be obtained by the payment in advance for a period not to exceed that for which bills are regularly rendered (present practice, one month). The company may discontinue flat-rate service for failure to pay in the manner prescribed or for any other incidental telephone charges due from the customer, because of the installation of such service. In any case, service is not to be disconnected until fifteen days after written notice to the subscriber. A subscriber making application for metered or measured exchange service may, where prepayment collection devices are not used, establish his credit in the following manner: (1) Where he owns the premises to be served. (2) Makes a cash deposit. (3) Furnishes a guarantor for the payment of his bills. (4) Has paid all his bills to the telephone utility promptly during the twelve months prior to the effective date of the order.

In an applicant for metered or measured service makes a cash deposit to insure payment, the amount shall not exceed $2.50 for domestic or residence, metered or measured exchange service, and $5.00 for business or commercial metered or measured exchange service. The order also provides that the utility may apply the deposit in the case of metered or measured service, where the applicant fails to pay his bills, or so requests them to do.

PENNSYLVANIA.

Abington Electric Company. Upon the complaint of C. A. Lisk vs. the

Digitized by Google

Abington Electric Company, the Commission has held that a public service company has no right to adopt a policy of serving only such customers as are remunerative at the time of installation of facilities, providing the requests for service are reasonable.

WISCONSIN.

Grange Hall Farmers' Telephone Company. The order of the Commission, refusing to authorize the Grange Hall Farmers' Telephone Company to furnish service in competition with the Highland Telephone Company was abstracted in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, August 21, 1914, p. 379. To review the situation briefly, the Grange Hall Company had been granted a certificate by the Commission to build a certain line, but it subsequently appeared that no notice had been given the Highland Company of the proposed extension, although the latter company was furnishing service along the route in question. The Commission ordered the construction of the line suspended, pending a formal hearing of the matter. The line was, however, rushed to completion, and after a finding that the duplication of service was unnecessary and not in any way desirable, the Commission's order required the abandonment of the line.

The matter was again brought before the Commission by complaint of the Highland Company that this order has not been complied with.

The Commission finds, however, that the intruding company, acting as an entity distinct from the patrons of the line, has discontinued service, but that the patrons continue to use the equipment installed as a neighborhood convenience. These patrons again urged their desire to continue the service, under the belief that they could furnish service at $3.00 per subscriber per year after an initial cost of $390 for 5.5 miles of line. The Highland Company charges $12 per year for rural service over metallic lines. The Commission says: "It is unfair to attempt any comparison between the rate charged by a company furnishing telephone service upon a commercial basis, and including presumably a reasonable allowance for interest on capital invested and for depreciation of the property, and the minimum annual cash disbursement at which farmers can secure grounded line telephone service with an excessive number of subscribers on the line and with no allowance made for depreciation or interest or for the labor required to keep up the line. * * * Just what character of service would be considered adequate by these subscribers is not fully determined. It may be said generally that what constitutes adequate service seems to depend very materially upon who is furnishing the service. Where it is being furnished on a commercial basis patrons are seldom slow to point out the shortcomings of telephone service over cheaply constructed grounded lines with the number of subscribers on a line not properly limited. Where, however, the service is furnished on a cooperative basis, patrons will often accept a very much lower standard of service than they would be willing to accept from a commercial company. We assume in this case that by adequate service the witnesses mean not merely service which will remain acceptable while the experience of having a telephone in the house remains a novelty, but such service as is usually demanded by persons accustomed to having telephone service, and who are acquainted with the standards at which such service may be maintained." * * *

The Commission points out a number of omissions in the estimate of costs the parties have in mind, and quotes from a letter from an association which made a failure of a similar undertaking.

"It may be argued that the patrons to be served should be permitted to furnish themselves with as poor service as they care to put up with. But the Highland Telephone Company, it must be remembered, already had a line in this territory, apparently capable of furnishing good service and supposedly put there in response to a demand, either direct or indirect, for such a grade of service. It is, therefore, entitled to protection against the competition of a line built as an experiment, to give service to a minority.

"If there were not telephone service being furnished in the territory the projectors of a new line might well consider, as a matter of policy, whether they could afford to pay a telephone company a rate sufficient to meet all the expenses incurred in furnishing telephone service or whether it would be better to pay a telephone company for only such portion of the service as each individual would be incapable of furnishing for himself. After a company has been induced to enter into the territory to give service it is too late to consider this preliminary problem." * * *

The parties now using the service are given one month in which to make other arrangements for telephone service. "Unless all connection between this line and the telephone instruments on the premises of subscribers are discontinued within one month from the date of this decision, the matter will be certified to the Attorney General for prosecution."

Bridgeport Toll Bridge Company. The Commission made a valuation of the property of the bridge company in order to determine the reasonableness of the toll exacted for the various classes of traffic. It appears that the present owner purchased the bridge in a badly deteriorated condition, and the question arose as to whether or not a utility is entitled to a return upon the cost new of such property "for which the present owners could not have paid an amount approximating the Commission's present value, if reasonable business judgment were exercised."

The Commission says: "The statement that 'The primary basis of any calculation as to the value * * * must be the money *actually invested* by the owners cannot, it is believed, be interpreted to mean that when a man purchases a property, which, due to peculiar circumstances, is in a precarious situation, for an amount which is only about one-quarter its appraised value, that he shall be limited to a return upon only the money actually paid by him for the property and not upon a reasonable present or depreciated value.

"The figures of the tentative valuation, as compiled by the Commission, have been carefully analyzed and checked on a thoroughly balanced basis, and there seems to be no question that the fair value of the property is at least as great as its present physical value. Nor can the fact that the present owners paid but very little for the property when the same was purchased in any manner compel a lower valuation under the provisions of the law. All the property used and useful for the convenience of the public must be valued by the Commission. The law says nothing about deducting the value of property owned by the company, but which originally cost it little or nothing. This Commission has previously discussed this point in a number of decisions, excerpts from which follow:

"'For the purposes contemplated here, the Public Utilities law does not inquire into the manner in which property of utility corporations devoted to the public use was originally obtained, whether by purchase * * * or gift * * * The law simply compels the Commission to value this property and to consider this valuation in taking official action with respect to rates and service.' Tighe et al. vs. Clinton Tel. Co. 1908, 3 W. R. C. R. 117-126.

"'As the cost of reproduction of a plant usually plays perhaps the most important part in determining its value, it is more than likely that the owners would have to bear losses in case land and other property had depreciated instead of appreciated. It would seem only just that the rule should work both ways.'"

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 310.—Cleaning Commutators.—I would like to know of something which may be safely used around motors and dynamos for cleaning gummy commutators, etc. We have been using gasoline, but have had trouble from sparks from the brushes igniting the gasoline.—A. S. N., Plymouth, Mass.

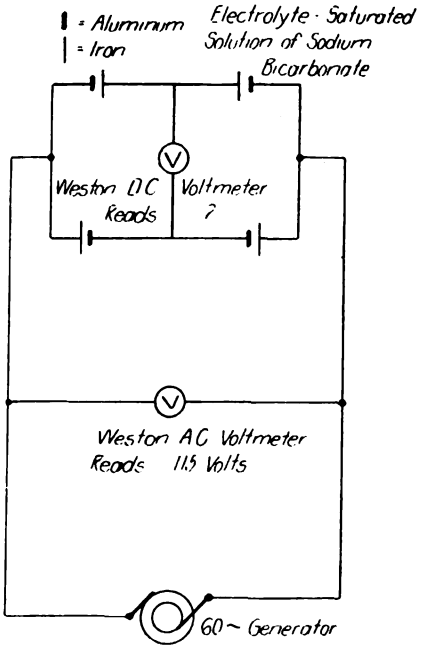
No. 311.—Simple Rate System.—Has any system of rates for residence customers of a central station ever been devised which, though based on actual or assumed maximum demand and including primary and secondary rates for, say. 30 hours' use of this demand, can be fully explained to any customer without using the words "30 hours' use," "demand," "maximum demand," or even "kilowatt-hours"? If such a simple system is as yet too ideal, what is the nearest approach thereto that has been attained?—W. H. T., Ann Arbor, Mich.

No. 312.—Connection of Bell-Ringing Transformer.—Recently I was called to correct some trouble in a door bell rung from a bell-ringing transformer. I found that the push-button was arranged to close the primary circuit of the transformer, the secondary being connected directly to the bell. The contacts of the push were burned from arcing, which did no further damage because it was in a non-combustible case. It was explained that this connection had been insisted on to save the small current that the transformer would take continuously. Is there any provision in electrical construction rules to prohibit this connection?—E. S., Atlanta, Ga.

Answers.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectified direct-current voltage be?—A. G., Fort Monroe, Va.

The actual values of voltage obtained will differ with the different means employed for obtaining them, namely whether a thermic, d'Arsonval or other type of instrument is used. The rectified voltage also depends to a certain extent upon the electrolyte, its composition and temperature, and the current flowing. Theoretically, a single cell, when measured with a direct-current voltmeter, which measures average values, will give a reading which is equal to the alternating-current voltmeter reading divided by 2.22, since the alternating-current instrument indicates the square-root-of-the-mean-square values. If alternating-current instruments be used in both the alternating-current and the rectified-current circuits


= Aluminum
= Iron
Electrolyte - Saturated Solution of Sodium Bicarbonate
Weston DC Voltmeter Reads ?
Weston AC Voltmeter Reads 115 Volts
60 ~ Generator

No. 304.—Nodon-Valve Voltages.

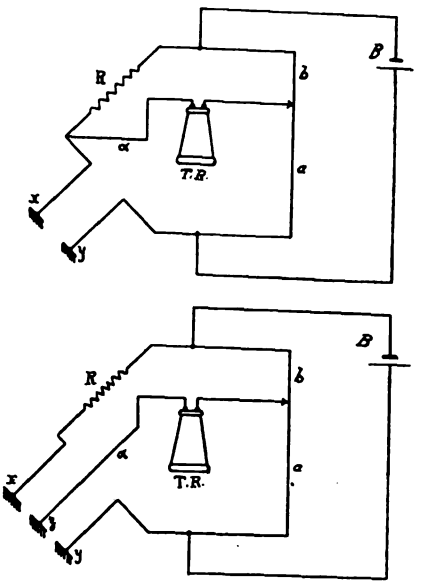
the voltage of the latter will be found to have a value equal to half that of the former or supply circuit. In practice the theoretical voltages do not exactly materialize because of leakage, capacity effects, as well as for reasons already given.

The arrangement of four valves or cells shown in the sketch is used in order that both half cycles of the alternating current may be utilized. With this arrangement each half cycle traverses two valves connected in series, and the two successive half cycles are rectified in one direction, adding their effects in the voltmeter circuit. With such an arrangement inductance is usually inserted in the alternating-current leads, as it assists regulation, reduces the pulsation of current and improves the wave form of the rectified current.

At the time of starting such an outfit as is shown in the sketch with an impressed voltage of 115 volts the rectified voltage may be as high as 96 with a new valve. It will soon drop, however, to probably 80 or 82 volts, where it will remain. The causes of the drop in voltage are, the resistance at the opening of the valves by the film upon the anode, resistance due to the film at the cathode, effects of static charge at the opening and closing, and because the composition of the anode is not uniform.

Querist states that he uses sodium bicarbonate as the electrolyte. Probably better results, longer life, less coating of the plates, etc., will result by using a neutral solution of ammonium phosphate. Use distilled water. Use the pure ammonium phosphate, not the double phosphate of ammonium and sodium; if the crystal phosphate neutral solution be used it will turn alkaline because of the ammonia gas evolved when the current passes through it.—K. R., Chicago, Ill.

No. 305.—Test of Ground Plates.—



No. 305.—Test of Ground Plates.

What is the best way to test the effectiveness of ground plates?—F. A. H., Chicago, Ill.

A widely used method for determining the resistance of a ground connection is to use Kohlrausch's bridge with a telephone. The method supposes that three grounds x, y and z are available. The values $x+y$, $x+z$ and $y+z$ are determined in succession to get the equations from which the values of the three resistances can be calculated. The connections for determining the value of $x+y$ are shown in the upper diagram. When silence is obtained in the telephone we have $b(x+y)=aR$, where a and b form together the contact wire along which a contact slides. In an analogous way the values $x+z$ and $y+z$ are found. However, this method has several inconveniences and may be replaced to advantage by the following method. The value $x+y$ is determined as described above, but then the connections are changed to those of the lower

Digitized by Google

diagram. All that need be done for this purpose is to change the connection of the telephone from the ground x to the third ground z. When silence is obtained in the telephone, it is $by=a(R+x)$; whence we have two equations for the two unknown values x and y. This method is, therefore, simpler and requires less calculation than the former method. It is also more accurate.

A recent article describng a series of tests on the proper construction of earth connections by the General Electric Company and the United States Bureau of Standards gives details of methods used and conclusions drawn, in the *General Electric Review* of September, 1915. Tests were made of various forms of grounding devices, such as plates, cones, rods and pipes of various sizes. The final conclusion reached was that pipes are the most desirable form owing to the fact that they can be readily driven to a depth sufficient to reach permanent moisture, while plates or cones require considerable excavation with resulting cost. No ground of any form is effective unless placed seven feet deep or more, which fact evidences the value of a deeply driven pipe. An earth connection having a resistance of 200 ohms is valueless in protecting transformer secondary mains in the event of a leak from the primary and even a lightning arrester connected to such a ground is of doubtful value. It was finally decided that a single three-fourths-inch galvanized pipe driven ten feet into the ground would meet the requirements, except at power houses or substations, at which points a number of such pipes in multiple are to be used. The first 250 such grounds which were installed showed an average resistance of 15.68 ohms as against an average resistance of 200 ohms (approximately) in a test of 100 grounds, in scattered locations and of various ages of other forms mentioned above.—P. B. W., Verbena, Ala.

No. 307.—Special Type of Induction Motor.—A new type of induction motor has been invented in which the bars of the squirrel-cage rotor are made of special composition possessing characteristics which automatically limit the starting current. Has this construction been applied to any large motors and is it effective in operation?—C. M. D., Gary, Ind.

Numerous schemes have been developed and patented to limit the starting current in squirrel-cage motors. Most of these arrangements make use of a material with a high temperature-coefficient for the rotor bars and end rings. At the moment of starting when the current is the greatest, the bars heat up very quickly and increase their resistance to such an extent as to limit the current to a certain predetermined value. As soon as the motor speeds up the current and therefore the temperature and resistance decreases until the motor has attained its normal speed. Materials with such high temperature-coefficient are, for instance, iron, iron alloys and certain of the bronzes.

None of these schemes, however, have, to the writer's knowledge, come into extensive use owing to the inherent bad mechanical properties of the materials used. The mechanical stresses to which the bars and end rings are subjected due to the wide ranges in temperature from start to running—up to 200 degrees centigrade—have invariably led to corrosion, frequent dismemberment of bars and rings and loosening of the bars in the slots, so that reliable working after a certain number of starts has been made becomes impossible. Further, the slip in motors of this kind is always considerable, as the metal used for the squirrel cage has already a high resistance compared with copper or bronze as used in a normal motor. This means, of course, a lower efficiency as obtainable with a normal motor.

To obviate these disadvantages other means have been devised. Several patents, for instance, refer to an arrangement of two squirrel-cage windings, one of high and the other of low resistance. The winding with the high resistance is always closed and, in starting, limits the current to a certain value. The other winding is open during starting; when the motor has nearly attained its full speed this winding is automatically short-circuited and offers thus a much lower resistance to the secondary path. The motor can therefore run with a slip like an ordinary motor approximately and has also a better efficiency than the motor with one winding only. But even these arrangements are not extensively used on account of their mechanical difficulties. The most reliable way is to use a phase-wound rotor with slip rings and starting resistances, the latter being cut out according to the starting current drooping down; the regulation is effected either by hand or automatically.—H. A., Pittsburgh, Pa.

No. 308.—Aluminum Solder.—Can aluminum wire be soldered and what is the best way for doing it, if it can be done?—S. H. L., Joliet, Ill.

The difficulty in soldering aluminum is to get a flux which will dissolve the skin of aluminum oxide, always to be found on aluminum wire which has been exposed to the air, and which will not affect the aluminum underneath, and then to get an alloy which will solder. The metallurgical magazines are full of recipes for such compounds, but I have not seen one yet that works reliably. Welding with the oxy-acetylene flame is used on aluminum sheets in aluminum-ware factories, while wires are usually joined by electro-percussive welding. This was the subject of a paper by C. E. Skinner and L. W. Chubb, presented at the twenty-sixth general meeting of the American Electrochemical Society at Niagara Falls, October 12, 1914, and is briefly described as being a process in which two wires are held together by mechanical force, while a condenser discharge is passed between the ends. The heat generated is so localized, so sudden and so intense that there is no time for heat conduction through the shanks of the wire, and the ends will be melted and vaporized whether the melting point be high or low. For this reason metals of different kinds can be welded together independently of their electrical resistance, melting point or heat conductance. While all combinations which have been tried are weldable the joints in such pairs as aluminum and tin, and lead and iron are not permanent. On the other hand, certain alloys near both ends of the copper-aluminum series are brittle, while the electro-percussive weld of copper to aluminum is ductile. This joint is of great importance, as copper lead wires can thus be attached to aluminum coils. The original paper should be referred for further information.—D. M. L., Elizabeth, N. J.

Aluminum can be readily electrically welded, and, by proper treatment, electroplated. But some difficulty has heretofore been attached to soldering this metal. The high heat conductivity of the aluminum withdraws the heat ordinarily of the molten solder so rapidly that it "freezes" before it can flow sufficiently. A German solder (probably market-short at present) said to give good results, is made of 80 per cent tin to 20 per cent zinc, using a flux composed of 80 parts stearic acid, 10 parts chloride of zinc, and 10 parts chloride of tin. Pure tin, fusing at 250 degrees centigrade, has also been used as a solder. The use of chloride of silver as a flux has been patented, and used with ordinary soft solder has given some success. A pure nickel soldering bit should be used, as it does not discolor aluminum, as do copper bits. The Aluminum Company of America recommends the following practice: Aluminum can be readily tinned for soldering, say, into a switch or busbar terminal, by anyone with but little experience. First, it is necessary to keep the end of the cable hot, because of the high heat conductivity mentioned above; secondly, one must mechanically work the tin through the oxide coating on the surface of the aluminum. The first condition is provided for by using a blow torch, in the flame of which the cable is kept off and on, after the preliminary heating during the tinning process, or by pouring the tin, from a pot of melted tin, over the cable with a hand ladle. The second requirement is kept by working the tin onto the aluminum with a piece of wire, a file or a fine scratch brush.

Digitized by Google

The last is the easiest and best method, and it has been found that a jeweler's scratch brush is the most satisfactory. Cables of more than two layers of strands should have each succeeding layer cut back one-half inch to expose the ends of the strands of the layer it covers, and the ends of all strands should be tinned. For tin Richards' solder is the best, though pure block tin or the ordinary half-and-half solder can be used.—P. B. W., Verbena, Ala.

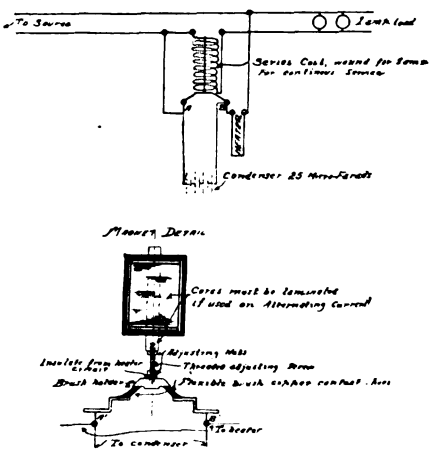
Aluminum can be soldered so that the joint will have good electrical conductivity and be mechanically strong, providing certain precautions are taken, and kept in mind at all times. The fundamental requirement is that the joint be kept hot. While copper and solder alloy at a temperature of about 240 degrees centrigrade, the alloying temperature of aluminum and solder is about 360 degrees centrigrade and the difficulty of reaching and maintaining this temperature is due to the high heat conductivity of aluminum permitting the flow of heat away from the joint. The use of a blow torch is almost always necessary for heating, and it usually proves quite satisfactory. A further difficulty in soldering aluminum is that, as with other metals, a film of oxide forms on the surface of the heated metal when it is exposed to the atmosphere. This film of oxide must be removed, otherwise the solder cannot make intimate and actual contact with the aluminum. With other metals this removal is accomplished by means of salts and fluxes, but no flux has as yet been discovered that is entirely satisfactory with aluminum, so resort is had to mechanically scraping the surface while maintaining a high temperature. The best way to clean the surface is to scrape with a hard brass scratch brush at the same time following with solder and scratching it in, as it were. This must be kept up until the whole surface is well "tinned." The solder should preferably be about 0.5 by 0.5 inch square, this size having been found in practice to be the most convenient for holding the heat and covering a wide surface at the same time.

The choice of solder plays quite a large part in soldering aluminum successfully. A solder having a high percentage of tin and zinc has been found the most suitable, although the ordinary half-and-half can be used, if no other is available. A solder composed of 30 per cent pure zinc, 35 per cent pure tin and 35 per cent phosphor-tin makes a good solder.

To obtain good results, and they may be obtained, remember to keep the joint really hot, tin thoroughly, and use the proper kind of solder.—K. R. Chicago, Ill.

Soldering aluminum and its alloys was for some time a difficulty, but the Alliance Aluminum Company now supplies a solder which works perfectly if the instructions furnished with it are followed. As it is often necessary to solder while repairing or erecting, this method makes it ideal for the workman. Aluminum can also be welded electrically; this makes a good joint, but as it is not as convenient as soldering, especially when out on repair jobs, the soldering method as supplied above will undoubtedly solve the problem.—W. T. E., Ansonia, Conn.

No. 309.—Automatic Cutout.—It is desired to keep an electric water heater taking 550 watts in circuit as continuously as possible. A few other devices and lamps are also on this circuit, but are turned on for short intervals only. Is it possible to devise some automatic means for temporarily cutting out the heater while the other load exceeds one ampere? The device must reconnect the heater as soon as the other load is cut off or reduced to less than one ampere.—V. B., Milwaukee, Wis.



No. 309.—Automatic Cutout.

The automatic making and breaking of that part of the circuit supplying the heater, which is to be accomplished independently of the other portion, can be best attained by means of a series magnet arranged and connected as in the accompanying diagram. The magnet should be wound to actuate on one ampere; specifications should state that this is to be in circuit continuously in order that undue heating of same may not occur, with consequent loss of energy. A circuit in parallel with the winding should be established after the plunger has reached the "up" position. This circuit should be of such resistance as to cut down the current in the magnet without sufficiently weakening same to allow plunger to drop.

If the supply is alternating current, it will be necessary to build the cores of laminated iron, otherwise local or eddy currents will be formed. In any case the plunger should be insulated from the local heater circuit. Means of regulating the break distance are obtained by the adjustment of the nuts on the threaded stud tapped in the plunger core, and insulating washer on the brush holder, as shown. The contacts, consisting of flexible leaves of copper, cause a brushing or wiping action on the studs, thereby tending to keep them clean.

If the voltage employed is relatively high, as 600 volts direct current, there will be a tendency to arc on the breaking of the 550-watt heater circuit. This can be reduced to a negligible quantity by inserting a small condenser of not greater capacity than 25 microfarads, across the points *A B*, as shown.

The writer has several magnets of this character operating on 125 and 250-volt direct-current circuits. In the latter case conditions are such that the auxiliary circuit, corresponding to the heater circuit, has to make and break over periods of considerable length, as often as several times each second. No condensers are used and arcing is not experienced by virtue of the brushing contact used.—M. K., Passaic, N. J.

Westinghouse Company Establishes Savings Fund for Employees.

In order to encourage the spirit of thrift among its employees the Westinghouse Electric & Manufacturing Company has just established a savings fund which offers facilities to the employees for the handling of their savings accounts. This fund is open to any employee of the company wherever he may be located, and he may become a depositor at any time and discontinue at any time. The amount of the deposit cannot be less than 10 cents and may be any multiple thereof and the deposits must be made from each regular pay. The deposit, however, is limited to one account, the amount of which in any one year cannot exceed $500. The idea of this is that the plan is intended as a method of encouraging the employee to save his earnings and when he has been successful up to this point, allow him to handle his own finances.

Interest is paid on the deposit at the rate of four and one-half per cent and is credited semi-annually. An interesting feature of the fund is that the Westinghouse Electric & Manufacturing Company acts as a trustee and guarantees the deposits and interest.

The rules provide that an amount of $100 or less may be withdrawn without notice, but an interval of two weeks must elapse before subsequent withdrawal can be made, and for withdrawals more than $100, notice of one week must be given.

An auditing committee not to exceed seven persons is to be elected by the depositors from among their own number.

Digitized by Google

ELECTRICAL PAPERS AT MANCHESTER MEETING OF BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

By Our Special Correspondent.

The eighty-fifth annual meeting of the British Association for the Advancement of Science held in Manchester, England, from September 7 to 11, was shorn of many of its usually attractive influences and features owing to the war, and an attendance of 1,400, as compared with 2,600 at the Birmingham meeting two years ago, is therefore to be regarded as quite as large a number as could be expected under the circumstances.

The proceedings of those sections of the Association which were able to deal specially with subjects and problems created by the war—economical, educational and agricultural—naturally have attracted most notice, but papers read in the other sections have been quite up to the average in the importance of the subjects dealt with. The program of the papers presented for discussion in Section G, Engineering, is given below, and of these the papers marked with an asterisk have been abstracted in the accompanying report:

*Presidential Address, by H. S. Hele-Shaw.

"Experimental Investigations of the Thermal Efficiency of a Gas Engine," by G. Asakawa and J. E. Petavel.

Report of Committee on Gaseous Explosions.

"The Apparent Specific Heats in Gaseous Explosions," by W. M. Thornton.

"The Work of the Mechanical Engineer Department of the Municipal School of Technology, Manchester," by A. B. Field.

"A Machine for Determining Fatigue Limits Calorimetrically," by C. E. Stromeyer.

"The Manchester Drainage Scheme," by de Courcey Meade.

*"The Manchester Electrical Undertaking and the Projected Barton Station," by S. L. Pearce.

"Recent Work in the Manchester Gas Department," J. G. Newbigging.

"A Unit Gas Producer for Steam Boilers," by E. C. Mills.

*"The Heating of Iron when Magnetized at Very High Frequencies," by N. W. McLaughlin.

*"A Self-Adjusting Commutating Device," by Miles Walker.

"Electric Oscillations in Coupled Circuits—A Class of Particular Cases," by W. Eccles and A. J. Makower.

*"The Capacity of Aerials of the Umbrella Type," by G. W. O. Howe.

*"A Note on Earth Resistance," by E. W. Marchant.

*"Transformer Core Loss," by H. M. Lacey and C. H. Stubbings.

*"Exposure Tests on Some Metals and Alloys," by Ernest Wilson.

"Recent Improvements in the Traction of Vehicles," by T. H. Brigg.

Report of Committee on Complex Stress Distribution.

"The Strength of Iron, Steel, and Cast-Iron Struts," by Andrew Robertson.

"The Calculation of Torsion Stresses in Framed Structures and Thin-Walled Prisms," by Cyril Batho.

"Some Experiments to Determine Whether There Exists Mutual Induction Between Masses," by Miles Walker.

"An Investigation of the Thermal Conductivity of Thin Air Films Enclosed Between Parallel Metal Plates," by A. A. Griffith.

Presidential Address.

The presidential address of Dr. Hele-Shaw, delivered on September 8, discussed the position created by the war in the engineering industries, and the following extracts from his address show that his remarks were as applicable to the United States as to the English conditions. After quoting from a manifesto by German professors as to the part Germany expected to play in the world of industry after the war, Dr. Hele-Shaw went on to say:

"It does not, however, want such published evidence to convince any practical person of the folly of thinking that a keen and virile nation having more than 100 million inhabitants is going to be crushed out of fierce and vengeful competition, whatever the end of the war may be. We shall better appreciate what this competition will mean if we consider the marvellous progress made by Germany during the last half-century in the arts and manufactures.

"Now, when we look closely into the causes of Germany's great advance, we can learn lessons which we have been culpably slow to take to heart. Although there are other causes, first and foremost, and overshadowing all others, is the determined and whole-hearted organization of German industry.

"Germany's power in war is admitted to be her mechanical organization, and the organization of every material and engineering force to that end. Just as striking, if not more so, is her organization for the arts of peace, and I lately heard a very shrewd man of affairs express his amazement at Germany's entrance into war, when by peacefully pursuing the way she was going she would have dominated the world commercially in a few years' time, and, in the words of the speaker, might in many manufactures have made us practically bankrupt. It is undoubtedly in the matter of scientific organization, even more than the organization science, that Germany has achieved such wonderful results, and it is, therefore, in this direction that we must leave no stone unturned, if we wish to have any chance of holding our own in the future."

Dr. Shaw then indicated the directions in which he considered useful work might be done at the present time, in preparing for the era of keen industrial competition, which will follow the conclusion of war. The proposals were discussed under the following heads: Education, research, standardization and the metric and decimal system of measurements, exhibition and museums, organization.

Proposed Manchester Generating Station.

On September 9, S. L. Pearce, the chief engineer of the Manchester Electrical Undertaking, read a paper on the development of the supply in that industrial center, and describing the proposed new generating station on Barton Moss, about five miles from the center of the city. The ultimate capacity of this new station will be 160,000 kilowatts and the first section of the plant will be of 30,000 kilowatts. It is proposed to erect it in four sections, each of which will contain two complete steam-raising, electrical generating and auxiliary plants, thus providing eight complete plants in the station. This allows of one spare plant, one set aside for repairs, and six plants in commission. As proposed, the first four generating units will be turbine sets of 15,000 kilowatts each, and the remaining four, similar sets of 25,000 kilowatts each.

The arrangement includes four boiler houses, each with two batteries of water-tube boilers facing onto a central firing floor, i. e., one battery of boilers for each turbine set, and four large coal storage bins practically forming extensions of the boiler houses, but separated from the latter by a canal dock for the reception of water-borne coal. Preliminary estimates show that 500,000 tons of coal per annum will be required by the complete plant, and the canal can handle at least 1,000 tons a day, while over the Trafford Park railways 300 tons of coal an hour can be handled, sidings being provided for its reception. The coal bins will hold a two-months' supply of fuel; each bin will be equipped with two endless-bucket-type conveyors into which rail-borne coal can be fed through hoppers below track level, situated at one end of the bin, while water-borne coal received on the dock will be fed into hoppers at the other end. For this

Digitized by Google

purpose the dock between the boiler house and bins, which will be roofed in, will be provided with a traveling crane with a bucket or grab for removing coal from the barges. Each bin conveyor will run across the dock and empty into an elevated coal hopper at the end of the adjacent boiler house, returning through a tunnel under the dock and bins. The elevated coal hopper in turn will feed two endless bucket conveyors situated (both lead and return) over the bunkers in the adjacent boiler house, which are designed to carry 36 hours' fuel supply. The suction system is proposed for the removal of the ashes and soot, the pipe systems leading to receivers on the canal-dock side, which will discharge into barges, and to other receivers at the end of the coal bins, which discharge into railway trucks, soot and ashes being kept separate.

For the first section of the station there will be installed eight water-tube boilers, each with a normal rating of 50,000 pounds steam per hour and a maximum rating of 60,000 pounds and complete with its own superheater, economizer, induced-draft plant and chimney—the Prat system being proposed in regard to the latter. The first section of the generating plant will consist of two 15,000-kilowatt turbo-alternators generating, with a speed of 1,500 revolutions per minute, three-phase current at 6,600 volts, 50 cycles, and developing their normal output at 0.85 power-factor.

Steam consumptions in the neighborhood of 11 pounds of steam per kilowatt-hour at full load are anticipated, or its equivalent, viz., 7.5 pounds of steam per indicated-horsepower-hour. Cool air for ventilating the generators will be drawn in from outside the building, and passed through air filters on the way to the machines. The bulk of the steam and water pipework, whilst being kept under floors, which will add to the general appearance of the station, is nevertheless readily accessible. Considerable attention has been given to the question of the various levels so as to facilitate ease of operation.

An unusual feature of the design, at any rate in the United Kingdom, is the pump hall. Herein will be installed two steam driven and one electrically driven boiler-feed pumps, each with a rated capacity of 25,000 gallons per minute, for each complete boiler house. The upper part of the bay will contain hot-well and reserve feed-water tanks. Beneath the floor of the pump hall the main steam header, the condensing-water culverts, and the weigh bridges for testing the steam consumption of the turbines will be accommodated. In addition, from the floor of this hall the various sectional valves controlling the steam and water supplies will be operated.

Another feature of the station will be a very complete installation of indicating and recording instruments, such as are necessary to record steam and water pressures and temperatures, temperatures of electrical generators, transformers, oil switches, etc., temperatures of stored coal, and temperatures of inlet and outlet cooling air. Electrical output being largely a question of permissible temperature rise, considerable importance is attached to the installation of the above.

The station drawings show four circulating-water inlet culverts below basement level, and adjacent to them four corresponding outlet culverts. These will be connected to the Davyhulme sewage works. It is proposed to erect a pumping station here, equipped with electrically driven high-lift pumps, together with a local substation for controlling the general supply to the sewage works. The purified effluent at these works will be drawn from a large storage reservoir, which will also fulfill the function of a settling-tank, and from which the effluent will be pumped up to the generating station, where it will pass through a specially designed valve chamber before entering the condensers. The discharge to the sewage works for final treatment will take place at a substantially higher level than the intake and, owing to this increased head, the capacity of the sewage works can be greatly increased. Moreover, the discharge effluent will gain some 15 degrees temperature in passing through the condensers, which will result in important economies in the subsequent purification processes.

The main cables from the generators will run direct to their step-up transformers, two three-phase 7,500-kilowatt sets in parallel, for raising the transmission pressure to 33,000 volts. These transformers and the necessary high-tension switch gear will be housed in a separate fireproof switch house, the switchgear, of the oil-immersed and the remote-control type, will be operated from a control gallery communicating with the engine room.

The estimated capital outlay is $53 per kilowatt, but this includes the cost of 1,400 yards of culverts to obtain water for condenser purposes. The estimated operating cost, with coal at $2.16 per ton, is 0.45 cent per unit, inclusive of interest on capital.

September 10 was devoted to the reading and discussion of numerous papers of more theoretical interest to electrical engineers and short abstracts of these are presented below.

Heating of Iron When Magnetized at High Frequencies.

This paper by N. W. McLachlan described experiments illustrating the heat produced when iron is magnetized by very high-frequency alternating currents. The magnetizing current is obtained by using a Poulsen-arc generator connected across the town mains (240 volts). In order to demonstrate the extent of the losses, a magnetic heater or boiler, consisting of a solenoid wound on a glass tube containing water, and a number of iron strips or wires, is inserted in the shunt circuit of the generator. A short time after the shunt circuit is closed, the water begins to boil.

An experiment was also arranged to show the variation in permeability of iron with variation in temperature. A ring of Lohys (mild) steel is insulated with asbestos, and is wound with a number of turns of copper wire. This is connected in the shunt circuit of the generator. By passing a large current through the winding of the ring, thereby obtaining a strong magnetizing force, the magnetization losses are such that a rapid rise in temperature is produced, causing the iron to attain a bright red heat. The variation in permeability corresponding to the rise in temperature may be followed by observing the current in the shunt circuit and the voltage across the terminals of the ring. Data, including the watts lost per kilogram, are given which enable the changes to be followed.

Capacity of Aerials of the Umbrella Type.

In a paper read before the British Association at Sydney last year, Professor Howe developed a method of calculating the capacity of radiotelegraphic antennas. In addition to describing the method in general, curves and formulas were given so that the capacity of aerials of standard types could be determined in a few minutes. The umbrella type, however, was not specially considered, and it has since been suggested to the author that the usefulness of the paper would be considerably increased if curves and formulas could be given for aerials of this type. The method is briefly as follows: The whole aerial is assumed to have a uniformly distributed charge, and the average potential of the whole aerial, under this fictitious condition, is then calculated. It is assumed that if the total charge, while remaining unchanged in quantity, be allowed to have its own natural distribution, it will assume a uniform potential approximately equal to this fictitious average potential. The proximity of the earth is taken into account by the method of images. Tables and curves are given for aerials with from two to six ribs, and for various angles between the ribs and the vertical. With these curves, and those given in the

Digitized by Google

original paper, each of the nine component potentials of any given aerial of the umbrella type can be read off and the resultant average potential determined. The method is then applied to two practical examples, one a simple aerial with six single-wire ribs, and the other a more complicated case in which each of the five ribs consists of a four-wire cage, the size of the wire being different from that used for the central vertical wire.

Tests on actual aerials have shown that the values of the capacity as calculated by the author's method, agree with the measured values, within the errors of observation and of estimation, as to the allowance to be made for connecting wires, etc.

Earth Resistance.

This paper by Professor Marchant described a new method of expressing the effectiveness of earthing arrangements, such as are employed for lightning conductors, radiotelegraphic stations, and in connection with many electric power distributing systems. The method consists in determining the length of the column of earthly material which, with a cross-section equal to the surface of the earth plates, would have the same resistance as the actual "earth" or "ground." For a hemisphere imbedded with its flat surface level with the surface of the ground, this "equivalent length of earth" is easily seen to be equal to the radius of the hemisphere. Some tests were described, made by the author at Liverpool on three earths or grounds of different types, one being the water-pipe system of the building.

Transformer Core Loss as Affected by Triple Harmonics.

This paper by H. M. Lacey and C. H. Stubbings described experiments conducted in the Siemens Electrical Engineering Laboratory, King's College, London. The object of these experiments was to investigate the effect of triple harmonics upon the core losses in transformers. An alternator giving approximately a sine wave was three-phase star-connected to a three-phase choke coil. The star centers were also connected through a switch. Current-measuring resistances were inserted in the neutral and one of the outer leads. Voltmeters and ammeters were also inserted as required.

Two experiments were made, (1) with the switch in the neutral wire open, and (2) with the switch in the neutral wire closed. In each case the wave-forms of phase amperes, phase volts, and in the second case amperes in the neutral wire, were taken by means of a Kelvin quadrant electrometer and a contact-maker. It was found upon analyzing the various wave-forms that in the first case there was a 48.9-per-cent triple harmonic in the volt curve, but practically none in the current curve. In the second case, there was practically no triple harmonic in the volt curve, but 48.2 per cent in the current curve; also the wave of current in the neutral wire was very nearly a sine wave of triple frequency and having an amplitude of approximately three times that of the triple harmonic in the current curve. This shows that the existence of a neutral connection enables a triple harmonic to exist in the current curve, and also that the suppression of this harmonic from the current curve forces it into the volt curve. Using these curves, the indication curves for the two cases were drawn, and from these the hysteresis loops (including eddy-current losses) were obtained. The areas of the two loops were measured, and the ratio of the areas of case 1 to case 2 was found to be 0.775, thus showing that by insulating the star centers, a saving of 22.5 per cent in the core loss is obtained, the voltages being equal.

The watts supplied in the first case were 24.3 per cent less than in the second case, the average watts being found from the curves. The results of these experiments indicate that from the point of view of core losses the star centers in three-phase systems should be insulated.

Exposure Tests of Light Aluminum Alloys.

The physical properties of certain light aluminum alloys have formed the subject of reports during the last 14 years. In order to investigate the influence of exposure to London atmosphere, Professor Wilson placed a specimen of each alloy on the roof of King's College, London. All the specimens were in the form of wire 0.126 inch in diameter.

Commercial Aluminum.—A specimen has steadily increased its electrical resistance to 17.2 per cent in 13 years.

Copper-Aluminum.—It has already been pointed out that the electrical resistance of the copper series, in a given time, increases with the percentage of copper. One specimen containing 2.61 per cent of copper had so far corroded in 1911 that it broke quite easily. Another specimen containing 1.86 per cent of copper has now so far corroded, as to become practically useless as an electrical conductor. The tests emphasize the opinion already expressed that alloying commercial aluminum with copper, except in small quantity, is not to be recommended.

Copper-Manganese-Aluminum.—Three alloys containing from 0.02 to 0.09 per cent copper and 0.05 to 1.78 per cent manganese have steadily increased their electrical resistance to about 10 per cent in 14 years. The specimen with the highest percentage has a breaking load of 35,000 pounds and is apparently in good condition.

Copper-Nickel-Aluminum.—A specimen containing 1.08 per cent copper and 1.29 per cent nickel has somewhat diminished its electrical resistance, the percentage being now 12.4 as against 19.4 in 1908. Its breaking load was 45,900 pounds before exposure.

Copper-Zinc-Nickel-Aluminum.—One specimen containing 0.11 copper, 1.77 zinc, 2.01 nickel has changed its electrical resistance as shown by the following figures:

Year	1901	1903	1904	1908	1911	1913	1915
Resistance	962	995	1,013	1,285	1,125	1,102	1,102

Copper-Manganese-Magnesium-Aluminum.—The alloy known as "Duralamin" is stated to contain about 0.5 per cent magnesium, 3.5 to 5.5 per cent copper, and 0.5 to 0.8 per cent manganese. A breaking load as high as 90,000 pounds can be obtained, according to treatment. The specimen exposed has steadily increased its resistance to 9.6 per cent in four years. It is, however, so brittle, that a small loop cannot be bent without fracture.

The author was unfortunately unable to report on the copper specimen, as it had been stolen from the roof.

Self-Adjusting Commutating Device.

It is well known that a direct-current generator fitted with commutating poles (sometimes called interpoles) will not commutate very heavy overloads, owing to the magnetic saturation which occurs in the iron of the interpole. When the excitation becomes very great the saturation of the iron interferes with the proportionality that should exist between the current to be commutated and the commutating flux.

The paper by Professor Walker describes a device tried at the Manchester School of Technology which automatically produces the right amount of commutating flux over very wide ranges of load. So effective is the correcting influence, even where the diverter in parallel with the commutating-pole winding is deliberately put out of adjustment that, whether it be short-circuited or given a resistance equal to five times the proper resistance, the flux will be preserved at approximately the correct value.

A 500-kilowatt 500-volt rotary converter, built by the British Westinghouse Company was fitted with the double-brush gear, and it was found that with 3,000 amperes flowing the commutation was sparkless. The device is being at present installed on a 1,500-kilowatt rotary converter, on which the commutating conditions would otherwise be rather difficult.

Cadmium-Vapor Arc Lamp.

At one of the other Section meetings H. J. S. Sand exhibited a cadmium-vapor arc lamp, the use of which he

Digitized by Google

recommended for polarimetric and other purposes. It is comparable in general principle with the mercury-vapor lamp. The lamp is constructed of quartz glass and the cadmium is freed from oxide and dissolved gas by a process of filtration while at the pump. It is hindered from adhering to the glass by the presence of a small amount of a loose powder (zirconia) in the lamp. The metal is melted by external heating before starting, and maintains itself in the molten condition by the heat of the current. Once started, said Dr. Sand, the lamp may be kept burning for an indefinite time.

Gas-Fired Boilers.

E. C. Mills discussed the several classes of gas-fired boilers and dealt more particularly with the features of the Mills furnace which comes in the class of unit bituminous gas producers delivering gases hot and unpurified direct to the boiler. He detailed the action and control of the induced draft, giving the separate air supplies for gas production and its combustion; the cellular construction of the roof and walls by which air for combustion is heated by the otherwise lost radiant heat of the producer; the special design of fire-brick gas-and-air-mixing device and burner; and other features. The results of tests on a Cornish boiler, worked on an ordinary internal fire and with the Mills producer, with the same fuel in each case, and tested by the same expert, showed a saving of about 50 per cent and there was no smoke. Tests on a Lancashire boiler with the Mills producer gave high efficiencies and standardized evaporations ranging from 10.23 to 11.47 pounds of steam from one pound of coal, and on a comparison with another boiler fired with the same fuel but with the ordinary internal fire, the tests showed a saving of about 18 per cent in evaporation, and an entire absence of smoke.

Radiotelegraphic Investigations.

An important report on radiotelegraphic investigations was submitted by the Special Committee, which, with Sir Oliver Lodge as chairman and Dr. W. H. Eccles as secretary, had been considering the subject. The effect of the war upon the investigations was naturally to place a handicap upon the efforts of the committee and those who in different parts of the world were furnishing statistical and other information. Early in August, 1914, private wireless telegraph stations throughout the British empire nearly all stopped collecting statistics, while naval and other government stations stopped all merely scientific observing The radiotelegraphic stations in Russia, Germany and neighboring countries doubtless discontinued the filling up of the committee's forms as soon as mobilization began. A few stations in India, Australia, Canada, the West Indies and the United States are, however, still at work. In the United States about thirty stations are making observations. The program of the committee for collecting statistics three days a week in all parts of the English-speaking world, and some other countries, was intended to embrace one complete round of the seasons, but the scientific value of this work is diminished by the fact of the interruption occurring after only three months. The conclusions drawn will yield information, which will guide the committee when it is able to further attack the problems concerned.

In its analysis of the records of strays the committee first referred to diurnal variations. The principal and most universal fact is that the strays heard in the dark hours are much more numerous and louder than those heard during daylight. If curves be drawn showing the amount of disturbance to telegraphic work from hour to hour, two of the curves stand out; one in which the changes from day to night and night to day conditions are somewhat abrupt, and another in which the changes are much more gradual. The former curves might be called "trough-shaped," the latter "U-shaped." The former type is met with at sea and on islands at a considerable distance from the mainland; the other on the mainland, especially in the tropics. The lowest point of the U, or of the trough usually falls a little after midday, and the highest point of the convex part of the curve occurs a little after midnight in nearly all stations north of the equator. The only exception to this rule is found in some records from Lagos, Nigeria, where the curve showing the intensity of disturbance is lowest about 7 a. m., and rises during the daylight hours. Unless local weather conditions are producing great disturbance, the change from night to day conditions and vice versa in stations north of the equator, lags behind sunrise and sunset. At some stations south of the equator, for example, Cocos Island, the opposite rule seems to be usual. These regular and universal diurnal variations have an average magnitude which is represented on the arbitrary scale used in the forms by figures like 2 in the day, and 5 at night, in tropical latitudes, or 0.3 in the day, and 3 at night, in temperate latitudes.

Occasionally the radiotelegraphic work at a station is rendered almost or quite impossible for a period, by strays of vigor and number greatly exceeding the average. These occurrences are for brevity called "X storms," the term X being an alternative designation for "stray" or "atmosphere." When an X storm happens in the day and lasts more than an hour or two it may completely alter the character of the curve of that day's disturbances, and even make the day portion of the curve higher than the night portion. An analysis of the records has shown that X storms occur within the same two or three days over very wide areas. A comparison of European, American and Canadian records has shown very plainly that periods of severe strays coincide with periods of low barometer, high wind velocity, rapid change of temperature, great rainfall and especially rapid barometer fluctuations. The worst X storm in the American records was also accompanied by the exceptionally rapid movement eastward from the Pacific of a cyclonic depression with steep pressure gradients. A report from a California station of the American Marconi Company, on this latter occasion, states that the barometer was fluctuating between 29.44 and 29.52 inches very rapidly, the variation being accompanied by gusts of wind, which attained the velocity of 70 miles per hour. The disturbance produced in the telephones by the strays amounted to a roar. Meteorological and other records lead to the conclusion that X storms are often associated with thunderstorms at places not very far distant. Sometimes all the symptoms of thunder weather, except thunder and lightning, may be present in a locality and a heavy X storm be recorded. A report received from the wireless telegraph station of the Australian government, situated at Esperance, states that during the daytime rain is preceded in at least 80 per cent of cases by intermittent disturbance. Strays of varying strengths may be heard from 6 a. m. to sunset for one or more consecutive days prior to rain. There is evidence that northwest winds on the British Atlantic coasts, especially in winter, are associated with strong strays at Irish stations and at sea. The atmospheric convection produced by land may be sufficient to account for this. R. Ricci, of the Marconi Company, reports that on two trips round the world he made especially careful daily observations, and he states that in midocean strays are, as a rule, very few and feeble, both in the day and in the night, but that when the edge of a mountainous continent is approached strong and even continuous strays are normal. In this something must depend on the direction of the prevailing wind relative to the land.

Considered as a whole, the statistics before the committee show that there appear to be two kinds of X storm occurring in the daytime: (1) Those

Digitized by Google

produced by convective conditions in the atmosphere within perhaps 100 miles of the station which may be termed local X storms. (2) Those originating at a distance. Regarding the first class, they may occur almost simultaneously over a whole continent, but this is only because convective conditions happen to be ruling all over that area. Stations not too far outside the boundary of such a region also receive many strays, but apparently their distance must be limited to within 200 miles of the disturbed regions. In general, it may be concluded that the observation of strays in the daytime constitutes a method of feeling the fringe of a region of convective weather, and so anticipating thunder and rain a day or two in advance. This ability to prophesy the advent of thunder weather is as old as wireless telegraphy itself, but hitherto it has been thought that the electric discharges at a great distance were responsible for the strays heard at the station attempting to prophesy. The present analysis indicates rather that at any rate in the daytime the strays are frequently due to very local discharges, often too weak to give noticeable lightning or thunder, but definitely indicative of an approaching period of instability in the atmosphere. The second kind of X storm is not of strictly local origin, but is sometimes traceable in the stray observations made hourly at the Malta station of the Eastern Telegraph Company and the Sierra Leone station of the African Direct Telegraph Company. There is evidence that on certain occasions the same cause is affecting both stations, though they are separated by 2,500 miles, mostly across mountain and desert. As regards disturbances observed at nighttime, these are also frequently very local and due to convective weather, but there is probably a greater proportion of non-local storms than appears in the day records. Australian stations report that the worst and most continuous type of disturbance (apart from local thunderstorms) occurs on calm nights, when the sky is blue and starry. Lieut. E. R. Macpherson reports from Sierra Leone that a very dry wind, which blows periodically for several days on the west coast of Africa, causes an almost complete cessation of strays immediately it starts, and allows of their resumption immediately it stops. On the other hand, the monsoon period on the same coast is one marked by great X storms.

Many observers have made for the committee precise observations of individual strays, by making, on lines graduated to represent time, marks corresponding to each stray as heard in the telephones, the zero of time being fixed by aid of radiotelegraphic time signals within range of the observer. Comparison of the records made in the British Isles has shown that on an average night many of the storm strays are heard by all the observers, and on days free from X storms the same remark applies. Coincidences have also been noticed between pairs of American stations not too widely separated. The analysis for very distant stations has not yet been carried out, except for a very few in Europe. For example, in June, 1914, coincidences were traced in the strays heard at Southampton and Dresden, Gibraltar and Dresden, Guildford and Malta. A proper investigation of the meteorological conditions accompanying or determining the periods when strays are heard simultaneously at places very wide apart, has not yet been made.

By the kindness of Gen. George P. Scriven, chief signal officer of the United States Army, the committee has obtained reports from officers in the wireless telegraph stations of Alaska concerning the presence or absence of any connection between auroral displays and disturbances due to natural electric waves or atmospheric discharges. At six stations special observations have been made during the later months of last winter. Various types of aurora were watched, but nearly all the observers reported that the appearance or disappearance of aurora caused no unusual disturbances. The best months for such observations in Alaska would, it is stated, be October and November. The systematic work had not then been started, but one telegraphist reports that during this period of more brilliant display the only thing noticed in the radiotelegraphic apparatus was a trifle more electrical disturbance than occurred when there was no aurora.

Radio Tower Falls at Tufts College.

A 300-foot steel tower at Tufts College, Medford, Mass., was blown down in the gale of September 26, falling across a railroad line and causing the derailment of the locomotive of an oncoming train. The embankment on either side of the track prevented the falling of the tower onto the rails, the impact of the locomotive breaking the framework and carrying it about 30 yards.

The tower had not been completed, temporary guy ropes holding the upper portion. It was erected for the American Radio & Research Company, organized to perfect inventions of Harold J. Powers. His discoveries are expected to eliminate many difficulties of long-distance wireless communication. A new type of aerial, shaped like a parasol, was to have been attached to the top, to avert the directional tendencies of stations now sending messages across the Atlantic. The tower will be rebuilt.

Edison and the Invention of the Electric Incandescent Lamp.

October 21 commemorates the thirty-sixth anniversary of the invention of the electric incandescent lamp by Thomas A. Edison. Following the example set last year this event will again be celebrated this year and it is hoped to set aside each recurring October 21 as Edison Day in honor of this important achievement. In view of the extraordinary developments of these 36 years in the electric lamp and electric lighting industries, it is interesting at this time to review some of Mr. Edison's reminiscences of the pioneer work in the latter part of 1878 and in 1879, and the stirring and exciting events during the constant striving and experiments, tempered first with anxiety and then with elation. On New Year's Eve, 1879, ten days after the first detailed newspaper account of the invention, the first public exhibition of the new electric light was given at Menlo Park, N. J., where Edison's laboratory is located, the place being illuminated with the new lamps. The detailed press account described the new lamp as "a lighted paper."

Edison practically began his experiments in electric lighting in September, 1878. Just previous to this he had returned from a visit to a Connecticut factory where an electric arc lamp was used, which concentrated his thoughts on the subject of lighting by electricity, and he determined to tackle the problem. Speaking of his entrance into the field, Edison has said, "The idea struck me all of a sudden in 1878. . . . . In those days it was easy to see what electric lighting needed—it wanted to be subdivided. The lights were too bright and too big. What we wanted was little lights and to distribute them to people's houses like gas."

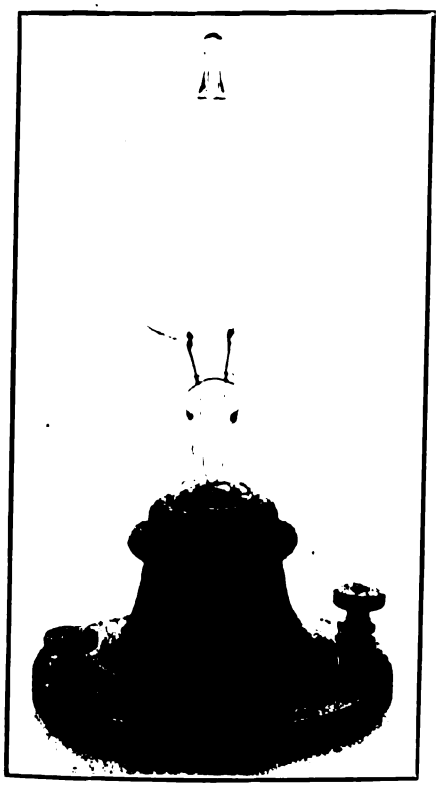
The task before the young inventor involved commercially, first, the production of a pure, steady and reliable light from electricity; second, producing it so cheaply that it could compete with gas for general illumination. The electrical problems presented constituted, first, a dynamo with low-resistance armature; second, a high-resistance lamp of relatively low candlepower; third a distributing system on which the lamps would be connected in multiple instead of in series. All these ideas were revolutionary at the time.

Of the two systems before him, the arc and the incandescence, Edison wisely chose the latter as the practical one for the subdivision of electric lighting into little units. The discovery of the proper substance and method for securing the incandescence proved the sticker. The almost bound-

Digitized by Google

less scope of his investigations, which is so characteristically epitomized in his remark, "We tried various things," is evidenced in some measure by the patent records. The substances that were experimented with included electric arc-light carbon (made into paste and rolled into threads), cotton thread, vulcanized fiber, jute, palm fiber, grasses, carbonized flax, threads made of lamp black and tar, charcoal, hemp, soft paper, fish line, various combinations of paper and tar, linen, cardboard, celluloid, boxwood, cocoanut hair and shell, shavings from hickory, baywood, rosewood, and many other varieties of wood, lamp wick, punk, cork, bamboo fiber, etc.

Reminiscing on his work at that



Replica of First Incandescent Lamp.

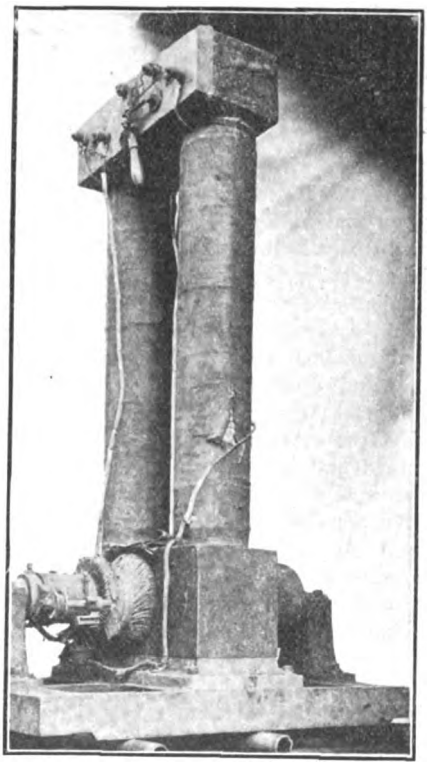
time, Edison declares, "I think I read every patent that was ever taken out on a piece of lighting apparatus, even though it had nothing to do with electric lighting. And I think I read every book that was worth reading on illumination, before I began work in earnest. The first thing to do was to find out what was the best material to use for a light producer. I soon made up my mind that of all the material I could obtain in 1877 carbon was the most promising, if I could get the right conditions. If there was any form of carbon we did not test, I have still to learn of it. . . . . Finally, on October 21, 1879, I carbonized a piece of treated cotton sewing thread bent into a loop, and sealed it in a glass globe from which the air had been pumped out. When the current was turned on, that black thread glowed for 40 hours. That was really the first incandescent electric lamp."

Commenting on the stirring scenes in the laboratory at the time of the discovery, he says, "We sat and looked, and the lamp continued to burn, and the longer it burned the more fascinated we were. None of us could go to bed, and there was no sleep for over 40 hours. We sat and just watched it with growing elation. It couldn't be put on the market, of course, but it showed unmistakably that electricity could be used for incandescent lighting. I spent about $40,000 in bringing the investigation up to that point; and yet in a way, this was only the beginning. A little later we placed several hundred paper-filament lamps on the market. Although people liked them, I knew we could do better. So I began a hunt for the right kind of carbon. Men were sent all over the world to collect grasses and fibers that looked promising. They brought back several hundred, and out of the lot I selected a certain kind of bamboo that grows in Japan. We made filaments out of that for nine years."

Edison also did a great deal of work with metal filaments, similar to those used at present. Among the early metals experimented with considerably was platinum and several alloys. Prominent among the difficulties encountered was the liability of platinum, when that metal was tried, to melt under the intense heat of the electric current, and the tendency of carbon, when employed, gradually to become dissipated under the combined action of gases and the electric current. He tried regulating the current with the platinum filament through levers and diaphragms, but the expansion and contraction of the platinum destroyed the fine adjustment of these devices and they became worthless. Many forms of spirals of platinum and alloys were tried, also osmium-iridium, from which he obtained some success. But Edison found that when metallic conductors that fuse at high heat are exposed to a high temperature near their melting point in air for several hours by passing a current of electricity through them and then allowed to cool, the metal is found to be ruptured, and under the microscope are revealed myriads of cracks, many of which reach nearly to the center of the wire. He also discovered that they lost weight. These faults lowered their resistance and were fatal to their lasting qualities.

It seemed then that all his work so far had been futile, but success grew out of failure. This very thing induced him to attempt intercepting the deterioriating effect of atmospheric action, which resulted in the vacuum bulb. Coincident with the discovery it dawned upon him that it was necessary to employ substances with high ohmic resistance for filaments to improve the quality of the light. And so the first commercial carbon filament lamps were evolved, and later through various stages of research the other improved types up to the present modern incandescent lamps.

Edison had already been working with success on a generator to produce current for his lighting system. Commenting on the scientific criticisms of his machine when the invention was publicly announced, Edison remarked, "I was told that to get the best effects the resistance of the machine must be equal to that of its load! Did you ever hear of such foolishness?



Early Edison Dynamo.

I thought it was strange to lose one-half the energy I generated in the machine, because what we were after was to get the stuff out and sell it."

The next great problem that Edison tackled was a system of distribution. Prior to 1880 there was no method known by which large numbers of electric lights of a power about equal to a gas burner could be operated practically over large areas. Speaking of this period, Edison said, "I had the central station in mind all the time. I wanted to use 110 volts. Now there is no use for you to ask me why, because I do not know, but somehow that figure stuck in my mind; and I had calculated that if we could get the voltage up that high, the copper cost would be somewhere within sight."

In regard to installing his first central station, the old Pearl Street sta-

Digitized by Google

tion in New York City, he said, "You cannot imagine how hard it was. There was nothing that we could buy or that anybody could make for us. There were no high-speed engines, and the manufacturers said they were impossible."

Edison paved the way to original scientific investigation in the lighting field, and this work is being carried on in the research laboratories of the General Electric Company by what is probably the greatest corps of lighting experts and scientists in the world. The technical skill employed to improve constantly electric lamps and lighting embraces every phase of associated invention, design and manufacture. Practically every branch of science and engineering is represented in this great work of experimentation, testing and development. The effectiveness of such extensive investigation is best secured through co-ordinated effort. A highly developed lamp service has therefore been established.

This service, with its headquarters at the Schenectady laboratory, draws upon the entire scientific, engineering and manufacturing skill of scores of laboratories and lamp factories. It studies the materials and methods at each factory, examines their test records, makes its own check tests, gathers and compares the scientific data obtained at each laboratory, systematizes the mass of information thus obtained and presents it to the study of the experts of the laboratory staff, and then transmits the carefully sifted results to each factory entitled to the service, so as to enable each factory to embody in its product the combined manufacturing experience of the largest lamp factories and the scientific knowledge of the experts most skilled in lamps and lighting.

Edison has emphasized the value of continuous research work and given us a vision of the future in the science and art of electric lighting. "No invention is perfect," he says, "and the incandescent lamp is not an exception. Light without heat is the ideal, and that is still far off. The electric incandescent lamp of today is the cheapest form of filament that has ever been produced, but some day it will be cheaper and colder than it is. There is a good deal of truth in the saying that the firefly is the ideal. It is, so far as coldness goes. But its color is against it. You couldn't use a thousand-candle firefly to match colors, and you wouldn't want the insect to light up a street, because his light would be a hideous greenish-yellow. But some day we will get reasonably near the firefly for efficiency without copying his disagreeable color. The task needs much investigation, much research of the kind we did in 1879."

Conference on Electrical Safety Code.

The deferred conference in Washington, D. C., on the proposed National Electrical Safety Code will be held at the Bureau of Standards on October 27 and 28, 1915, in accordance with the announcement made several months ago. Official delegates have already been appointed from the following organizations: American Institute of Electrical Engineers; National Electric Light Association; American Electric Railway Association; American Railway Association; Independent Telephone Association; Association of American Railway Telegraph Superintendents; American Telephone and Telegraph Company; Western Union Telegraph Company; Postal Telegraph Company; General Electric Company; Westinghouse Electric and Manufacturing Company; National Fire Protection Association; Workmen's Compensation Service Bureau; National Safety Council; National Electrical Contractors' Association; International Brotherhood of Electrical Workers; International Association of Municipal Electricians; Western Association of Electrical Inspectors.

A considerable number of state industrial and public service commissions and municipalities will also be represented. In addition a considerable number of electrical engineers, representing the different groups of engineers with whom conferences have been held by the Bureau of Standards from time to time, will attend by special invitation. Among the places where such conferences have been held are the following: Boston, New York City, Philadelphia, Cleveland, Columbus, Chicago, St. Louis, Omaha, Denver, Los Angeles, San Francisco, Portland, Seattle, and Boise.

The Bureau of Standards will report to the conference concerning the work which has been done in the preparation of the proposed code and present the latest revised copy of the text of this code. It will also present some recommendations with regard to the method of revising the code in future and of its administration by the various states and municipalities. This will be followed by a discussion of the code and of its administration, and of the subject of electrical inspections by public authorities. All proposals in writing for amendments to the code as submitted to the conference will be referred to a special committee which will report back to the conference on the second day. After this report has been presented and discussed, it is hoped that the conference will approve the code as amended. The Bureau of Standards will recommend, however, that the code shall not be made mandatory until after its tentative use for one year, in order to give the commissions and municipal authorities, as well as the utility companies, an opportunity to become thoroughly familiar with it and to permit the experience of one year to be utilized in its further revision before being made mandatory.

A very careful revision of the proposed code has been made during the summer, and on September 1 revised copies were sent out to a large number of persons with whom the Bureau of Standards had been in conference or correspondence, and replies have been received from a number giving additional suggestions for the further improvement of the code. These latest suggestions will be used in preparing the final draft to be submitted to the conference for discussion and approval.

About 100 delegates are expected to attend the conference, and they will represent the interests which are most concerned with the code.

Transcontinental Wireless Telephony.

The successful transmission of wireless telephone messages from the United States Naval Radio Station at Arlington, Va., to the Naval Radio Station at Mare Island, Cal., a distance of 2,500 miles, was announced by Secretary of the Navy Daniels on September 29. In transmitting this information Secretary Daniels made the following statement:

"I am pleased to announce the successful outcome of experiments which have been carried on for the last few months by the American Telephone and Telegraph Company and the Western Electric Company in co-operation with radio stations under the jurisdiction of the Navy Department by which long-distance wireless telephony has been made possible.

"Today speech was successfully transmitted from the Arlington Radio Station to the Radio Station at Mare Island, Cal., and there successfully received, thus making possible conversation without wires over a distance of approximately 2,500 miles, the first time this great distance has been covered by wireless telephony. In the first experiments today the voice was successfully transmitted by radio to Mare Island from Arlington, the return answers and communication being made over the transcontinental land telephone line. This was successfully accomplished in the presence of officials and engineers of the Western Electric Company, a representative of the Signal Corps of the army, representatives of the technical and operating departments of the Navy Department, and a few other interested parties.

"After this successful demonstration, conversation originating in New York was transmitted over the land wire to Arlington, there automatically connect-

Digitized by Google

ed to the radio transmitter which carried the voice to Mare Island, where it was clearly and distinctly received, and answers and other conversation were from there transmitted over the transcontinental line to the originating office in New York.

"The conversation was carried on by the president of the American Telephone and Telegraph Company, Mr. Vail; the vice-president, Mr. Bethell, and Mr. Waterbury, one of the directors, while at Mare Island were officials of the Navy Department, John J. Carty, chief engineer of the American Telephone and Telegraph Company, and representatives of the Western Electric Company.

"Every official taking part in this demonstration is enthusiastic about the results and the possibility of developing this system as an extension of the telephone system to ships at sea. The fact that the voices can be started on a land wire and automatically transmitted to a voice radio transmitter holds out hope that persons should readily be put in touch by telephone with others at sea through some central transmitting station.

"The use of such long-distance wireless telephone communication in naval or military operations is still in an undeveloped state, but it is expected valuable use can be made of this wonderful demonstration; but aside from such considerations the department and its officials feel proud that they have been interested co-operators in the first practical development of this last march in the wonderful science of radio communication."

Later in the week announcement was made that distinct wireless telephonic communication was had with the Pearl Island Naval Station in Hawaii, 4,900 miles away.

Chief credit for the great achievement is attributed to John J. Carty, chief engineer of the American Telephone and Telegraph Company. In commenting upon this accomplishment Mr. Vail telegraphed Mr. Carty as follows:

"Carty: I want to congratulate you on yesterday's climax in the way of achievements, the greatest in intercommunication the world has ever seen. To you and the wonderful staff created by you the world owes a debt.

"To throw your voice directly without the aid of wires from Washington to Hawaii—nearly 5,000 miles—a greater distance than from New York to Paris, Berlin, Vienna or even Petrograd, and greater than that between Seattle and Tokio or Yokohama, was wonderful, but to send the recognized voice part way over wire and part through the air was still more wonderful and was the demonstration of the chiefest use that will probably attach to the wireless, as amplifying and supplementing, not substituting, the wire system, and bring into conversational communication ships, islands and places which cannot otherwise be reached.

"Your work has indeed brought us one long step nearer our ideal—a 'universal system.' Theo. N. Vail."

It is understood that the voice transmission was so clear that the operators at either end of the system of communication were able to distinguish the voice tones and recognize the characteristics of speech of the several individuals conducting the experiment.

American Institute Meetings.

The first monthly meeting of the American Institute of Electrical Engineers for the present season was scheduled to be held last night in New York City. The subject of the meeting was "Rates and Rate Making" and the author of the paper was P. M. Lincoln, a past-president of the Institute.

The next meeting of the Institute is to be held at the University of Pennsylvania, Philadelphia, on Monday, October 11. There will be sessions in the afternoon and evening and a dinner between at the Normandie. The following papers are to be presented:

"Supplemental Power for Hydroelectric Systems," by J. F. Vaughan.

"The Combined Operation of Steam and Hydraulic Power in the Pennsylvania Water and Power Company's System," by John Abbet Walls.

"Construction Elements of the Tallulah Falls Development," by Charles G. Adsit and W. P. Hammond.

A two-day meeting is to be held at St. Louis on October 19 and 20, with headquarters at the Planters Hotel. Sessions will be held on Tuesday morning and evening and on Monday morning and afternoon. The following papers will be presented:

"Municipal Co-operation in Public-Utility Management," by Philip J. Kealy.

"Automatic Control," by C. W. Place.

"Recent Results Obtained from Preservation Treatment of Telephone Poles," by F. L. Rhodes.

"The Engineering Experiment Station of the University of Illinois," by Ellery B. Paine.

"The Magnetic Properties of Some Iron Alloys Melted in Vacuo," by Trygve D. Jensen.

"The Effect of Displaced Magnetic Pulsations on the Hysteresis Loss of Sheet Steel," by L. W. Chubb and T. Spooner.

"The Unsymmetrical Hysteresis Loop," by J. D. Ball.

"Decomposing Magnetic Fields Into Their Higher Harmonics," by H. Weichsel.

"The Repulsion-Start Induction Motor," by J. L. Hamilton.

"Single-Phase Squirrel-Cage Motor With Large Slanting Torque and Phase Compensation," by Val A. Fynn.

"Calculation of the Long-Distance Transmission Lines Under Constant Alternating Voltage," by George R. Dean.

Tuesday afternoon will be devoted to an automobile trip. The St. Louis Jovians will entertain visitors at luncheon on Tuesday and the St. Louis Section, A. I. E. E., will do likewise on Wednesday.

Report on Electrolysis in Providence, R. I.

A special report on damage to water and gas pipes and telephone cables due to electrolytic conditions in Providence, R. I., has been rendered to the Commissioner of Public Works by Public Service Engineer Brunet.

The report shows that, in addition to pipes and cables, service pipes and water meters have been affected seriously by stray currents from the Rhode Island Company's street railway system, due to failure to bond its rails properly.

Instances of serious damage include the bursting of a service pipe badly affected by electrolysis, resulting in the flooding of a store, and the perforating of a meter and lead service pipes which produced damaging leaks.

A total of 2,191 open and defective rail joints, or about 13 per cent of all the joints on the system, was disclosed by the investigation which led to the report. Already 700 have been attended to, at the suggestion of the engineer, during the progress of investigation, which has continued during the past seven months.

The report recommends that temporary bonding be required at points where new tracks are being laid or where repairs are being made; that broken and imperfect rails be repaired or taken up as soon as discovered, and that the Rhode Island Company adopt at once the electrical method of bonding the rail joints. Electric welding was formerly recommended, but it was thought local conditions did not warrant the expense.

New York Show Opens.

The New York Electrical Exposition was opened on Wednesday afternoon, October 6, under auspicious circumstances. An address was made over the telephone by President Moore of the Panama-Pacific Exposition, and was listened to by over 200 invited guests holding telephone receivers. Arthur Williams responded over the telephone. Other addresses were made by E. W. Rice, president of the General Electric Company; by John W. Lieb, of the New York Edison Company, and by H. S. Brooks, of the American Telephone & Telegraph Company.

Digitized by Google

Civil Service Examination for Junior Electrical Engineer.

On October 20 the United States Civil Service Commission will hold examinations in the usual places throughout the country for eligibles to fill vacancies in the staff of the Interstate Commerce Commission, which is making a valuation of the properties of all common carriers throughout the country. The particular positions are designated as Junior Electrical Engineer, Grade I, salary $1,000 to $1,680 a year, and Grade II, salary $720 to $1,080 a year. The duties of this position contemplate chiefly field work, and traveling expenses will be allowed.

Applicants should be between the ages of 21 and 36. Applicants will be examined on the theory and practice of railway electrical engineering as applied to electric traction power engineering and transmission, lighting and motor drive and the mathematics used in this work. One-half of the credit in the examination will be based upon education, training and experience. Applicants for Grade I must have had four years' experience in railway electrical engineering, of which at least two years must have been with an electric railway or an electrified division of a steam railway. Applicants for Grade II should have had two years' experience in railway electrical engineering, of which one year must have been with an electric railway.

Further details in regard to this examination can be obtained from the United States Civil Service Commission, Washington, D. C., or from the secretaries of the local civil service boards by writing for circular No. 852.

Plans for Development by Ontario Hydro-Electric Power Commission.

Plans for power development that will make the Hydro-Electric Power Commission of Ontario independent of all private developments and provide a supply sufficient, not only for the next few years, but for many years to come, have been given final approval by the Commission and sent on to the Provincial Government.

As outlined by Sir Adam Beck, chairman of the Commission, several months ago upon the opening of the first "hydro-radial" (or rural) car line in the province, the plans call for an initial development of 100,000 horsepower by utilizing the maximum head of power on the Niagara River, now undeveloped. The plans, it is understood, outline a possible supply from this source of 250,000 horsepower, and cover as well developments possible from the utilization of the Welland Canal spillways, which will add as much to the power supply of Ontario.

The plans are the result of over a year's work by the engineers of the Commission, and for the guidance of the Canadian Government have been completed in great detail, with careful estimates of cost and production.

The construction of a great development plant in the Niagara district has become an urgent necessity by the rapid growth of the cheap power system in Ontario. Sir Adam Beck and his colleagues on the Commission are facing the end of their present sources of supply. The 100,000 horsepower supply contracted for with the Ontario Power Company at the Falls will soon be exhausted by the increasing demands of the municipalities which even the big increase in the supply from new plants here and there in the province will not meet. With the advent of hydro-radial car lines on an important scale, the present supply will fall far short, and when that time arrives the Commission must be in a position to furnish practically unlimited power.

Annual Meeting of Chicago Section, Electric Vehicle Association of America.

The fourth annual meeting of the Chicago Section, Electric Vehicle Association of America, was held on Tuesday evening, October 5, at the Hotel La Salle. The report of the Nominating Committee, presented by D. C. Arlington, was accepted and the following officers elected for the ensuing year.

Chairman, George B. Foster.
Vice-chairman, W. F. Bauer.
Secretary-treasurer, F. E. McCall.
Executive Committee, D. M. Simpson, Gail Reed, A. J. Brechtel and W. C. McNitt.

The retiring chairman, W. J. McDowell, conducted the business meeting and reports reviewing the work of the year were presented by the chairmen of the various committees.

Following the reports brief addresses were made by Robert Bland, W. B. Taylor, George B. Foster and the new officers. Homer E. Niesz acted as toastmaster and at the close of the program presented Mr. McDowell with a diamond-studded emblem, on behalf of the Section.

BOOSTING ELECTRICAL PROSPERITY WEEK.

Sandusky Makes Elaborate Plans for Electrical Prosperity Week.

Sandusky, O., claims a unique feature for the forthcoming celebration of Electrical Prosperity Week. One day during that week, members of the Sandusky Ad Club, city officials, electrical people and citizens generally will make a pilgrimage to Milan, O., to pay their homage to Thomas A. Edison at the place of his birth. A committee of citizens is now engaged in working out a program for this day, and it is tentatively planned to make it a rather ceremonial occasion. A strenuous effort will be made to induce Mr. Edison to revisit the place of his birth for this occasion; but in any event the pilgrimage will be made.

Milan is a village of about 500 population, located 14 miles south of Sandusky and in the same county. The old Edison home still stands and is the show place of the village. Many of the older residents still remember "Tom" as a bare-legged boy, with a mania for "tinkering."

Sandusky's celebration of Electrical Prosperity Week will be in charge of the Ad Club (composed mainly of retail merchants), the Federated Commercial Club, and other civic organizations, co-operating with the Sandusky Gas & Electric Company, and city officials. It is proposed to put on an electrical show on the largest possible scale.

St. Louis Jovians Hold Prosperity Meeting.

The first fall meeting of the St. Louis Jovian League of Electrical Interests was held at the American Annex on September 21 at noon. Frank D. Beardslee, president, opened the meeting and announced the next Rejuvenation, which was to be held Friday, October 8.

The topic of the day was "Optimism, Progress and Business Prosperity" with W. N. Matthews, twelfth Jupiter, as the presiding officer.

Mayor Kiel was the first speaker and spoke of the "Progress of Civic Development." A. C. Einstein, the next speaker, said the time for optimism, progress and business prosperity was opportune. He spoke of "Prosperity Week" which will be conducted the week of November 29 to December 6, over the entire United States by the Society of Electrical Development. He also told of the plan of the Union Electric Light & Power Company to advertise St. Louis as a city with advantages for the establishing of industries and jobbing houses. Mr. Einstein called the attention to the fact that in many lines of manufacture and the distribution of commodities St. Louis was a world leader.

Hugo Wurdack said that from the viewpoints gathered from ten different states that prosperity was coming; that

Digitized by Google

the people were getting interested in their own business and letting other people conduct theirs. "As soon as we get in the attitude," said Mr. Wurdack, "of recognizing the rights of the other fellow to make a living, we will have prosperity. I want to say to you men who travel, boom St. Louis. When you sit around the hotel table and in the hotel lobby, boom St. Louis. Believe in your town; brag on St. Louis as you brag on your wife's cooking. You must do this if you want harmony."

The League adopted various resolutions indorsing a national prosperity movement.

Rotary Clubs to Hold Electrical Meetings.

At the recent convention of the International Association of Rotary Clubs of the World, held at San Francisco, the electrical trade sections decided to hold special electrical meetings during Electrical Prosperity Week. A resolution was adopted by each of the electrical sections endorsing the Electrical Prosperity Week campaign, and recommending that all meetings of Rotary Clubs held during the week from November 29 to December 4 be devoted to the subject of electricity and its bearing on the progress, prosperity and comfort of the people. The Society for Electrical Development was requested to mail copies of its prospectus to the president and secretary of each Rotary Club and to all members of the electrical sections.

There are 170 of these Rotary Clubs located in different cities, with a total membership of about 17.000. Trade sections exist for electric light and power, electrical construction, electrical supplies, electric lighting fixtures and transportation, the latter including electric street and interurban railways.

Bill-Posting Campaign for Electrical Prosperity Week.

To bring Electrical Prosperity Week to the attention of every person in the United States, the Society for Electrical Development has instituted a national co-operative billboard campaign in addition to its many other publicity features operating for the success of Electrical Prosperity Week, the six-day celebration to be held from November 29 to December 4.

The posters provided are eight sheets 8 feet 10 inches high and 6 feet 8 inches wide that can be used singly or be made up into 16 or 24 sheets. They present the "Goddess Electra" emblem of the big celebration, attractively lithographed in six colors. At the bottom is left a space for the name of the electrical firm making use of the posters. The posters will be placed on the most prominent billboards and will be displayed during the time when numerous other means are being used to promote electricity and Electrical Prosperity Week. The use of these broadsides will therefore be of timely advantage to every central station and merchant.

Billboard advertising for such a campaign has been found to be of unquestioned effectiveness. It appeals by pictures rather than by words and therefore is quick to arrest the attention. These posters reach the people of every walk of life. Their size enables their message to be read at a considerable distance away. Publicity experts declare that merchants whose names appear upon these posters will gain a volume of timely publicity which will prove a lasting stimulation to their business.

The Society for Electrical Development has issued an attractive folder which illustrates the poster as it will appear upon the billboards, specifies sizes and gives instructions for its use.

Texas Central Station Conducts Prosperity Campaign.

An active campaign is now being waged by the Texas Power & Light Company to induce all merchants in towns where the company operates electrical properties to participate in "Electrical Prosperity Week."

"We have taken this matter up with Chambers of Commerce and Young Men's Business Leagues in the more important cities where we operate," writes J. H. Moseley, advertising manager for the company, "and are reciving considerable encouragement. So far, every city heard from has expressed interest in the plans and has offered to co-operate. It is probable that the week will be known simply as "Prosperity Week." The merchants are expected to participate by offering special inducements during this time."

"The idea of requesting all newspapers to refrain from displaying "war news," or news of crimes, etc., on their front pages during this week has been incorporated in the plans and several papers have already promised to comply with the request.

To Celebrate "Edison Day" at Texas State Fair.

The officials of the State Fair of Texas, which will be held at Dallas from October 16 to 31, have decided to set aside October 21 to be known as "Edison Day" in celebration of the thirty-sixth anniversary of the discovery by Thomas A. Edison of the first incandescent lamp.

As a souvenir of the occasion the Edison Lamps Works will furnish a large number of stick pins on which a miniature of Edison's first lamp is mourted. The stick pins will be distributed through the Texas Power & Light Company which will have a special display in its exhibit booth featuring the development in the lamp business.

Central-Station Executive Predicts Returning Prosperity.

Louisville Jovians, in the way of publicitiy in connection with preparations for Electrical Prosperity Week, have published, in display form, a letter written by Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, to R. E. Brian, manager of the Louisville branch of the Federal Sign System (Electric). This letter, used in connection with a picture of Mr. McDonald, is in reply to an inquiry addressed by Mr. Brian to the writer, and which appears to have related to business prospects. Mr. McDonald, in his reply begins by saying: "I can see nothing ahead for this country except abundant prosperity." He then discusses the causes that made for resumption of business, says that the chances of this nation becoming involved in war are less all the time, and concludes:

"The course of the speculative market shows that a very large number of people who have money with which to back their opinions take the same view of the matter I take. They are buying stock now, because they believe that the immediate future will show large increases in the earnings of these stocks. Where these purchases are made by persons who are strong enough to hold what they have bought and not be compelled to sell on the first drop, I believe the event will show that the men who are buying now have correctly foreseen the future. In fact, I am at present an optimist."

Chattanooga Jovians Enlist Merchants in Prosperity Propaganda.

Local Jovians of Chattanooga, Tenn., have taken up actively the promotion of "Electrical Prosperity Week" and have appointed a special committee to work out plans for the celebration. Local merchants are entering into the spirit of the movement, especially since it will work in with their plan to inaugurate the Christmas shopping season on November 27. The same decorations by the merchants will serve both purposes, and the retail trade is giving its endorsement to the movement.

Pittsburgh Electrical Interests Arrange for Prosperity Week.

Electrical interests in Pittsburgh, Pa., are working energetically to make Electrical Prosperity Week a notable success. A committee, of which Henry Harris is chairman, has been appointed to stimulate enthusiasm and to formulate definite plans for participating in the event.

A get-together meeting was arranged for the evening of October 8.

Digitized by Google

New Electrical and Mechanical Appliances

Frantz-Premier Electric Washer.

The electrically operated Frantz-Premier washer shown in the accompanying illustration makes use of the suction and compression principle. Rubbing is entirely eliminated and wear and tear on the clothes is reduced to a minimum. Two vacuum plungers move up and down inside the tub at the rate of 60 times a minute, revolving above the water and thus reaching all parts of the tub. On the down stroke of the plunger air is compressed and forces the soapy water through the mesh of the fabric, while on the up stroke the plunger reverses the operation, sucking the water through the mesh and carrying with it all dirt and foreign substances.

The washer and wringer are operated independently or together by a Westinghouse one-sixth-horsepower motor which is extremely durable and requires practically no attention. The entire machine is made of metal attractively finished and is simple in construction and easy to operate. It can be readily moved from place to place, casters being provided to facilitate this. The machine is durably built and in all respects up to the reputation of its maker, the Frantz-Premier Company, Cleveland, O.

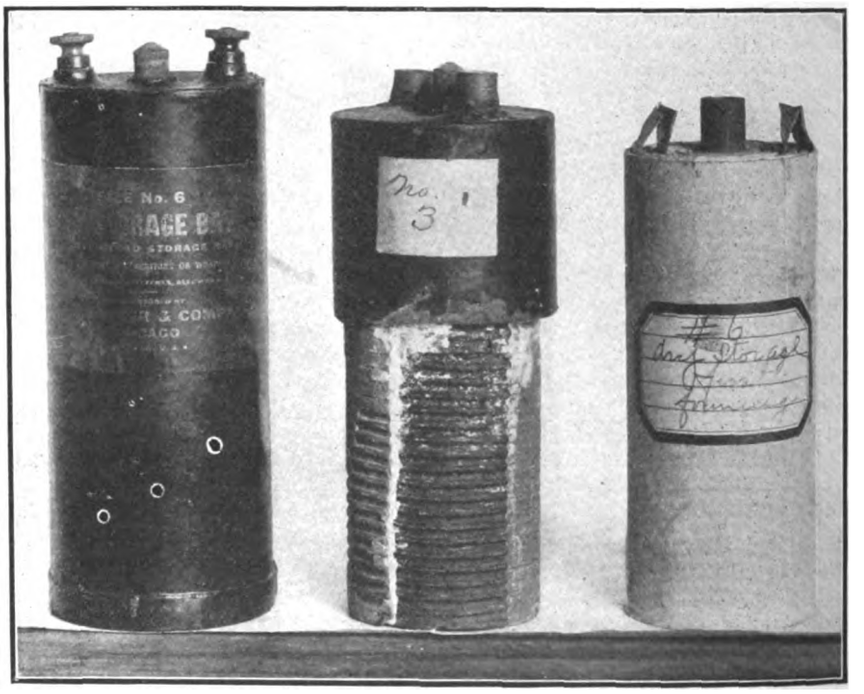
Frantz-Premier Electric Washer.

The Dry Storage Battery.

A storage battery employing a non-flowing electrolyte and made to conform in size and shape to the standard No. 6 dry cell is being placed on the market. Unlike the early types of storage batteries that used gelatine or a gelatinous electrolyte, the new battery is based on a structureless, amorphous, non-crystallizing white substance that has an exceptionally high absorbing power, permitting a container packed full of it to receive 90 per cent of its liquid capacity.

It is claimed that this flexible, absorbent separator can be boiled in the strongest sulphuric-acid electrolyte, then exposed to the air and it will not carbonize or darken in color. Furthermore, it adds practically no resistance to the cell. In its sheet form it is made to fill the predetermined space between the positive and negative elements when dry and under a considerable pressure, and leaves no space for washing or shedding or loss of active material. So long as a string of metallic lead support is left to the cell element, this spongy absorbent separator holds the active material pressed against it and active. It is claimed that loss of active material, as well as sulphating, is practically impossible.

The construction is somewhat unique, being a direct departure from present storage-battery practice in that cylindrical construction is adhered to. The positive and negative elements are made from lead in rolled strips. These are corrugated to furnish greater area for the active material, which is pasted to the plates. In the accompanying illustration the central view shows the construction of the plates with the flexible absorbent separators between them. The view on the right shows the separators used in assembling the cell, and on the left is shown the completed product.



Dry Storage Battery. Views Showing Complete Cell, Plate Construction and Partly Formed Element.

In the center of the cell is a tube for supplying water to guard against drying out. This tube also acts as a gas vent and as a means of taking up the changes of volume of electrolyte during charge and discharge.

The container for the cell was developed from the point of necessity to avoid the expensive and breakable hard-rubber container. It is a paper-fiber can, made proof against water, acid and electrolysis and is unbreakable. It is pulverized and vulcanized at a high temperature, and has a coal-black glossy finish. The finished cell is neat in appearance and durable.

Digitized by Google

After careful and exhaustive tests as to the operating characteristics of the new battery, it is claimed by the manufacturers that it holds its charge longer and can be recharged indefinitely for much less than the cost of a carbon dry battery. It has 40 per cent higher working voltage, greater amperage, greater watt-hour output and five times more working capacity. The capacity of the No. 6 size is one-half ampere for 28 hours when fresh from the factory. The manufacturer asserts that the capacity increases with use and attains a value of 0.5 ampere for 40 hours, one ampere for 18 hours, two amperes for 8 hours and three amperes for 5 hours. The average voltage of discharge is two volts.

While at present made only in the size of the No. 6 dry cell, the new battery will later be made in various sizes for all purposes. It is guaranteed against internal short-circuits and against drying.

The "dry" storage battery is manufactured by J. P. Mentzer & Company under Crowdus patents. S. S. Stolp, 134 South La Salle Street, Chicago, is sole sales agent for the company.

Simplex Pole Jack.

Electric light and power companies, also telephone companies, especially those operating in the larger cities, frequently have occasion to move poles from one location to another or to take them out entirely. The removal of the poles is by no means an easy job, as it requires considerable time in addition to a number of men.

A new pole jack recently placed on the market has been especially designed for the purpose of removing poles. It supersedes in effort, time and expense all former means of pulling a pole and eliminates the necessity of digging around the pole. A general view of this tool is shown in Fig. 1.

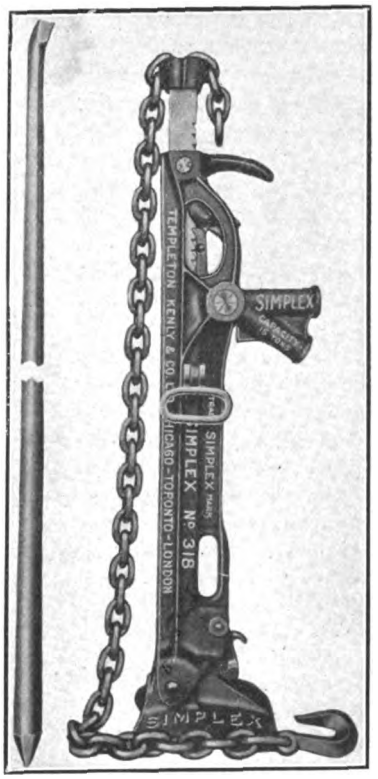


Fig. 1.—Simplex Pole Jack.

The jack in use is shown in Fig. 2. In this case the pole was about five feet in the ground, had a big butt and had been solidly imbedded for years. It took just 19 minutes for the Simplex jack to pull it straight from the earth and this without preliminary digging around the pole. The time necessary by former methods of first digging and operating with roller and rope, would have approximated an hour and a half; hence as a labor-saving device the tool should quickly pay for itself.

This Simplex jack is single-acting, operating on the down stroke of the lever, or tripping at any point. In this way, at the end of its entire lift the cap may be dropped back to take a new hold on the pole. The capacity is 15 tons, lift 24 inches and full height 39 inches. It pivots on its own base from 30 to 90 degrees to the horizontal and follows the angle of the pole being pulled.

The cap is recessed to firmly hold the links of a chain when they are dropped in position. This chain with grab hook attached is furnished with the jack and is of sufficient length to wrap once around the average pole. An I-beam base support acts as a substantial foundation where the ground is soft or hollowed. The standard is a heavy malleable casting. All other parts are drop forgings. The double-lever socket insures a convenient position of the lever bar with the jack at any angle. A five-foot steel lever bar of pinch-bar construction also forms a part of the equipment.

This jack is designated as Simplex No. 318 and is manufactured by Templeton, Kenly & Company, Limited, 1020 South Central Avenue, Chicago, Ill.

Low-Capacity 66,000-Volt Sub-Station.

The accompanying cut illustrates a low-capacity 66,000-volt substation de-

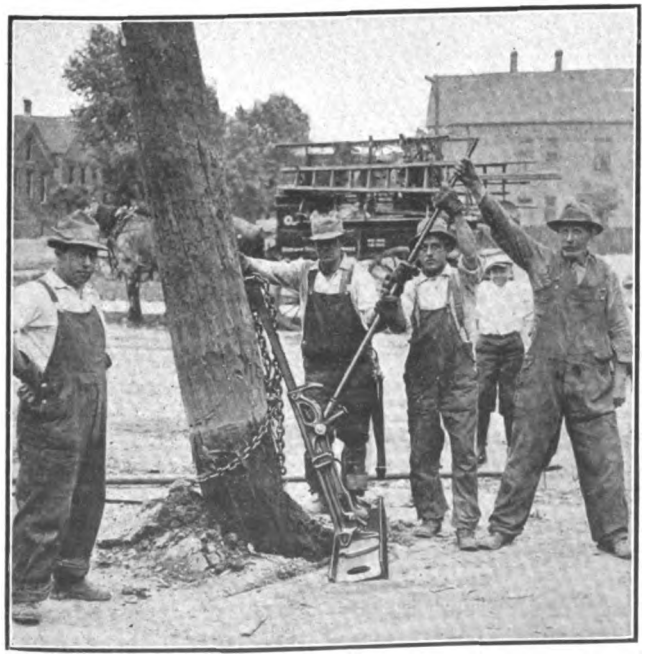
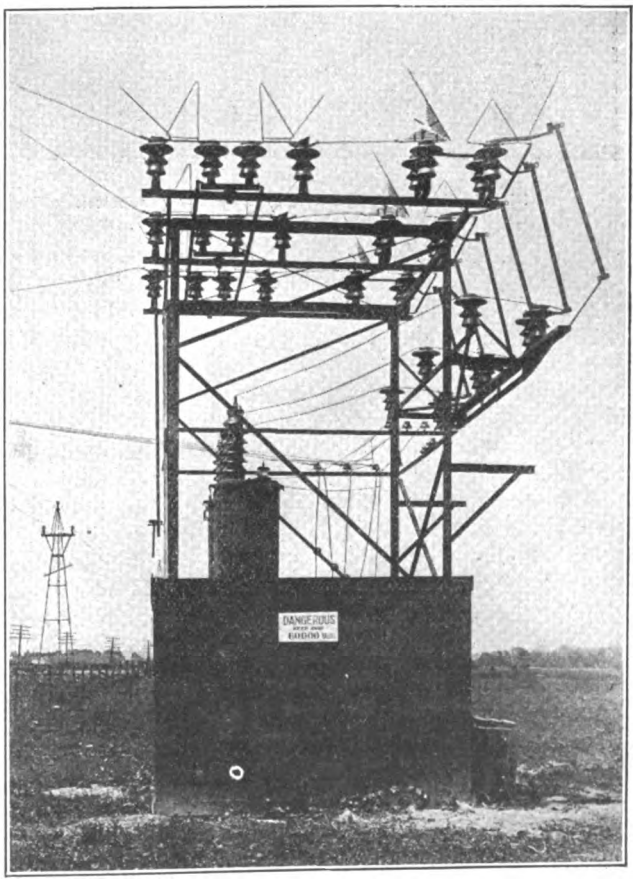


Fig. 2.—Pole Jack Lifting Pole from Position.



66,000-Volt Outdoor Substation.

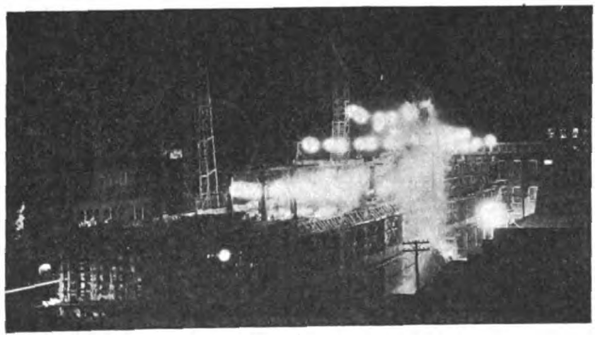
Digitized by Google

veloped and built by the Railway & Industrial Engineering Company, Pittsburgh, Pa. The station shown is at Bergen, N. Y., and is one of several on the lines of the Niagara, Lockport & Ontario Power Company, used to serve power to various towns.

At the Bergen sation there are at present installed two 25-kilowatt 66,000-volt Westinghouse transformers, but the platform on the steel structure is arranged so that a third transformer can be installed later when the load is increased. The switching and protective apparatus consists of a standard 70,000-volt Burke horn-gap switch and Burke horn-gap lightning arrester, choke coil and fuse. The station is complete in every respect, but very simple and compact, all of which is necessary for a station of this low capacity where the initial investment must be kept at a minimum in order to return a proper income.

Rush Construction at Night Facilitated by Tungsten Lighting.

A large reinforced-concrete building now under erection in the East is urgently needed for manufacturing purposes. This work is prosecuted in two shifts, night work being carried on by means of large clusters of tungsten lights, as shown in the illustration.



Illumination to Facilitate Factory Erection.

The lights used were 100-watt tungsten lamps. These were hung both singly and in clusters of six upon home-made stands. For isolated lamps the Milburn type was used. No reflectors other than those supplied with the Milburn lights were used.

The lighting from this source is so good that the work proceeds with the same certainty and precision, and practically with the same speed as in the daytime. By handling the matter in this way the owners will get the building several weeks earlier than would have been possible by the regular one-shift method of construction.

The lighting arrangements were made by the electrical staff of the Aberthaw Construction Company, of Boston, Mass., which has the contract for the entire structure.

Teaching the Young to Cook Electrically.

A unique feature of the Electrical Exposition and Motor Show being held at New York City, is in a section of the New York Edison Company's exhibit, where the new Western Electric-Hughes Junior range is being demonstrated.

This range, which was recently described in these columns, and which a prominent central-station man has characterized as "the greatest electrical novelty in years," is a practical, miniature electric range, complete in every detail, upon which real food can be boiled, baked or fried. It is intended for the use of young girls as a toy, and also as a means whereby they may be taught to cook.

As a direct tribute to the educational value of this device, the Board of Education of the city of New York has arranged with the New York Edison Company to send squads of young girls from the public schools to visit this exhibit and receive instructions in the art of cooking electrically, using the range in the demonstrations. Opportunity is afforded the school children to do some of the cooking themselves, in order to give the instruction work its greatest possible value.

This feature is to be continued throughout the duration of the show, which closes on October 16. It will serve, as few other things could, to impress the new generation with the "Do It Electrically" idea.

Water-Current Meters.

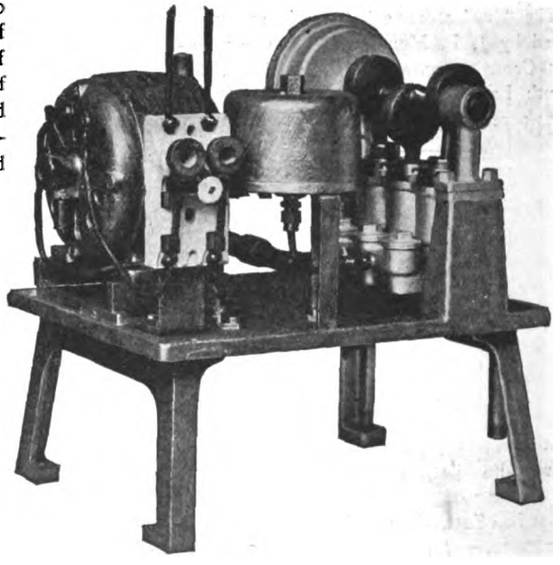
Electrically controlled meters are being used on the Panama Canal to measure simultaneously the direction as well as the velocity of water currents in the canal and its tributary works. By this means currents from 0.15 to 20 miles an hour can be measured.

New Electrically Operated Pumping Outfit.

The illustration herewith shows a new pumping outfit of the triplex type recently designed by the Buckeye Pump & Manufacturing Company, Columbus, O., for house-pumping service. The outfit illustrated has a capacity of 180 gallons per hour, and will pump against pressures of 25 to 50 pounds. The overall dimensions of the complete set are 17 by 13 inches by 12 inches high. The weight is 100 pounds.

If it is desired to mount the outfit on the wall instead of the floor it can be furnished with brackets instead of the legs shown in the illustration.

The plungers are bronze and are driven by a cam shaft. They are self-lubricating. Each cylinder has independent suction and discharge check valves. Any obstruction becoming lodged under one check valve will therefore not interfere with the operation of the other cylinders.



Electrically Operated Pumping Outfit.

The outfit is equipped with a one-sixth-horsepower direct-current or alternating-current motor, as specified, made by the Robbins & Myers Company, Springfield, O. The pump and motor are connected through a worm and spiral-cut gear which operate in a tight grease-packed case.

An automatic controller is provided which cuts the motor in when the pressure in the tank falls to 25 pounds and cuts the motor out when the pressure reaches 50 pounds. A knife switch and fuse block are also furnished, mounted in front of the motor on the base plate.

A new chemical laboratory building is being erected for the Bureau of Standards, Washington, D. C. Its cost will be about $200,000.

Digitized by Google

New Automatic Starters for Alternating-Current Motors.

The accompanying illustrations show two new types of automatic starters for alternating-current motors operating on 110 to 550-volt, 25 to 60-cycle systems. One is designed for use with single-phase self-starting motors, or with polyphase squirrel-cage motors, and uses resistance in the primary circuit of the motor to reduce the voltage for starting. Two double-pole magnet switches and a solenoid-operated timing relay are provided. One switch connects the motor to the line through the resistance and the other short-circuits this resistance after a definite time interval, determined by the setting of the relay.

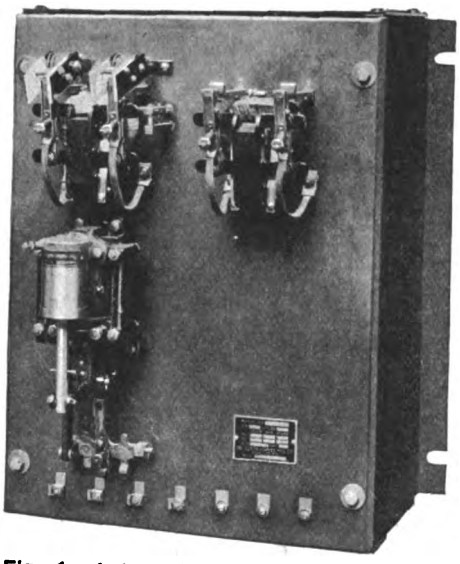


Fig. 1.—Automatic Starter for Polyphase Squirrel-Cage Motors.

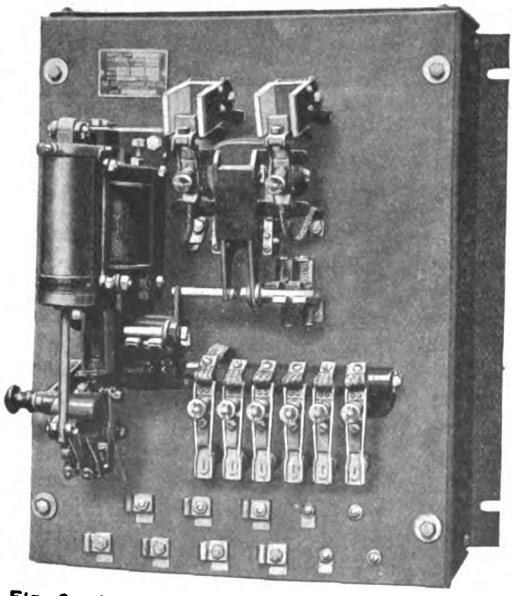


Fig. 2.—Automatic Starter for Polyphase Slip-Ring Motors.

The controller shown in Fig. 2 provides automatic means for starting and stopping polyphase slip-ring motors driving pumps, compressors and similar machines. A double-pole magnet switch with blowouts handles the primary current, while the secondary resistance is cut out of circuit and the motor accelerated by means of a multiple-finger solenoid-operated rheostat. These automatic starters are particularly applicable to installations where the load is likely to vary between wide limits. They are manufactured by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

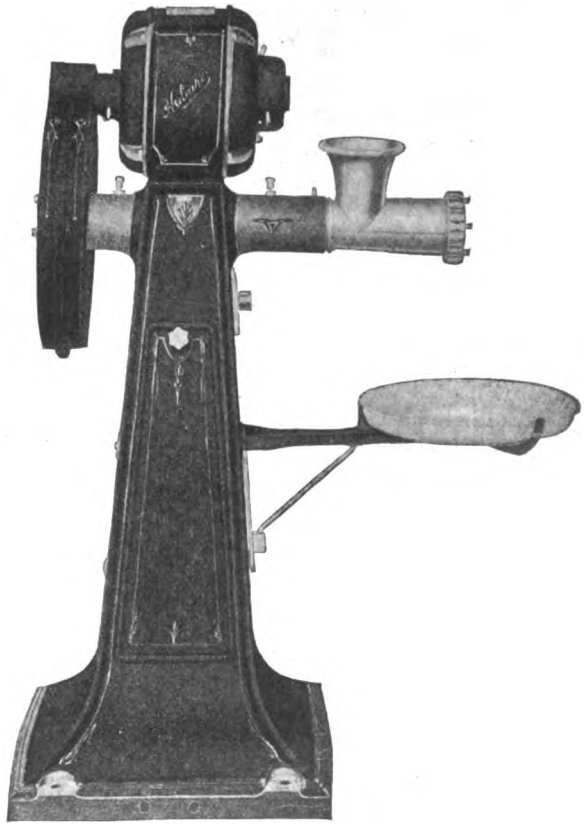
Both types of controllers illustrated may be controlled by single-pole knife or snap switches, by float switches on open-tank pumping systems or by pressure or vacuum regulators on closed systems.

Motor-Driven Meat-Chopper.

Every progressive business man knows that a clean, up-to-date, attractive store is an invaluable asset, the possession of which aids considerably in building up store prestige in his community. While this is true to a certain degree of every business, it applies particularly to those lines in which the handling of foods is involved. The grocery store, the confectionery shop, meat market, all must be inviting or the public will go elsewhere.

The use of electrically operated devices in the modern store, besides contributing to the appearance, does much toward increasing business by reducing the time required to make a sale. For instance, the machine illustrated herewith, made by the Hobart Electric Manufacturing Company, Troy, O., will chop over three pounds of beef per minute, whereas with a hand-operated chopper the operation would require several minutes. Also, another customer can be served while the machine is doing the work. A one-half-horsepower Westinghouse motor of special design is used; a snap switch on the device starts and stops the motor.

This machine is capable of performing a broad range of service. While intended primarily for meat chopping, the following attachments may be used: grindstone for tool grinding; pulley for light work, such as kraut cutting and meat slicing; bone-cutter to interchange with the chopper; and a grinder, making it suitable for coffee or pepper grinding. When used in a store handling both meats and groceries, these features are specially valuable.



Motor-Driven Meat Chopper.

Telephone-Booth Fans Solve Another Problem.

Talking-machine records must be demonstrated to be sold, and this demonstration must be made in a quiet room to be most effective. These rooms must also be cool, and the air in them fresh, or else the prospective customer is not in buying mood. The regular type of electric fan has been tried, but the quietest of them was found to make too much vibration, which was transmitted to the wooden partitions of the demonstrating rooms or booths, thus interfering with the playing of the records.

After many experiments a Pittsburgh sales concern installed a number of telephone-booth fans, and found that they gave the required ventilation, and on account of their special spiral-spring suspension were found to be without any vibration while in operation.

Telephones in China.

Telephone systems in China exist at Shanghai, Hongkong, Tientsin, Peking, Dairen, Mukden, Hankow, Soochow, Tsingtau, Kinkiang, Sanjoabu, Harbin, Antung, and Hangchow.

Until recently telephones were but little used by the Chinese natives.

Digitized by Google

An Aerial Telephone-Cable Terminal.

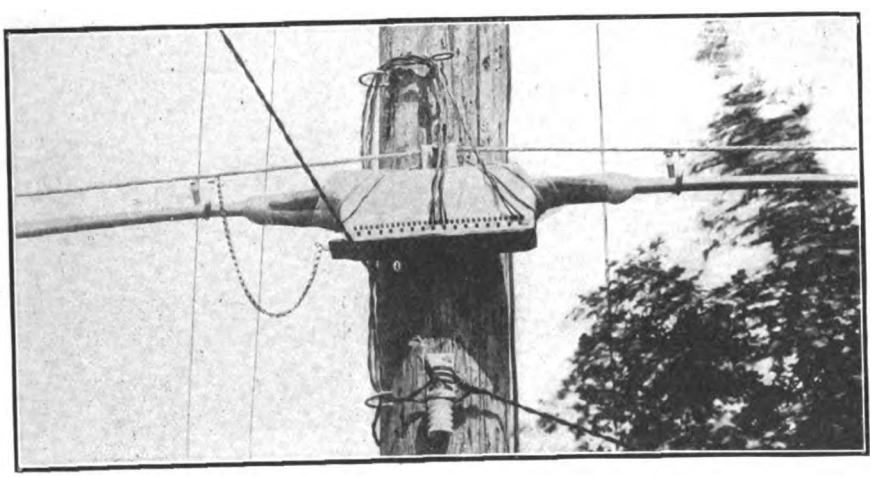
The growing use of aerial cable for telephone lines is directing attention to the development of cable terminals by those interested. One of the new patented cable devices controlled by Henry E. Zipkie, 1903 Avenue I, Brooklyn, N. Y., shows many interesting features. It is die-cast of lead with both outer and inner face plates through which the bolts pass with locknut fastenings; the space between the plates is filled with compound which prevents moisture entering the sleeve.

These terminals can be used to advantage in suburban construction where cement poles are placed in back yards. No trouble can arise from snow packing in them; no moisture condensing on binding posts and running down the face plates. The terminal may be opened in wet weather for transfer and tests, and there need be no splicing of bridle wires to make transfer.

A considerable saving can be made in both material and labor items in the installation of these boxes, and the upkeep is materially lessened.

It is said that 60 per cent of aerial-cable trouble is due to broken tail ends caused by the cable creeping. This box does away with tail ends and creeps with the cable, thus entirely eliminating this trouble.

The box can be placed on existing cables by using it as a split sleeve. In new construction it can be hung on messengers and the cable pulled through the box. The device can be made advantageously as a six or eleven-pair box.



New Terminal Box for Aerial Telephone Cable.

Control-Board for Series-Parallel Battery Charging.

The Globe Electric Company, 195 Broadway, Milwaukee, Wis., is putting out a new type of board for series-parallel charging of Edison storage batteries especially adapted for 30 and 60-volt systems. The arrangement of the board is very simple and embodies all of the features commonly used in a battery lighting system. The equipment consists of a 16 by 30-inch slate panel containing the following parts:

A voltmeter with a rear-of-board type switch with which it is possible to obtain the voltage of the battery, of the lights or of the generator, and an extra connection is provided. This extra connection has a pair of flexible cords connected to the contacts of the extra position, which permit the reading of individual cells or the testing of an automobile battery. An ammeter is provided with a scale having a zero center. This meter has a switch in its circuit which is connected in a manner that permits independent indications of current for either dynamo or battery. In this way it is always possible to determine the dynamo load when lights are burning; this has an advantage over the usual method of employing an ammeter placed in the battery circuit only.

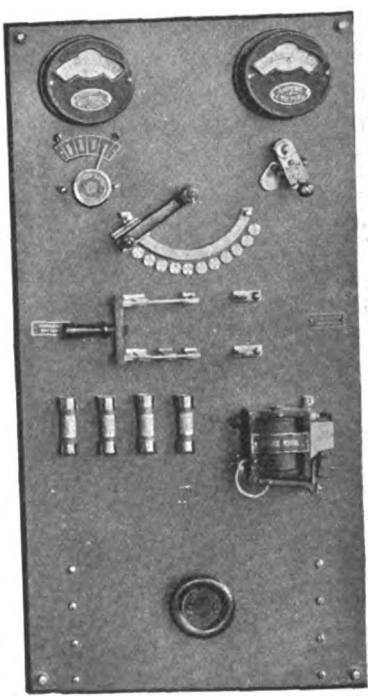
Where lights are used at the same time that the battery is being charged, it is desirable that the switchboard should permit ampere readings of the battery-charging current and the total load on the dynamo, for store-lighting and commercial-lighting plants are generally operated during the lighting hours.

A charging resistance is arranged with a dial switch having 12 points which permits charging at any current rate. This is particularly desirable where lighting is being done at the same time that batteries are being charged, as it enables the operator to charge the battery at any rate of current that may be available. The resistance is designed to charge the batteries at a range of from 50 per cent above normal charging rate to 50 per cent below normal charging rate.

A double-pole double-throw switch with contact for resistance is provided. The usual series-parallel connection is made to this switch which places the batteries in series on one side and in series-parallel on the other side. Charge and discharge name plates are provided.

An automatic contactor, which automatically opens and closes the circuit between dynamo and battery, takes care of the dynamo circuit entirely independent of manual attention. This contactor is provided with carbon contacts of high carrying capacity and these contacts prevent freezing or blistering of contactor. The contactor opens under a very small reverse current and is of heavy sturdy construction designed for hard usage.

This switchboard accomplished everything that may be desired in a series-parallel equipment for small lighting plants and does not have any unnecessary complicated features that do not add to the successful operation of the equipment. This style of board has been standardized and is carried in stock.



Series-Parallel Battery-Charging Panel.

Aid to Export Trade.

A new government publication of interest to manufacturers desirous of developing export trade is "Foreign Publications for Advertising American Goods," which gives advertising rates, circulation, subscription price, etc. It is No. 10 of the Miscellaneous Series issued by the Bureau of Foreign and Domestic Commerce. The list of advertising mediums in foreign countries is arranged alphabetically according to the various countries, thus making reference very easy.

The price of this pamphlet is 25 cents, and it can be obtained from the Superintendent of Documents, Washington, D. C.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

LEBANON, PA.—The Board of Education will shortly open bids for the erection of a $175,000 high school building here. A. A. Richter, of Reading, Pa., is the architect.

PHILADELPHIA, PA.—Bids will soon be asked for a $500,000 high school building to be erected at Amber and Cumberland Streets, for the Philadelphia Board of Education. J. Horace Cook, Philadelphia, is the architect.

NORTH CENTRAL STATES.

CLEVELAND, O.—The sum of $75,000 will be expended to extend west side lighting. Address Maurice Sarbinsky, secretary of Public Utilities.

BICKNELL, IND.—A stock company, to have $1,000,000 capital stock, was organized in this city by A. L. Brockssmith, superintendent of the Bicknell Light and Power Company. The company expects to build a power station at Apraw Falls, on White River two miles south of this city, and provide power for coal mines operating in this field. It also intends to build an electric line connecting the mines.

CORNELL, ILL.—Work will commence immediately on the rebuilding of the electric light system in Cornell. Address president of the Public Service Company.

EAST ST. LOUIS, ILL. — The capital stock of the East St. Louis Light and Power Company has been increased from $1,000,000 to $1,100,000.

GALESBURG, ILL.—An ordinance has been passed by the city council setting October 26 for holding an election to vote on a $20,000 bond issue for the installation of additional equipment at the electric lighting plant.

KANKAKEE, ILL. — Ways and means are under consideration for more street lights. Address Mayor Alpiner.

NORMAL, ILL.—Cluster lights are to be provided for the business section of Normal. Address chairman of the Electric Light Committee.

ROSEVILLE, ILL.—Contracts have been signed between the village board of Roseville and the Public Service Company of Central Illinois, for the furnishing of electric light to Roseville. The Central Illinois company is to secure the current from the Monmouth Public Service Company, of Monmouth, Ill. A right of way is to be secured for the pole line from Monmouth to Roseville and as soon as this is done work of constructing the line will be begun. It is expected the line will be in operation within sixty or ninety days. Z.

URBANA, ILL.—Plans for the installation of a boulevard lighting system on West Green Street are under consideration by the board of local improvements. Z.

MARATHON, IOWA. — The town has voted $12,000 in bonds for a municipal electric lighting plant. Address the town clerk.

HAVENSVILLE, KANS. — Bonds to the sum of $8,000 have been voted to build a transmission line and wire the city. Address the city clerk.

TEKAMAH, NEB. — The municipal lighting plant is planning to erect a new power house soon, and will purchase one 150-horsepower Corliss-type steam engine, two boilers, and one 100-kilovolt-ampere generator and switchboard. Address F. A. Nassum, mayor.

SOUTH CENTRAL STATES.

NICHOLASVILLE, KY.—The city council committee, which has been investigating the proposition to construct and operate a white way on Main Street, has decided to make a favorable report on that project. G.

GROVE, OKLA.—The contract for constructing extensions and enlargements of the electric light and water works systems here will be awarded soon. The proceeds from the sale of $10,000 bonds will be used for the purpose. D.

LAHOMA, OKLA. — A municipal electric light plant to cost about $5,000 will be built here. D.

LITTLE ROCK, ARK. — The city will expend $25,000 for 210 street lights, five transformers, accompanying equipment, etc. Address John W. Bleidt, city electrician.

COMANCHE, TEX.—The city has granted to the Texas Power and Light Company a franchise to sell electricity for light and power purposes in Comanche. It is stated that power will be supplied by means of a transmission line built from Brownwood. Several small towns between Comanche and Brownwood will be served.

DENISON, TEX. — A deal involving the final purchase of a 50-acre site for a mammoth power plant, to be erected on the Red River by the Texas Power and Light Company, has been consummated. The site selected is above danger of floods from Red River. Announcement was made that work on the plant would in all probability be started by January 1. An interurban line from Denison to Durant, Okla., is another project under consideration.

PLAINVIEW, TEX.—The town of Lubbock is now being lighted from the Malone Light and Ice plant, at Plainview. The towns of Hale Center and Abernathy are to be supplied from this plant in the near future.

ROYSE, TEX.—Arrangements have been completed whereby the Texas Power and Light Company will take over the electrical properties in Rockwall, Garland and Royse. A transmission line will be built from Royse to Jenkins connecting with the present 33,000-volt line of the company. A survey of the proposed transmission line, which will be about 20 miles in length, will be made at once.

WESTERN STATES.

ANACONDA, MONT. — Officially reported the council has passed a resolution creating special improvement District No. 70, wherein an ornamental lighting system will be installed at a cost of approximately $5,000. The territory covers Hickory Street, from Third Street to Park Avenue, Park Avenue from Hickory Street to the city limits on the west. M. J. Kelly, city clerk, states that bids for the installation and furnishing of materials will be called for shortly. O.

BOZEMAN, MONT.—C. A. Speith, city clerk, reports the city council has rejected the eight bids submitted for the installation of an ornamental street-lighting system, and has decided to install the system by day labor, under the personal direction of Assistant City Electrician E. V. Smith. O.

KELLOGG, IDAHO.—Power transmission lines will be constructed to the Highland Surprise mining property, on Pine Creek, by the Washington Water Power Company, of Spokane, Wash., according to announcements recently made by officials of the company. The current to be provided will be utilized to operate the mine and stamp mill of the Highland Surprise Company. O.

PHOENIX, ARIZ.—J. B. Girand, city engineer of this place, will make preliminary surveys for six dams at the proposed sites of six hydroelectric power plants to be erected in the Grand Canyon of the Colorado. According to the plans, the first power plant will be erected in Diamond Canyon, north of Peach Springs, where it is expected to develop 50,000 horsepower. The six plants are expected to developed about 400,000 horsepower. The United States Department of the Interior has granted permission for the preliminary surveys to be made.

PHOENIX, ARIZ.—Bids have been called for by the city manager for not less than 25, nor more than 300 ornamental electric light standards, according to plans of the city engineer.

LAS VEGAS, N. M.—Plans are under way for the ornamental electric lighting of the Plaza in this city.

OLYMPIA, WASH. — The city council is about to grant an electric light and power franchise to Wilbur B. Foshay, Portland, Ore., same being for a period of 50 years. The franchise will permit Foshay to sell electric current to this city, and will also give him a 50-year franchise for a steam-heating plant. This legislation, it is understood, provides for municipal ownership of a lighting plant. The franchise provides that the city may purchase the plant at the end of five-year periods during the life of the fran-

Digitized by Google

chise, at a price to be fixed by a board of arbiters. O.

WENATCHEE, WASH.—On September 24, a fire caused by short-circuit in a temporary wooden switchboard, practically destroyed the entire plant of the Dryden station of the Wenatchee Valley Gas and Electric Company, which is the largest plant maintained by the company in this section. The loss will seriously affect the company's business, as the Dryden plant developed 80 per cent of the electricity sold by the company. O.

ALBANY, ORE.—William Hoeflich, formerly with the Oregon Power Company, operating here, and a group of local capitalists, have petitioned the city council for a franchise to construct, operate and maintain an electric lighting and power plant to serve this city in competition with the Oregon Power Company. O.

PORTLAND, ORE. — Plans are in contemplation for the electric lighting of several of the city parks that are now without illumination. Commissioner Baker, of the Department of Public Affairs, has the matter in charge.

SILVERTON, ORE. — At the last meeting of the city council an ordinance was introduced calling for bonds for the erection of a municipal electric lighting plant and distributing system.

LOS ANGELES, CAL. — The city council is considering the erection of hydroelectric power plants on Rush and Leevining creeks in connection with the city's Owens River water system.

ORANGE, CAL.—Plans are under way for the installation of a small electric lighting plant at the Orange County Park.

OROVILLE, CAL.—It is announced that the Great Western Power Company, of San Francisco, has arranged to buy the power plants and distributing system of the Oro Electric Company of this place. The latter company will continue its gold-dredging business.

PASADENA, CAL.—The city council has adopted a resolution providing for the ornamental electric lighting of Colorado Street.

QUINCY, CAL.—The Great Western Power Company has been granted a franchise permitting it to erect transmission lines along the county roads of Plumas County.

HONOLULU, HAWAII.—The East Maui Irrigattion Company, operating in the Island of Maui, is considering the construction of a hydroelectric power plant in the Koanae Valley, Maui, the power generated to be used for operating irrigation pumps.

NEW PUBLICATIONS.

ELECTRIC OVENS.—An article by A. E. Kennelly, F. D. Everett and A. A. Prior entitled "Thermal-Insulation Tests of Electric Ovens," has been reprinted in pamphlet form for distribution by the authors. It describes an experimental investigation of the resistance to heat offered by five different kinds of oven walls, which was carried out at Harvard University.

VACUUM LAMPS. — Scientific Paper No. 253, issued by the Bureau of Standards, Washington, D. C., is entitled "A Direct-Reading Device for Use in Computing Characteristics of Vacuum Tungsten Lamps," by J. F. Skogland. This gives a scale for the computations and explains how it is to be used. The advantages and disadvantages are discussed and the method of construction explained.

LAMP SOCKETS AND BASES.—The American Society of Mechanical Engineers has issued in pamphlet form the report of the Committee on Standardization of Special Threads for Fixtures and Fittings. This report, which has been corrected since being originally issued, deals with the sizes of rolled threads for screw shells of electric sockets and lamp bases. Recommended standards are given.

HOUSEHOLD MEASUREMENTS.—Circular No. 55, of the Bureau of Standards, is entitled "Measurements for the Household." This explains the units, methods and instruments of measurement useful in household activities, and indicates how to assure correct quantity in commodities bought by weight and measure. The watt-hour meter and its use are explained and directions given for reading the dials.

CANADIAN SALT INDUSTRY.—A report on the salt deposits of Canada and the salt industry has been issued by the Canadian Department of Mines, Ottawa, Canada. This is a comprehensive review of the industry in Canada and gives a large number of maps and illustrations showing the location of salt deposits and the methods of working them. Interesting descriptions are given of electrochemical processes used in this industry.

TELEPHONE DIAPHRAGMS. — Bulletin No. 7 of the Research Division of the Electrical Engineering Department of the Massachusetts Institute of Technology is entitled "Explorations Over the Vibrating Surfaces of Telephonic Diaphragms Under Simple Impressed Tones," by A. E. Kennelly and H. O. Taylor. This is a paper which was presented before the American Philosophical Society at the spring meeting in Philadelphia.

RULES FOR METAL MINES.—The Bureau of Mines, Washington, D. C., has issued Bulletin No. 75, entitled "Rules and Regulations for Metal Mines." This is a series of recommendations made by a committee appointed originally at a meeting of the American Mining Congress in 1906; this committee later served under the Bureau of Mines in drafting a proposed uniform law to cover the regulation of metal mines. This report covers 296 pages and gives a summary of the work of the committee which had the co-operation of nearly all interested in the mining industry.

UNITED STATES MINING STATUTES.—The Bureau of Mines, Washington, D. C., has issued what is designated as Bulletin No. 94, entitled "United States Mining Statutes Annotated." This is a work in two volumes comprising a total of 1,772 pages. It has been compiled by I. W. Thompson, of the Bureau, and shows the status of every Federal mining law, both laws relating to metal mining and those relating to coal, oil and phosphate mining, and to mining on public, Indian and railroad lands. This valuable work is obtainable from the Superintendent of Documents, Washington, D. C., for $2.50.

MAGNETIC OBSERVATIONS. — The Department of Terrestrial Magnetism of the Carnegie Institution of Washington has issued Vol. II of its researches entitled "Land Magnetic Observations 1911-1913 and Reports on Special Researches," by L. A. Bauer and J. A. Fleming. This is a large volume of 278 pages giving results of magnetic observations in various parts of each of the continents, with details of the field reports of the different observers and descriptions of the stations where observations were made. Reports are also included with respect to special researches made at the headquarters of the department and at various observatories, as well as those of a special trip during the total solar eclipse of 1911. The volume is illustrated.

PROPOSALS.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on October 19, 1915, for the following material: 4,300 feet lighting and power wire; 6,000 feet single, rubber-covered stranded wire; 1,000 feet lead-covered rubber-insulated wire, Schedule No. 8833, all for delivery at Navy Yard, Brooklyn, N. Y.; miscellaneous interior communication cable; 7,500 feet single conductor, soft steel wire, Schedule No. 8838, both for delivery at the Navy Yard, at Brooklyn, N. Y.

NEW INCORPORATIONS.

DAHLGREN, ILL.—The Dahlgren Electric Light Company has been incorporated with a capital of $25,000, by L. L. Aydt, William Acks and F. F. Aydt.

MELROSE, MINN.—The Grove and Greenwald Lighting and Power Company has been incorporated with a capital of $50,000, by Henry G. Meyer, Fred Gzieski and others.

ALBANY, N. Y.—Albany Storage Battery Company, Incorporated. Manufacturing, repairing and dealing in storage batteries, auto accessories, etc. Capital, $1,500. Incorporators: Christian F. Weeber, Pauline Weeber and Alfred C. Dederick.

WEST SALEM, ILL. — The West Salem Ice and Light Company has been incorporated with a capital stock of $15,000. The company is to manufacture and sell ice and electricity. W. E. Scheurer, P. O. Hallbeck and E. H. Hallbeck are the incorporators. Z.

ROCHELLE, ILL.—The Rochelle Electric Manufacturing Company has been incorporated with a capital stock of $35,000, and is to manufacture and deal in electric motors, dynamos and electrical appliances. W. R. Dusher, Frank Carney and J. C. Fesler are the incorporators. Z.

INDIANAPOLIS, IND. — Articles of incorporation have been filed by the Loco Light Company. The company is capitalized at $10,000, and proposes to manufacture locomotive headlights. The incorporators are Robert H. Pyle, Lewis I. Isbell, George D. Thornton and Arthur R. Baxter.

CHICAGO, ILL. — The Gardner-Stedman Company has been incorporated with a capital stock of $1,000. The company is to do electric wiring and construction work, and is to manufacture and deal in electric devices. Fulton Gardner, Seymour Stedman and Swan M. Johnson are the incorporators. Z.

Digitized by Google

FINANCIAL NOTES.

The Narragansett Electric Lighting Company will issue to stock and debenture holders of record of October 4, $500,000 of capital stock at par in the ratio of one share of the new stock for each 14 shares now held. Payment for the new stock is to be made November 1 and transfer books of the company will be closed from October 4 to October 16.

The Memphis Street Railway Company has sold to a syndicate composed of Bertron, Griscom & Company, Reilly, Brock & Company, of Philadelphia, and Counselman & Company, of Chicago, an issue of $1,500,000 two-year six-per-cent collateral gold notes, if, as and when issued, to be dated November 1, 1915, due November 1, 1917. It has also sold to Bertron, Griscom & Company and Reilly, Brock & Company an issue of $600,000 one-year six-per-cent guaranteed gold notes, if, as and when issued, to be dated November 1, 1915, due November 1, 1916. Out of the proceeds from the sale of these issues there will be met maturities of $1,000,000 debenture notes on November 1 1915, and of $906 000 Citizens Street Railway first-mortgage bonds on January 1, 1916, the balance going to working capital. The retirement of the Citizens Street Railway Company first-mortgage bonds will make the consolidated bonds of the Memphis Street Railway Company a first mortgage.

Dividends.

	Term.	Rate.	Payable.
Asso. Gas & Elec., pf...	Q	1.5 %	Oct. 15
Bell Telephone, Pa.....	Q	1.5 %	Oct. 15
Boston Sub. Elec.....	Q	50c	Oct. 15
Commonwealth Edison..	Q	2 %	Nov. 1
Dallas Elec., 1st pf.....	S	3 %	Oct. 11
Dallas Elec., 2d pf.....	S	2.5 %	Oct. 11
Edison Elec. Illmg., Brockton	S	4 %	Nov. 1
Ill. Nor. Util., pf.....	Q	1.5 %	Nov. 1
Kan. Gas. & Elec., pf...	Q	1.5 %	Oct. 1
Manchester Trac., Pr. & Lt.	Q	2 %	Oct. 15
Montreal Teleg.....	Q	2 %	Oct. 15
Montreal Teleg., extra..	—	1 %	Oct. 15
Mountain States Tel. & Tel	Q	1.75%	Oct. 15
Northern States Pr....	Q	1.75%	Oct. 15
Ottawa Ry. & Lt., pf...	Q	1.75%	Oct 15
Penn. Cent. Lt. & Pr., pf.	Q	1 %	Oct. 4
Penn. Ltg. Co., pf.....	Q	1.25%	Oct. 15
Pub. Serv. Co. of Nor. Ill.	Q	1.5 %	Nov. 1
Pub. Serv. Co. of Nor. Ill., pf.....	Q	1.5 %	Nov. 1
United Rys. & Elec. Baltimore, com.....	Q	50c	Oct. 15
Va. Ry. & Pr.....	Q	1.5 %	Oct. 20
Wash., Baltl. & Annap. Elec., pf.....	Q	1.5 %	Sept. 30

Reports of Earnings.

WISCONSIN EDISON COMPANY
(North American Company, Subsidiary.)

	1915
August gross.....$	704 873
Expenses and taxes.....	446,538
Net earnings.....	258,335
Balance available for Wisconsin Edison and depreciation.....	121,002
Twelve months gross.....	8,452,850
Expenses and taxes.....	6,036 487
Net earnings.....	3,416,363
Balance available for Wisconsin Edison and depreciation.....	1,781,426

The appropriation for depreciation of subsidiary companies for the 12 months ended August 31, 1915, was $874,776, an increase of 6.95 per cent over the similar appropriation for the preceding year.

ELMIRA WATER, LIGHT & RAILROAD.

Three months and the 12 months ended June 30, 1915:

	1915	1914
Three months gross....$	256,652	$ 270,890
Net after taxes.....	95,171	102,170
Surplus after charges..	43,030	33,916
Twelve months gross..	1,105,689	1,067 355
Net after taxes.....	453,700	379,777
Surplus after charges..	214,270	127,130

Decrease in earnings and reduction in fixed charges for the three months is due to the sale by the company to the City of Elmira, in April, 1915, of the water works department, the proceeds of the sale being used to retire bonds of the company, thus increasing the surplus.

WESTERN RAILWAYS & LIGHT.

Three months and twelve months ended June 30:

	1915	1914
Three months gross....$	623,786	$ 647.021
Net after taxes.....	216 027	245,679
Surplus after charges..	48,173	62,477
Balance after preferred dividends	638	14,942
Twelve months gross..	2,601 937	2,651,178
Net after taxes.....	1,075.727	1,051,650
Surplus after charges..	375.426	377,389
Balance after preferred dividends	185,286	187,249

NEW ENGLAND TELEPHONE & TELEGRAPH.

New England Telephone & Telegraph Company reports to the Public Service Commission for the year ended June 30, 1915, compared as follows:

	1915	1914
Gross .....$	17 973,606	$17,798,327
Net	5 048,199	4,980,350
Surplus after charges	3 321,410	3,137,333
Dividends	3,025 732	3,017,896
Surplus	295,678	119,437

TWIN CITY LINES.

	1915	1914
August gross.....$	797 662	$ 796,205
Net	300 975	302,637
Surplus after charges..	163 464	171,408
Eight months gross....	6 180 302	6,123 344
Net	2,151 480	2 988 536
Surplus after charges..	1,090,758	1,248,437

NORTHERN STATES POWER.

	1915	1914
August gross.....$	377 343	$ 390 570
Net after taxes.....	197,738	172,723
Eight months gross...	3 204,993	2,855 892
Net after taxes.....	1 738 948	1,493,969
Twelve months gross..	4 868 772	.....
Net after taxes.....	2,604 728	.....
Surplus after charges..	1,197,543	.....
Balance after preferred dividends	610,474	.....

CITIES SERVICE COMPANIES.

	1915	1914
August gross .....$	312 725	$ 264 881
Net after expenses.....	298,170	252,581
Surplus after charges....	257,336	211,747
Balance after preferred dividends	126,503	74,914
12 months' gross	4 051,573	3,671,480
Net after expenses.....	3 805 732	3 571,465
Surplus after charges ..	3,405.732	3,225,023
Balance after preferred dividends	1 817.736	1,729,604

Accumulated surplus August 31, 1915, $4,648,369.

PERSONAL MENTION.

MR. E. B. GRAY, well known in Canada and in the Middle West, has accepted a position with the Detroit Fuse & Manufacturing Company, with headquarters at Chicago. Mr. Gray was formerly with the Holophane Works of the General Electric Company at Chicago and more recently has been representing this company in Toronto, Can.

MR. BYRON T. BURT, vice-president of the Rutland Railway, Light and Power Company, Rutland, Vt., has assumed the duties of general manager of that company in addition to the vice-presidency. Mr. Burt was formerly general manager of the Chattanooga and Tennessee River Power Company, with headquarters at Chattanooga, Tenn.

MR. JOHN C. M'CLENDON, who has been connected with the Harry I. Wood Company, was guest of honor at a dinner given by Jovian friends at the Henry Watterson Hotel, Louisville, before going to Elyria, O., where he will be connected with the R. E. Burger Electric Light and Power Company. Farewell addresses were made by a number of the members of the order and a traveling case was presented as a farewell gift.

MR. WALTER E. HOLLAND has resigned his position as research engineer of the Anderson Electric Car Company, Detroit, to become a firm member of the Broadway Automobile Company, Inc., of Seattle, Wash., agents in the Northwest for Detroit electric pleasure cars, Walker electric trucks, Elwell-Parker industrial trucks and Philadelphia storage batteries. Mr. Holland will be secretary and treasurer of the Broadway Automobile Company. Mr. Holland was for ten years connected with the Thomas A. Edison interests at Orange, N. J., and is well known as an expert on storage batteries and electric vehicles.

MR. T. LEE MILLER has been placed in charge of the Sangamo Electric Company's New York office, 50 Church Street. He was graduated from the University of Cornell, class of 1909, with the degree of mechanical engineer, and established connections with Marwick, Mitchell, Peat & Company, accountants, where he originated and established the present efficiency system for the Buick Motor Company. For the past four and a half years he was associated with the Toledo Railways and Light Company in the capacity of assistant to the president in charge of purchases and car maintenance. Mr. Miller is an associate member of American Institute of Electrical Engineers and of the American Society of Mechanical Engineers. He is a member of the National Electric Light Association, Racquet and Tennis Club Cornell University Club, and West Side Tennis Club of New York.

MR. J. H. PRIOR has been appointed chief engineer of the Illinois Public Utilities Commission, with headquarters at Springfield, Ill. Mr. Prior has been in the service of the Illinois Public Utilities Commission for about one year, as assistant chief engineer. He was educated at the Armour Institute of Technology and the University of Chicago. He was formerly assistant engineer in the service of Ralph Modieska, civil engineer, and he was engineer of design of the Chicago, Milwaukee & St. Paul Railway from

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 4.	Sept. 27.
American Tel. & Tel. (New York)	123⅜	125⅛
Commonwealth Edison (Chicago)	136½	136
Edison Electric Illuminating (Boston)	240	239½
Electric Storage Battery common (Philadelphia)	74	74
Electric Storage Battery preferred (Philadelphia)	74	74
General Electric (New York)	177½	173½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	8¾	9
Massachusetts Electric preferred (Boston)	42	43
National Carbon common (Chicago)	158	140½
National Carbon preferred (Chicago)	120	121
New England Telephone (Boston)	132	131
Philadelphia Electric (Philadelphia)	25	25
Postal Telegraph and Cables common (New York)	78	76¼
Postal Telegraph and Cables preferred (New York)	65½	66½
Western Union (New York)	76⅞	77
Westinghouse common (New York)	137¾	121⅛
Westinghouse preferred (New York)	146	140

Digitized by Google

1905 to 1914, in charge of the design of the heavy track elevation work executed by that company in the cities of Chicago, Ill.; Evanston, Ill.; Milwaukee, Wis.; and Minneapolis, Minn., during those years. He made some of the first valuations of railroad structures required by state regulatory and taxing bodies. He is a member of the American Railway Engineering Association, the American Economic Association, and the Chicago Engineers' Club. The Illinois Commission, which Mr. Prior will serve, has the broadest jurisdiction and powers. It is charged with the regulation, not only of steam and electric railways, gas and electric plants, but with the supervision of telephone companies, heating plants, warehouses, water works, wharfingers and steamboat lines, except such utilities as are municipally owned. The organization of the engineering department of the Commission has been proceeding during the past year until the Commission has a staff of nearly 30 engineers engaged in appraisal work, in service inspection, safety-appliance inspection and grade-separation work. Mr. Prior has been discharging the duties of chief engineer for the past seven months, pending his appointment.

J. H. Prior.

E. C. Robinson.

MR. E. C. ROBINSON, who was recently elected president of the Northwest Electric Light and Power Association, was born in Memphis, Tenn., September 12, 1875. He prepared for college at the Memphis Military Institute, later entering the University of Tennessee. On account of ill health in the summer of 1894 he went to Leland Stanford University, Palo Alto, Cal., that fall completing the course of electrical engineering, and receiving the degree of Bachelor of Science. Mr. Robinson followed electrical construction in Los Angeles for about a year. He then went to the Klondyke, Y. T., and spent four years in various electrical and steam engineering work, installing many isolated plants and serving as chief electrician for the Dawson Light & Power Company. He left Dawson in the fall of 1902, settling in Seattle, and accepting the position of superintendent of the Ballard Electric Company. This was a defunct municipal plant taken over by a private company, and Mr. Robinson had to re-build and put on a financial footing this run-down municipal experiment. He resigned this position for superintendent and manager of the Skagit Improvement Company of Sedro-Woolley, serving here about one and a half years, when he accepted the position he now holds as manager and engineer for the Jim Creek Water, Light & Power Company, at Arlington, Wash. He still serves as consulting engineer for the Skagit Improvement Company. Mr. Robinson has built the present hydroelectric plant, and has made an excellent showing for a system of that size. He was a charter member of the Seattle Section of the American Institute of Electrical Engineers, and has been an active figure in the Northwest Association from its inception, having served on various committees and also for two years as vice-president of the Association for Washington.

OBITUARY.

MR. ISAAC B. HAMMOND, Portland, Ore., for more than 25 years owner of the Hammond Manufacturing and Electric Company, died on September 22, at his home in Portland. Mr. Hammond was 71 years of age. The deceased was born at Lambs Corner, New York, on May 24, 1844, and came west in early life. For many years he had been very active in civic affairs of Portland, was a prominent Mason and belonged to the leading clubs of Portland. Death was caused by hardening of the arteries and complication of diseases.

DATES AHEAD.

Jovian Order. Thirteenth annual convention, Hotel Sherman, Chicago, Ill., October 13-15. Mercury, Ell. C. Bennett, Syndicate Trust Building, St. Louis, Mo.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Association of Railway Electrical Engineers. Annual convention, Hotel LaSalle, Chicago, Ill., October 18-22. Secretary, J. A. Andreucetti, Chicago & Northwestern Railway Company, Chicago, Ill.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Topeka, Kans., October 21. Secretary, Ivor Thomas, 237 South Main Street, Wichita, Kans.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 10-11. Secretary, H. F. Wheeler, Hattiesburg, Miss.

With the Electrical Manufacturers

Westinghouse Lamp Company has moved its Philadelphia office from the North American Building, to more spacious quarters in the Widener Building.

Lux Manufacturing Company, Hoboken, N. J., has issued a new price list of Lux tungsten vacuum lamps, gas-filled tungsten lamps and concentrated-filament tungsten lamps. All lamps made by this company are manufactured in this country.

Crouse-Hinds Company, Syracuse, N. Y., has issued a set of lists of conduit stock for the benefit of contractors, dealers and central stations. Seven typical lists giving assorted conduit fittings are given, also very favorable discount arrangements attainable thereby.

The Fibre Conduit Company, Orangeburg, N. Y., has moved its New York office to 101 Park Avenue, at the corner of Fortieth Street, New York City. This change was necessitated by the growth of the business requiring larger quarters. The new office is about three times the size of the former New York office.

Central Electric Company, 326 South Fifth Avenue, Chicago, Ill., has issued Bulletin No. 45 illustrating and describing the Ralco line of heavy-current plugs and receptacles. These are meeting with much favor in shops, roundhouses, docks, schools, etc., where large portable tools, machines, lamps, etc., are to be connected to circuits. The company also has ready

Digitized by Google

for distribution a folder giving illustrations and data on a new line of Maxolite fixtures for gas-filled Mazda lamps.

National Carbon Company, Cleveland, O., has issued a new booklet on Columbia batteries. It gives not only illustrations and valuable data on the various types of the well known Columbia dry cells, but also similar data on the several types of wet cells made by the company, among which are the National, Trojan, Le Clanche, Fuller and Columbia; the latter is a caustic-soda closed-circuit battery. Connectors and testing instruments are also included. The booklet also contains a brief history of the company and views of its eleven factories in the United States and Canada.

Bolinders Company, 30 Church Street, New York City, has issued a bulletin illustrating and briefly describing the Bolinder stationary engines for using heavy crude oil as fuel. This type of engine was originated by the parent Bolinders Company, of Stockholm, Sweden, which has put in service in all parts of the world, over 11,000 engines aggregating about 350,000 brake horsepower. The American company has but recently begun the introduction of this type of engine in this country and feels confident that the excellent results achieved with it abroad will assure it a demand here where simplicity and compactness of design and economy in operation are appreciated.

The Adanti Manufacturing Company, 919 West Avenue, Cleveland, O., has ready for distribution a new catalog of Adaptibox conduit fittings and other labor-saving electrical specialties. This catalog has been prepared with the idea of convenience to the electrical contractors and others interested in these devices. All illustrations are printed on the outer margin of the page directly opposite the listing of the article illustrated. Each specialty is clearly described and specified and a number of footnotes are repeated at the bottom of the page to save the trouble of looking up references usually put at the back of such lists. In addition to the complete line of Adaptibox fittings there are shown a number of special appliances including switchboxes, reinforced-concrete outlet boxes, loom clamps and connectors, and a new combination outlet box and receptacle. A copy of this catalog will be sent to anyone on request to the company.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports the following among orders recently received: Public Service Electric Company, Perth Amboy, N. J., two 1,083 kilovolt-ampere, 60-cycle, 13,200-volt three-phase to 2,600-volt two-phase duplex air-blast transformers. Board of Comissioners State Institutions, Lincoln, Neb., one 200-kilowatt, 240-volt, three-phase, 60-cycle, engine-type generator; one 15-kilowatt, turbine gear-driven exciter; one 20-kilowatt, motor-driven exciter; 190-kilovolt-amperes in 12 transformers of various sizes; 103.5 horsepower in 12 220-volt, three-phase motors. J. G. Robertson, Warren, Minn., one 150-kilovolt-ampere and one 75-kilovolt-ampere, 2,400-volt, three-phase, 60-cycle, engine-type generators; two belted exciters; one four-panel switchboard. Interurban Construction Company, for Salt Lake & Utah Railroad, three 250-kilowatt, 750-volt rotary converters for operation two in series on 1,500-volt direct-current circuit, alternating-current self-starting; three 150-kilovolt-ampere, 44,000-volt transformers with triple secondaries and complete switching equipment for same. Craig Electric Company, for Schenley High School, Pittsburgh, Pa., two 300-kilowatt, 250-volt direct-current, self-starting rotary converters, and one 10-panel switchboard. Public Service Electric Company, Newark, N. J., one 1,083-kilovolt-ampere, 11,000-volt, three-phase to 2,600-volt, two-phase, air-blast duplex transformer; four 48-kilovolt-ampere, two 24-kilovolt-ampere, single-phase, 60-cycle, 2,400-volt, 10 per cent regulation induction regulators. New York & Queens Electric Light & Power Company, Long Island City, N. Y., two 1,500-kilovolt-ampere, single-phase, 60-cycle, 13,000 to 2,200-volt air-blast transformers; two 1,000-kilovolt-ampere, single-phase, 60-cycle, 15,000 to 2,200-volt, air-blast transformers; three 1,500-kilovolt-ampere, single-phase, 60-cycle, 14,000 to 8,400-volt, air-blast transformers, complete with dial regulator of the step type, and four 46-kilovolt-ampere, single-phase, 60-cycle, 2,300-volt, 10 per-cent-regulation induction regulators. Burlington Traction Company, Burlington, Vt., one 500-kilowatt, 600-volt, direct-current, six-phase, 60-cycle, alternating-current, self-starting rotary converter; three 165-kilovolt-ampere, 2,400-volt to rotary-converter voltage, single-phase transformers; one two-panel switchboard.

Record ef Electrical Patents

Issued by the United States Patent Office, September 28, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,154,600. Damper-Controlling Apparatus. D. Belden, assignor to Jewell Mfg. Co., Auburn, N. Y. Details of thermostatic control of operating motor.

1,154,601. Extraction, Purification and Electrolytic Precipitation of Metallic Zinc from Smelter Fumes, Zinc Ores and the Like. O. Best, San Francisco, Cal. Pure zinc sulphate suitable for electrolyte is formed and zinc and sulphuric acid formed therefrom by electrolyzing, the acid being then neutralized and the neutral solution returned to the cell.

1,154,604. Electroplating Device. H. R. Boissier, Great Neck, N. Y. Particular structure of revoluble cathode carrying rack.

1,154,615. Safety Lamp. H. Csanyi, assignor to Maxivolt Primary Battery Co., New York, N. Y. Lamp in lensed casing has circuit held closed by frangible, translucent member bearing on bulb.

1,154,626. Terminal for Electric Apparatus. W. S. Hadaway, Jr., New Rochelle, N. Y. Resistor ribbon for heater has reinforced end.

1,154,628. Wireless Selective System and Apparatus. J. H. Hammond, Jr., Gloucester, Mass. Particular arrangement of receiving and relay stations.

1,154 653. Steering and Controlling System for Automobiles. A. W. Pattison, assignor to Grinnell Electric Car Co., Detroit, Mich Controller shiftable so as to permit operating from front or rear seat.

1,154,660. Plating Machine. L. Schulte, assignor to Electro Chemical Products Association, Chicago, Ill. Arrangement of tanks and structure of tube carrier.

1,154,671. Generator Mounting and Drive for Railway Cars. W. I. Thompson, assignor to Safety Car Heating Co., New York, N. Y. For axle-driven, car-lighting generator.

1,154,764. Insulating Head. C. L. Van Ness, Akron, O. Structure and arrangement of wire die and wire guider.

1,154,700. Telephone Apparatus. A. J. Kempien, St. Paul, Minn. Hand-controlled dimming resistance in branch at subscriber's station controls lamp associated with cord and line circuits at central.

1,154,701. Process of Producing Tungsten Filaments. E. A. Krüger, Seehausen, Altmark, Germany. Rod consisting of powdered tungsten with small proportion of boric acid and carbon, is caked together by heating and then made incandenscent by electric current in stream of hydrogen and reduced to wire.

1,154,725. Regulator. G. R. Radley, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Automatic controller requiring two ranges of control to operate in proper succession.

1,154,728. Rheostat. T. Rhodus, Chicago, Ill. Has particular form of resistance ring and rotating interior contactor.

1,154,733. Circuit-Controller. A. Simon, assignor to Cutler-Hammer Mfg. Co. For polyphase circuits.

1,154,735. Photographic Printing Apparatus. S. A. Smith, Burlington, Vt. Automatic apparatus has white and red lamps for illuminating at printing and other times.

1,154,738. Insulated Rail-Joint. C. E. Stevens, Lenexa, Kans. Arrangement of chairs, fish plates, insulation, etc.

1,154,750. Amplifying Electrical Impulses. R. A. Fessenden, Brant Rock, Mass. Amplifying circuit carries alternating current and is attuned to frequency of prime circuit, the circuits being inductively associated by means including a split circuit having reversely arranged rectifiers in its branches.

1,154,759. Trolley-Pole Base. C. E. Gierding, assignor to Ohio Brass Co., Mansfield, O. Detachable connection of pole to fork.

1,154,773. Junction Box. S. A. Huntington, Syracuse, N. Y. Special arrangement of insulating plates, busbars, etc., in water-tight, cable-connecting box.

1,154,785. Controlling Mechanism for Internal-Combustion Engines. H. Lemp, assignor to General Electric Co., Schenectady, N. Y. Electromagnetic regulators for pilot and additional engines.

1,154,791. Mechanical Releasing Means for Electric Brakes. G. M. Marr, New York, N. Y. Spring-applied, magnet-retracted brake has cam device for decreasing pressure on spring on release.

1,154,808. Method of Joining Metal by Welded Rivets. A. F. Rietzel, assignor to Universal Electric Welding Co., New York, N. Y. Elements of composite metal work united by a welding piece located between them and electrically welded in holes in their meeting portions.

1,154,818. Electric-Light Hanger and Adjuster for Mastarms. R. W. VanDorn, Saratoga Springs, N. Y. Rope and pulley arrangement.

1,154,820. Light-Regulating Device for Film-Printing Machines. G. White, Jersey City, N. J. Resistance device having its sections arranged in different combinations by exchangeable cards of insulating material carrying conducting eyelets.

1,154,823. Pot-Head Connector. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Connection is made by rotating intermediate member of the connector.

1,154,824. Headlight. R. F. Wilson, Denver, Colo. Concave reflector has lower half absorbent and upper half reflective.

1,154,828. Sleet-Cutter for Trolley Wires. W. H. Ahrens, Canandaigua, N. Y. Mounting of cutter on bracket for attachment to trolley harp.

1,154,834. Attaching Plug. H. P. Ball, assignor to General Electric Co. Two-part socket in insulating casing held together by spring on outside of casing acting through opening.

1,154,849. Means for Controlling Electric Current. C. R. England, assignor of one-half to R. E. Stone, McKeesport, Pa. Particular arrangement of adjustable resistance cartridge containing granular resistance material, and short-circuiting switch.

1,154,852. System of Current Distribution. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Arrangements of trans-

Digitized by Google

former and rectifiers for constant-current arc circuit.

1,154,896. Potential Transformer. O. W. Lunnon and E. Harvey, Denver, Colo. Special arrangement of core and coils.

1,154,903. Bonding Device for Rails. A. A. Ziegler, Boston, Mass. Tie bolts for fish plates support the bonding wires.

1,154,907. Electrostatic Separator for Sorting Out the Constituent Parts of Commodities According to Their Premeability. A. Bibolini, Agordo, and P. Riboni, Naples, Italy. Arrangements of field plate, conveyor and drums.

1,154,916. Cable Clamp. I. Evans, Lenoir City, Tenn. Has peculiar wedging means for gripping the cable.

1,154,925. Time-Controlled Thermostat. C. E. Jewell, assignor to Honeywell Heating Specialty Co., Wabash, Ind. Has provision for manual adjustment.

1,154,929. Signaling System. O. M. Leich and C. E. Hague, assignors to Kellogg Switchboard & Supply Co., Chicago, Ill. Automatic exchange system for party-line telephones.

1,154,933. Electrically Welded Tubing and Process of Making the Same. K. Peiseler, assignor to Thomson Electric Welding Co., Lynn, Mass. Joint of butt-welded tubes expanded so that inside burr will not restrict diameter beyond that of tube sections.

1,154,934. Sphygmomanometer. C. J. Pilling and G. S. White, assignors to G. P. Pilling & Son Co., Philadelphia, Pa. Pressure-controlled mercury column successively closes circuits containing translating devices having distinguishing characteristics.

1,154,945. Automatic Electric Regulator. E. B. H. Tower, Jr., assignor to United States Light & Heating Co., Niagara Falls, N. Y. Provision for increasing sensitiveness of electromagnetically operated carbon-disk rheostat in regulator for car-lighting system.

1,154,953. Electrical Heating Device. E. L. Wiegand, Youngstown, O. Resistor is imbedded in enamel in heating plate.

1,154,954. Electric Range. R. Williams, assignor to Simplex Electric Heating Co., Cambridge, Mass. Some heaters of range are turned out as others are turned on so as to keep maximum demand within total current capacity.

1,154,956. Electric Train-Control System. E. Woltmann, New York, N. Y., assignor to Automatic Train Stop Co. Train-controlled, sectional power-conductor system prevents too-near approach of trains.

1,154,963. Separable Attachment-Plug. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Details.

1,154,964. Braider Mechanism. F. Bentley, assignor to Simplex Wire & Cable Co., Cambridge, Mass. For use in covering w[illegible] roof wire.

1,154,976. Controller for Electric Motors. H. H. Cutler, Milwaukee, Wis. Electromagnetically operated resistance device for automatically accelerating motors.

1,154,979. Electrical Measuring Instrument. A. L. R. Ellis, assignor to General Electric Co. Arrangement of counterbalance for indicator arm of moving-coil instrument.

1,154,983. Machine-Efficiency Recorder. H. R. Ford, Buffalo, N. Y. Electromagnetically operated; forms record showing periods of rest and operation also output.

1,154,992. Apparatus for Electrically Igniting Miners' Safety Lamps. V. E. Joyce, London, England. Casing contains lamp and generator and generator is inoperative except when casing is closed.

1,154,993. A. J. Kercher, assignor to Berkeley Electric Cooker Co., Berkeley, Cal. Relates to heat insulation of electric cooker.

1,155,001. Apparatus for Regulating the Field Density of Electric Generators. G. S. Neeley, assignor to General Electric Co. Vibratory-contact voltage regulator.

1,155,021. Electric-Meter Brush. R. S. White, Washington, D. C. Moves with commutator in end play of armature.

1,155,026. Signaling Device for Vehicles. W. D. C. Wright, Philadelphia, Pa. Electromagnetically operated direction-indicator for automobiles.

1,155,036. Electrotherapeutic Apparatus. S. Brooks, Jr., and C. R. Anderson, Los Angeles, Cal. Arrangement of applicators and circuits in combined continuous-current and intermittent-current device.

1,155,046 and 1,155,047. Storage Battery. W. A. Crowdus, assignor to Atkinson, Mentzer & Co., Chicago, Ill. First patent: structure of grid holding active material. Second patent: plate spacing and ground-wood-pulp filler for absorbing electrolyte.

1,155,058. Electrical Resistance. C. E. Hay, Ilford, and H. W. Sullivan, London, England. Arrangement of superposed cylindrical windings to neutralize inductance. (See cut.)

1,155,063. Pigtail Brush. J. Hetherington, Newark, N. J., and C. E. Chapin, New York, N. Y.; said Hetherington assignor to said Chapin. Connection of conductor to carbon brush.

1,155,095. Electrical Measuring Instrument. W. E. Porter, assignor to General Electric Co. Arrangement of counterbalancing and counterweight arms on movable element.

1,155,098. Electrically Operated Water Heater for Automobile Radiators. E. M. Rosenbluth, Philadelphia, Pa. Attachment having circulation through intake and drip cock.

1,155,100. Portable Electric Flashlight. C. J. Sagebrecht, assignor to Interstate Electric Novelty Co., New York, N. Y. Structure of tubular casing and arrangement of conductors.

1,155,106. Synchronizing Recorder. E. O. Schweitzer, Chicago, Ill. Movements of pointer recorded on movable sheet with provision for controlling the recording and advance of sheet.

1,155,121. Switch. V. G. Apple, Dayton, O. Details of push snap switch.

1,155,123. Driving Mechanism. F. C. Barton, assignor to General Electric Co. Motor in hub drives rim of tractor wheel through gearing.

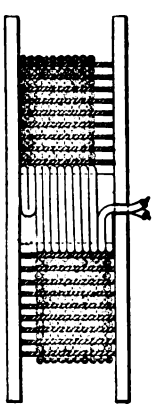
1,155,127. Cable Support. O. W. Brenizer, assignor of one-half to D. L. Short, West Collingswood, N. J. Single piece of wire for suspending from messenger.

1,155,133. Protective Means for Electrical Systems. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Arrangement of circuit-breakers and tripping coils at ends of transmission line for cutting it out upon abnormal conditions.

1,155,134. Means for Protecting Electrical Systems. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Modification of above for same purpose.

1,155,144. Burglar-Alarm. H. T. Gay, assignor to Protection Co., Baltimore, Md. Battery bell circuit in box is closed when box is moved.

1,155,157. Reversing Switch. H. A. Lewis, assignor to Westinghouse Electric & Mfg. Co. Details of magnet-operated device.



No. 1,155,058.—Noninductive Resistance.

1,155,162. Frame for Turbo-Driven Machines. R. H. Rice, assignor to General Electric Co. Girder frame for turbo-generator.

1,155,163. Geared Turbine-Driven Set. R. H. Rice, assignor to General Electric Co. Relates to gearing between turbine and dynamo in unitary set.

1,155,164. System and Method of Control for Electric Motors. L. G. Riley, assignor to Westinghouse Electric & Mfg. Co. Battery sections and motor windings are connected in different series-parallel combinations.

1,155,166. Percolator. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Arrangement of electric heater at base of fountain tube.

1,155,167. Electric Heating Apparatus. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Heating unit has resistor in casing with one end exposed.

1,155,170. System and Method of Control for Electric Motors. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Electric motor operated regeneratively in battery vehicle.

1,155,172. Vending Machine. H. J. Sweany, Ouapaw, Okla. Electrically operated ticket-seller.

1,155,197. System of Electric Motor Control. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. Speed control of motor for planers, etc.

1,155,208. Electrically Lighted Pencil. W. O. Browne, Boston, Mass. Pencil-holding attachment at end of flashlight casing.

1,155,225. Electric Locomotive. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Arrangement of cab, trucks, etc

1,155,226. Trolley Wheel. E. E. Eby, assignor to Westinghouse Electric & Mfg. Co. Connection to wheel made by disk on shaft dipping into conducting liquid in recess in wheel.

1,155,249. Flashlight. H. M. Koretzky, New York, N. Y. Details of battery lamp arranged in casing resembling a watch.

1,155,290 and 1,155,291. Starting Box. M. Talgman, New York, N. Y. First patent: for ceiling attachment; arrangement of retracting spring. Second patent, same type; arrangement of operating levers.

1,155,294. Signaling Device. L. Abeles, assignor of one-half to D. J. Shern, Philadelphia, Pa. Automobile tail indicator having apparatus arranged to be removable as unit from casing.

1,155,300. Expression Device for Electric Organs. J. W. Darley, Jr., Baltimore, Md. Vibratory bodies electrically controlled by key, the degree of control depending upon the speed impressed on the key.

1,155,301. Key-Controlled Contact-Maker for Use With Musical Instruments. J. W. Darley, Jr. Related to above.

1,155,302 Circuit-Closer. J. W. Darley, Jr., Baltimore, Md. Related to above; contacts made depend upon extent of movement of key and pedal-controlled means.

1,155,307. Switch-Operating Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Details of pull socket.

1,155,317. Method of Applying Protective Coatings to Metallic Articles. Clarence Mark and Clayton Mark, Jr., assignors to Clayton Mark, Lake Forest Ill. Article is immersed in molten lead bath protected by flux of sal-ammoniac containing iron and zinc salts, the lead bath being alloyed with sufficient zinc to render the coating obtained electropositive to iron.

1,155,322. Electric-Circuit-Timing Device. R. C. Leake, assignor, to General Railway Signal Co., Gates, N. Y. Contacting of finger timed by rocking part to which it is secured.

Reissue 13,999. Selective System of Telephony. R. C. M. Hastings assignor to International Telephone Co., Columbus, O. Original No. 1,061,285, dated May 13, 1913. Particular arrangement for selectively calling and locking out subscribers on party lines.

Patents Expired.

The following United States electrical patents expired on October 4, 1915:

611,601. Electric Arc Lamp. S. Bergmann, New York, N. Y.

611,638. Signal Apparatus. H. G. Leopold, New York, N. Y.

611,707. Electrical Connector. J. Pedriali, Brussels, Belgium.

611,719. Electrical Circuit-Controller. N. Tesla, New York, N. Y.

611,722. Electrical Measuring Instrument. E. Weston, Newark, N. J.

611,723. Index Needle or Hand for Electrical Measuring Instruments. E. Weston.

611,724. Electrometer. E. Weston.

611,752. Trolley Ear. H. Geisenhöner, Schenectady, N. Y.

611,760. Surface-Contact Railway System. W. B. Potter, Schenectady, N. Y.

611,766. Device for Suspending Arc Lamps. J. Borka, Buffalo, N. Y.

611,778. Electric Railway. J. B. Entz, Philadelphia, Pa.

611,809. Electric Meter. S. Evershed, London, England.

611,820. Roadbed Construction. J. H. Robertson, New York, N. Y.

611,821. Electric Railway Conduit and Trolley. J. H. Robertson, New York, N. Y.

611,822. Electric Time Switch. F. M. Schmidt, J. H. Gerry and W. S. Barstow, New York, N. Y.

611,850. Electromagnetic Engine. P. B. Watson, Philadelphia, Pa.

611,869. Automatic Switch Apparatus. A. Schlatter, Budapest, Austria-Hungary.

611,894. Signaling. J. P. Coleman, Edgewood Park, Pa.

611,897. Electric Signal Device for Railways. L. T. Dube, Paris, France.

611,902. Apparatus for Adjusting Phases of Alternating Currents. J. H. F. Görges, Berlin, Germany.

611,919. Telegraph Key. F. E. Lewis, Jefferson, Tex.

611,927. Multiple-Rate Metering System. F. T. McIntyre, Washington, D. C.

611,943. Railway Signaling. J. G. Schreuder, Edgewood Park, Pa.

611,970. Method of and Means for Controlling Energy Delivered to Translating Devices. H. W. Leonard, East Orange, N. J.

611,971. Electrical Wireman's Combined Gauge and Calculator. H. Lutz, Hamilton, Can.

611,974. Automatic Switching and Telephone System. L. G. Nilson, Sioux City, Iowa.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 16. CHICAGO, SATURDAY, OCTOBER 16, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:

The Future of the Electric Vehicle..... 693
Flood Lighting 694
Improvement in Electrical Export Trade..... 694
Measuring Maximum Demand..... 695

DEPARTMENTS:

Electrical Construction 716
National Association of Electrical Inspectors..... 718
Among the Supply Men..... 720
Public Service Commissions..... 721
New Electrical and Mechanical Appliances..... 728
Latest Approved Fittings..... 735
Current Electrical News..... 736
Record of Electrical Patents..... 739

LEADING ARTICLES:

The Electric Vehicle Association of America..... 697
The Opportunity for the Sale of Electrics..... 703
The Electric Vehicle as a Business Builder..... 710
An Electric Commercial Car Garage in Chicago..... 713
Tests of Splices in Galvanized Iron Wire.—By Terrell Croft 716

MISCELLANEOUS:

Jovian Convention Opens in Chicago..... 696
Commonwealth Edison Company Orders 30,000-Kilowatt Unit 696
Another Postponement of the Washington Conference on Safety Code..... 696
Electric Vehicle Making Long Cross-Country Run..... 712
The Need for Reducing the Number of Standard Wheel and Tire Sizes for Electric Vehicles.—By Paul W. Kerr 712
Electrical Exports for July..... 715
Lynn Section Meetings..... 715
Convention of Colorado Association..... 715
Among the Contractors..... 717
Chicago Jobbers Stage Big Golf Party at Belmont..... 720
Effective Display of Line Material..... 720
A New Maximum-Demand Meter..... 722
Big Electrical Prosperity Week Meetings..... 723
Empire State Meeting..... 723
Flood Lighting of Building Front From Ornamental Cluster Posts..... 724
Exhibitors at New York Electrical Show..... 725
Exposition Engineers' Day at the Panama-Pacific International Exposition..... 726
Electric Railway Associations Elect National Officers..... 726
Peoria Club Wins Prize..... 727
Municipal Electric Power System of Sydney, Australia... 727

Copyright, 1915, by Electrical Review Publishing Company, Inc.

THE FUTURE OF THE ELECTRIC VEHICLE.

The experience which has been had up to the present time with the electric vehicle in both commercial and pleasure service is sufficient to indicate what the future developments in this line must be in order to assure it the greatest success. Mistakes have been made, but every mistake, and every failure whose cause is recognized, should serve as a stepping stone to more successful efforts in the future.

With the accumulation of operating experience and operating data it is more exactly possible today than ever before to specify the type and size of vehicle which will be best suited to a particular service and hence to furnish that service with satisfaction. And it is important than this be always done. To sell the user a model which cannot meet his requirements is far worse than losing a sale. It has not only created a knocker of that particular customer, but in all probability the failure which is heralded far and wide is connected not only with that particular make of vehicle but with electric vehicles in general.

Next to the selection of a model suited to the requirements of the service, the provision of adequate garaging and charging facilities is of paramount importance. Their lack has caused the condemnation of many a vehicle. Such facilities connote expert attention and proper care and maintenance. They are absent from many private garages. The commercial electric garage, especially catering to trucks, is indicated, and is as necessary as the electric garage which cares for passenger vehicles. The charges of such a garage should be based upon services rendered, which includes a charge for electric energy on a meter basis. Facilities for repairs should be provided and this suggests as an adjunct to the public garage a machine shop. An example of such a machine shop, which accommodates outside work and is being operated successfully, is described in this issue.

Another large factor in the future success of the electric vehicle will no doubt be the system of battery exchange. This will be greatly facilitated by the standardization of cell and tray dimensions, a crying need which should soon be realized. Definite action by the Electric Vehicle Association of America will undoubtedly hasten the culmination of the movement to this end. Battery service is perhaps the most vital point of all in the operation of the electric vehicle, and the exchange system seems to offer the most feasible means of furnishing it.

A development which would accelerate the introduc-

Digitized by Google

tion of electric-vehicle service in commercial hauling would be the supply not only of batteries, but of the vehicles themselves by a central agency. Contracts could be made to supply as many vehicles as were necessary for a given company's hauling, the vehicles being owned and cared for by the central agency. No doubt such a possibility would lead to the use of electric vehicles by many concerns which think that electric vehicles are in the experimental stage and do not care to take the risk of purchase. The scheme has already been applied to gasoline automobiles with notable success in several large cities, and its adoption in the electric field would greatly stimulate the use of electric wagons, to the great advantage of both manufacturers and central stations.

FLOOD LIGHTING.

The illumination of building exteriors so as to simulate daylight appearances in an effective but economical manner has long been one of the many problems whose solution has been sought by the illuminating engineer. The development of outline lighting over 20 years ago has resulted in the production of some pleasing results of its own type, but could hardly be regarded as achieving daylight effects. To reproduce the latter realistically required throwing a flood of light upon the entire building front from a source or sources concealed or at least not conspicuously noticeable. Since sunlight illumination was the model to be copied, naturally the first attempts at what has now come to be known as flood lighting were made with searchlights or projectors. Where these can be placed advantageously so as to spread their beams uniformly over the building surface, the result is very effective.

The development of high-efficiency sources of the concentrated type during the last two years has greatly stimulated this type of lighting. Doubtless the finest example of it is that so successfully employed on a very large scale at the Panama-Pacific International Exposition. The grandeur of the effects obtainable when an imposing architectural edifice is brought into striking relief against the back-ground of the dark sky, as is done so wonderfully at San Francisco, must be very gratifying to the architect by bringing the fruits of his design more into the public eye by night than even by day.

While flood lighting is peculiarly adaptable to the illumination of large and handsome public buildings, and has been pleasingly employed in quite a number of cases of this kind, the advertising value it gives to the structure made prominent by it has naturally brought about its employment for commercial purposes and this has broadened its possibilities as a central-station load. Neglecting its use for the illumination of billboards, the flood lighting of theaters, banks and other business houses presents a fruitful field for exploitation by the wide-awake central-station company.

Commercial adaptation of flood lighting has been retarded by the fact that it has required a favorable location for the projectors needed for throwing the light upon the building front. To mount them upon opposite buildings requires the consent of their owners, which is not always obtainable for commercial purposes, and usually involves such a placing of the projecting lamps as would cause very annoying glare. An ingenious solution of this problem has been worked out by Mr. J. R. Cravath, of Chicago, and the first installation of it is described on other pages of this issue.

By this method no separately mounted projectors are required and for the projecting lamps there are used the top lamps of standard ornamental cluster posts somewhat modified for this purpose. This not only eliminates the numerous difficulties connected with the location of projectors, but utilizes advantageously the ornamental standards that have come into considerable vogue along business streets. The results achieved so successfully in this first installation are along the modern line of lighting from concealed sources, thus reducing glare to a minimum and making it possible to see the object illuminated without effort. The harmonious effect produced of illuminating an entire commercial building and the sidewalk about it without interfering with the effectiveness of electric signs and window displays is peculiarly advantageous to the merchant.

Success in a new development adaptable to commercial ends readily leads to its application without proper consideration of the requirements. In the case of flood lighting from posts at the curb, it should be noted that each installation requires careful study of the conditions prevailing, such as height, configuration and color of building, width of sidewalk, etc., else reflectors of unsuitable type or improper mounting will be used, as well as other technical points overlooked. Skillfully employed, this method of lighting a building exterior should find many applications that would not be suited to projector lighting.

IMPROVEMENT IN ELECTRICAL-EXPORT TRADE.

Much encouragement should be felt by American electrical manufacturers because the improved business conditions in the home markets are being rivaled by steady improvement in the electrical-export trade. The official export figures for July, just come to hand, disclose a larger total value of electrical shipments than for any month during the last year and a half. As compared with July of last year, which was the month just preceding the opening of the European war, the electrical total shows an increase of nearly 52 per cent. The detailed figures of the government report, as given on another page of this issue, indicate an increase in all but two of the fourteen electrical classes reported, thus showing a very gratifying general improvement.

It has been pointed out in these columns that this improvement, which has become more and more marked as the present year advanced, was due in part to heavy shipments of electrical supplies needed in prosecuting the war and in part to the necessity

Digitized by Google

confronting neutral countries, that formerly imported electrical goods from the belligerents, of buying their equipment from our manufacturers. The market created by this latter demand has placed our exporters in a peculiarly advantageous position for the time being, at least. Upon the manner in which this foreign trade is handled will depend its permanency. It is evident that every legitimate effort should be made to encourage this business to come permanently to us. This requires extension of the greatest courtesy to the foreign buyers, attention to minute details of their requests, and active cultivation of their good will.

Although the dependence of neutral countries, particularly in South America, on our products has been manifest for over a year since the war began, the increase of this commerce has not been commensurate with the expectations of either exporters or importers. At a recent meeting of commercial interests in Buenos Aires to consider the causes restricting the development of trade with the United States, it was agreed that, if American commerce is to realize its ambition of securing the Argentine market, it will be obliged to modify its methods of sale, manufacture and shipment. It is necessary to meet the customs followed by European manufacturers, who have largely controlled the South American market, of extending liberal credits to reputable purchasers, of manufacturing the products in strict accordance with the climatic and other needs of the importing country, and of making the shipments exactly as instructed. These complaints against American practice are not confined to South American purchasers.

It is conceded by those who have thoughtfully considered the subject that the European manufacturers will, at the conclusion of the war, make heroic efforts to re-establish their former extensive foreign commerce. It is undoubtedly true that they will be handicapped by heavy additional taxation, resulting from the burdens of the war. Nevertheless, they will again appear as active competitors for foreign business. In order that American manufacturers can meet their competition, they must firmly establish their reputation for fair business dealings, reliability of products and courteous attention to the susceptibilities of sensitive foreign buyers.

Price, while very important, is by no means the only consideration. In fact, in the electrical line, particularly in wiring devices, sockets, switches, etc., American products are vastly superior to much of the cheap stuff that has gutted the foreign markets. Education as to the value of this superior quality should result in creating for it an increasing demand, since the standards for quality of electrical goods are bound to be raised abroad. Electrical development in nearly all lines has been carried much further in this country than anywhere else. It is but natural, therefore, that our electrical manufacturers should have a predominant position.

MEASURING MAXIMUM DEMAND.

The cost of furnishing electric service may be divided into four parts. The first is made up of those elements which are dependent upon the consumption of energy, such as coal; the second of those independent of consumption, but dependent upon the capacity of the generating, transmitting and distributing equipment, such as fixed charges on machinery; the third of those which depend upon the number of consumers receiving service, such as meter reading; the fourth of those overhead or general expenses which do not depend definitely upon any one of the above conditions, such as legal expenses.

The relative importance of the different elements of cost varies greatly with the conditions of service. Where steam plants supply power, the first or energy cost may predominate. Where hydroelectric plants not requiring water storage supply power, the second or capacity cost may predominate. Where there are a large number of small consumers, the third or consumer cost may predominate.

A rational schedule of rates must give consideration to all of these elements. For simplicity the rate may be based on one element when it greatly predominates. If a schedule attempts to fix prices so that each consumer is charged according to the cost of serving him, it becomes necessary to determine both his consumption and the capacity of equipment necessary to serve him. The latter depends upon his maximum demand and upon the diversity-factor of his load when combined with that of other consumers.

The greatest development of central-station service in this country has taken place in localities where power is generated from fuel. Naturally in formulating charges emphasis was put on the energy consumption and the use of watt-hour meters as a basis for bills has become almost universal. Cognizance of other factors has been taken by fixing prices per kilowatt-hour dependent upon conditions of use and grouping consumers according to average conditions. Under some of the conditions mentioned above it would be much simpler to base charges upon demand. The importance of measuring maximum demand was pointed out in these columns in the issue of September 18.

The subject is brought to our attention once more by the paper presented last week by Mr. Paul M. Lincoln to the American Institute of Electrical Engineers, describing a new instrument for the measurement of maximum demand. Unfortunately the discussion was largely turned from the subject of measuring demand to the question of using demand meters by the inappropriate title of the paper. Mr. Lincoln's device has the merit of being influenced by the load in the same manner as the electrical equipment used to supply power, and this feature should commend it for the purpose intended. The industry will await with interest the commercial production and operation of the new type of meter. Not until then can proper comparisons with other types be made. A satisfactory and cheap type of demand meter having the characteristics stated will be eagerly welcomed.

Digitized by Google

Jovian Convention Opens in Chicago.

The registration of Jovians from outlying points on the first day of the annual convention of the Jovian Order at the Hotel Sherman, Chicago, Wednesday, October 13, indicated that all previous attendance records would be eclipsed by the current meeting. At an early hour 412 had registered, this figure not including the heavy local registration which is expected before the close of the convention.

A fitting reception to the visiting delegates was tendered by business interests of Chicago in the form of a complimentary luncheon on Wednesday noon under the auspices of the Chicago Association of Commerce at the Hotel La Salle. A stirring address was delivered by Dr. Frank W. Gunsaulus, president of Armour Institute of Technology, in which tribute was paid to the contributions of the electrical industry in benefiting mankind.

The opening business session was held on Wednesday afternoon, Reigning Jupiter Homer E. Niesz extending a cordial welcome to the thirteenth convention. City Prosecutor Miller, of Chicago, represented Mayor William Hale Thompson in extending the hospitalities of the city and an eloquent response was made on behalf of the Jovian Order by Henry W. Kiel, mayor of St. Louis.

Henry Harris, of Pittsburgh, then took the chair and presided at the remaining sessions. The report of Mercury Ell C. Bennett presented at the opening session reviewed in detail the work which has been accomplished during the past year and embodied suggestions for future activities. The most important feature of Jovian work is embodied in the activities of the Jovian leagues throughout the country, there now being 72 such organizations. In many instances these local organizations have been active in promoting a wider use of electricity and in gaining the co-operation of the various allied interests. Mention was made of house-wiring campaigns, co-operative electrical shows, etc., which have been carried on during the past year in numerous localities under the auspices of the Jovian Order. There is a vast field for further work in this direction.

Regarding membership it was pointed out that while the aim of the administration has not been to break previous records in candidates initiated, there has nevertheless been a net gain during the thirteenth administration of 1,231, making the total membership to date of 16,147.

The report deals at some length with the classification of this membership and the part that various officers and individuals played in securing the increase.

Reference was made to Electrical Prosperity Week and the part which the Jovian Order can take in making it a success. Many of the local leagues have formulated definite plans for participating in co-operation with other local organizations. It is pointed out that Jovian Day can be designated as a time when similar activity can be promulgated annually hereafter.

The work of the Commercial Division of the Order was reviewed and the possibilities in this direction emphasized. The Efficiency Campaign inaugurated shortly after the annual convention last year has been productive of good results and the articles dealing with various efficiency ideas submitted in a contest conducted by the Order contain a wealth of suggestions for improving efficiency in many directions. These articles will be printed in pamphlet form for general distribution. Another activity of the Commercial Division has been the establishment of an employment bureau which is operated without expense to either the employer or employee. Work is actively progressing on the standardization of electric shows and when completed will enable local Jovian organizations, central stations, or others interested, to conduct an exhibition on a modest scale that will stimulate interest in things electrical and at the same time be made self-supporting. Other plans which have been considered and which will be carried out as time and funds permit include the working for the co-operation of architects in providing suitable electrical facilities in buildings; the preparation of publicity matter which will be at the disposal of all interested in furthering the use of electricity; and the establishment of correspondence courses for those desiring an elementary course of instructions in various branches of electrical work. The degree of Vulcan which was created primarily to insure funds for the carrying out of the work of the Commercial Division is meeting with favor and it is expected that during the coming year these funds will enable the Order to carry out the proposed work in a complete manner.

On Wednesday evening an informal reception and dance was held at the Hotel Sherman, the program including exhibitions of dancing by professionals and a concert by the Commonwealth Edison orchestra of 150 pieces.

A complete report of the remaining sessions will be given in our next issue.

Independent Telephone Convention in San Francisco.

A convention of the Independent Telephone Association of America, which is expected to be national in scope, is to be held at San Francisco, Cal., on October 26 to 29. This will be the first national independent telephone meeting ever held on the Pacific Coast. Addresses will be made by leaders in the movement, among whom will be E. B. Fisher, of Grand Rapids, Mich.; C. E. Summer, San Diego, Cal.; A. Schuler, Santa Barbara, Cal.; T. H. Gould, Redondo Beach, Cal.; A. Wardman, Whittier, Cal.; E. P. Morphy, Redlands, Cal., and C. A. Rolfe, Redlands, Cal.

Commonwealth Edison Company Orders 30,000-Kilowatt Unit.

The Commonwealth Edison Company has just placed an order with the Westinghouse Electric & Manufacturing Company for a 35,300-kilovolt-ampere turbo-alternator which is to be installed at Northwest station. The new unit will be rated at 30,000 kilowatts at 85 per cent power-factor, three-phase, 60 cycles, 12,000 volts, and it is said will embody many novel features.

The turbine is of the Parsons type, tandem compound, direct-connected to a single generator. The turbine is designed for a 250-pound steam pressure and 29-inch vacuum. A direct-connected exciter unit will be provided as also a separate motor-driven blower equipment for supplying cooling air. This will be installed in the air inlet duct.

The entire unit will be 75 feet long, 18 feet 6 inches wide and will measure 21 feet at its highest point.

In the new unit use will be made for the first time of micarta folium insulation. The unit will therefore be guaranteed to stand a temperature of 150 degrees centigrade in continuous operation.

The company expects to have the unit in operation by the fall of 1916.

Another Postponement of the Washington Conference on Safety Code.

The Bureau of Standards announces the postponement of the conference that was to meet at Washington on October 27 and 28, until a date to be announced later. This sudden change of plans is due to the urgent request of the National Electric Light Association, the American Institute of Electrical Engineers, and the Association of Edison Illuminating Companies, that additional time be granted for the consideration of the code of rules that has been formulated by the Bureau before they are submitted to a formal conference.

The engineering societies requesting the postponement have given the Bureau assurance of prompt and active co-operation and every effort will be made to complete the work at an early date.

The Bureau regrets the inconvenience to many delegates caused by a postponement at so late a date, but believes that the issues at stake are so great and the results obtainable by the expenditure of further time and effort are likely to be so much more satisfactory under the circumstances than would have been possible otherwise, as to fully justify whatever inconvenience and confusion will be caused by the further postponement of the conference.

Digitized by Google

THE ELECTRIC VEHICLE ASSOCIATION OF AMERICA.

Its Influence on the Present and Future Development of the Industry.

With all the merit that the electric vehicle possesses to warrant its employment as a domestic convenience by the average well-to-do family, and in the commercial field as the cheapest and most expeditious conveyance yet devised, there nevertheless has been, and still is, a need for comprehensive co-operative work on the part of the various allied interests if the industry is to achieve the success to which it is legitimately entitled.

One of the underlying requirements in the industry has been the need for a proper appreciation on the part of the separate interests that comprise the business as a whole, of the position each holds with respect to future developments. It was early realized that co-operation between the electric-vehicle manufacturers and the central stations was essential to the success of the business, but it was difficult to establish a common basis for the discussion of problems of mutual interest. The manufacturers were prone to place the responsibility for the success of the business upon the central stations, expecting perhaps that the same assistance would be given as is true in the motor or electric appliance business. The central stations, on the other hand, were slow in realizing the immense possibilities of the battery-charging load and were skeptical regarding the merits of the electric vehicle.

Another most important need upon which the success of the electric-vehicle industry hinges is that of educating the public. The electric, in its present efficient state, is a comparatively new development, although the origin of the battery vehicle dates back many years, and like other fields of commercial endeavor, where the introduction of new methods or improved equipment becomes a problem, the impediments of novelty must be brushed aside and the facts presented in a clear and concise manner.

Such co-operative work lies clearly within the province of the Electric Vehicle Association of America, and to its influence in bringing about a better understanding of the relations that should exist between the central stations, the manufacturers, the garages and the public, is due a large share of the credit for the present development of the business.

This remarkably active association, which has 14 branches in as many important cities throughout the country, is a tremendously powerful ally to the industry. The various branches hold weekly and monthly meetings, in addition to the annual meeting of the parent body, at which papers are read on the more important aspects of the business, and at which methods are planned and carried out for increasing the use of electric vehicles. All of which means that the Association is no academic body of merely philosophical enthusiasts, but rather an energetically determined body of men bent on pushing, and, moreover, forcing the electric into the front-rank position they think it should hold.

Although the millennium has by no means been reached, there is today, fortunately, a better understanding of the importance of the field, and a more pronounced tendency towards real co-operation. From the standpoint of the electric-vehicle manufacturer the principal objects to be attained through co-operation are greater satisfaction among vehicle users, reduction of operating difficulties, and consequent increased sales, and also vehicle sales, made possible by the good example established in the use of vehicles by the electric service companies, and because the service companies are in a position to advise the manufacturers of live prospects for the purchase of vehicles.

From the standpoint of the central station the advantages to be realized are the promotion of the sale of electricity, thereby increasing revenue; improved operating conditions, that is through obtaining a considerable off-peak charging business the central-station load-factor is improved and the cost of production reduced; advertising, the service company feels that every electrically operated machine, be it an automobile or a buzz-saw, is an advertisement instrumental in bringing new customers to its lines; furthering the interests of the industrial and social progress of the communities in which the central-station company operates, for any improvement in civic welfare is ultimately reflected to the service

A PROPHECY—BY PRESIDENT GILCHRIST.

The study of the evolution of the various major pieces of electrical apparatus and the conquest of industrial, commercial and domestic situations by this apparatus is one of absorbing interest. Electric illumination has all but crowded out other illuminants wherever electricity is obtainable. The stationary electric motor has had an easy victory over both the steam and the gas engine. In the case of vertical transportation in the modern sky-scrapers, various types of hydraulic and steam methods of propulsion, which a few years ago seemed to be so thoroughly intrenched that no adaptation of electricity would ever be able to supplant them, have, after a stubborn resistance, given way until today well-informed experts, regardless of their former favorites, unanimously admit that the electric method, which for so many years of its development period seemed doomed to failure, is without question, the superior of all methods, both mechanically and economically; and this leads us to the consideration of the electric idea as applied to vehicle transportation.

The development of the gasoline engine for such service has been one of the world's wonders; but in this field also the electric has taken a firm hold, and slowly but surely it has forced upon the attention of the industry the absolute superiority of service whcih it makes possible. In the development of the electric-vehicle industry many great businesses are brought into consideration. The manufacturers of vehicles, of electric machinery, of electric storage batteries, rubber tires, and finally, the electric utilities which provide for the charging of the vehicles are all vitally interested. This situation has led to the formation of the Electric Vehicle Association of America, enrolling on an equal footing the representatives of these interested industries, and through its organization various constructive work is being done for the furthering of the mutual interest. The electric-vehicle industry is destined to be one of the greatest industries of the century.

Digitized by Google

company, either in improved surroundings and aesthetic betterment, or in good round dollars.

The public, too, is being educated to the many inherent advantages of the electric vehicle, and the co-operation which developed in the Electric Vehicle Association made possible an educational advertising campaign which has had inestimable influence in this direction.

In reviewing the important work which has been done by the Association it is significant to note that all has been accomplished within a space of six years.

The Electric Vehicle Association of America was the outgrowth of an electric-vehicle promotion organization, created in Boston in 1909. The Association was originally termed "The Electric Vehicle and the Central Station." The first organization meeting and convention of the Association was held in Boston in the Edison Auditorium of the Edison Electric Illuminating Company, October 17, 1910. The membership at that time was about 50.

The second convention was held in New York City, October 10, 1911, with W. H. Blood, Jr., president. The membership at that time was about 200. At

H. W. Johnson,
Vice-president.

this convention there was a report of general progress by the president, and reports from various Committees on Education, Standardization, Membership, Transportation, etc., and comprehensive papers by E. W. Curtis, Jr., W. E. Holland, S. C. Harris, etc.

The third annual convention was held at Boston, Mass., October 8 and 9, 1912. The membership at this time had increased to 335, and the convention was considered successful from every standpoint. During this year the Chicago Section was created, this being the second branch of the Association.

At the fourth convention, held in Chicago, October 27 and 28, the membership was announced as 429. President Arthur Williams, in his presidential address, forcibly called attention to the necessity of central-station co-operation and at this convention the greatest stress was laid upon this phase of the problem of vehicle development.

The fifth convention, held at Philadelphia, on October 19, 20 and 21, 1914,

H. M. Edwards,
Treasurer.

was notable in many ways. The increasing influence of the Association was reflected in the number of members secured during the year, and also in the increasing of the influence of the Association by the establishment of 12 additional sections. At the close of the convention the membership had reached the high total of 885, a gain of 456 for the year.

At the sixth annual convention in Cleveland, October 18 and 19, it is expected that the membership will have reached the 1,000 mark and the formation of two additional sections will be announced.

The work of the Association is largely carried on by committees, which work continuously for the good of the industry. Among the more important of these may be mentioned the following:

Committee on Garage and Rates, which has obtained an index of garage conditions and rates throughout the country, and at the 1914 convention presented a comprehensive report indicating electric-vehicle charging facilities along the route of the Lincoln Highway.

The Committee on Insurance has been instrumental in securing a ruling whereby many of the fire-insurance companies have given a reduction of 15 per cent from standard automobile rates where electric vehicles were properly equipped with suitable fire extinguishers.

The Committee on Legislation has co-operated with various interests in an effort to secure for the electric vehicle due consideration in legislative matters.

The Committee on Educational Courses has under preparation electric-vehicle courses which may be included in the curriculum of colleges, and which may, with modifications, be employed by vehicle manufacturers and central stations.

The Committee on Standardization has been responsible for needed standardized practice, and has co-operated with the Standardization Committee of the Society of Automobile Engineers, which action will further assure electric vehicle recognition in the broad motor field.

The Committee on Traffic has been working largely with the Citizens' Street Traffic Committee of New York and elsewhere in effecting desirable traffic regulations.

The Committee on Central Station Co-operation, lately appointed, has been investigating the relations of central stations and manufacturers in the sale and use of electric vehicles with a view to promoting the interests of all concerned.

The Committee on Good Roads has been obtaining an index on the road situation throughout the country, also lending any aid possible in furthering good-road development.

A. J. Marshall,
Executive Secretary.

The Committee on Parcel Post Delivery has conducted a very extensive investigation of the parcel-post delivery field, and has waged an aggressive campaign to insure the recognition of the electric vehicle by the postal authorities and others concerned.

The Committee on Publicity has had charge of the very successful advertising campaign, which was discontinued about February 1, last year, the remaining funds being applied to the operating expenses of the general office.

The Committee on Motion Pictures arranges for the production and distribution of films featuring electric vehicles.

In order to further aid, in a concrete way, the promotion of the sale and use

Digitized by Google

of electric vehicles, the Association has established a permanent office, in New York City, in charge of an executive secretary. Here facilities are provided to aid manufacturers and central stations in promotion work, to compile special lists and data for members, prepare publicity articles for publication in newspapers, magazines, etc., establish vehicle bureaus for central stations, develop foreign trade relations, prepare lectures, advertising matter, etc., and to otherwise promote the use and sale of vehicles and assist members in this work.

Section Activities.

The greatest influence of the Association on the development of the electric-vehicle industry is, of course, extended through the activities of the various Sections. These are now established at New England, Chicago, Philadelphia, Washington, Cincinnati, San Francisco, Los Angeles, Pittsburgh, New York, Detroit, Cleveland, Toronto, Denver, St. Louis, Kansas City and Portland, and still others are contemplated.

The work which is being done and can be done in the future by the sections to aid in promoting the use and sale of electrics is practically unlimited. As is true of the parent body, committees carry on the important work of the year, although the periodic meetings that are held enable all problems to be discussed by all members.

J. W. McDowell,
Chairman, Chicago Section.

L. D. Gibbs,
Chairman, New England Section.

R. L. Lloyd,
Chairman, Philadelphia Section.

Chicago Section.

The work which can be done by the various local Sections is best illustrated by a brief account of the activities of the Chicago Section, the second to be established. Meetings are held weekly, at which topics of general interest are discussed. Occasionally a special program that will appeal directly to the user or prospective user is arranged, and an effort is made to have an attendance of this character at these times. The underlying purpose of all of these meeting is to bring the various elements of the vehicle industry together so that they will understand each other and work in harmony to boost the electric in every way possible.

Committee work also forms an important part of the Section's activities, and all local problems are handled in this manner. For instance, the increasing congestion in the downtown district made necessary during the year a city ordinance prohibiting the parking of vehicles for longer periods than one-half hour. The effect of this law was to materially reduce the utility of the electric passenger car. The question was referred to the Garage Committee of the Section, with the result that parking stations were established at prominent points in the business district, where owners can leave their cars, in charge of competent attendants, who drive them to the parking space outside the restricted area and return them to the stations at any time specified. This service is free to owners, and is financed by voluntary contributions from garage owners and dealers. Results indicate that the service is going to be a great help in the sale of electric passenger cars, and it will have a direct influence in keeping them in use more than if such service did not exist. The Garage Committee also does important work in striving to gain the fullest cooperation between garages, dealers and central station.

All matters relating to traffic and traffic regulations and street and road improvements are handled by a traffic committee, which keeps closely in touch with all pending legislation, and also gives advice and information to users. Recently this committee sent to all electric vehicle owners in the city a communication explaining the ordinance relative to slow-moving vehicles and their use of the streets.

The Standardization Committee also plays an important part in local activities. A report of this committee dealing with the standardization of size of cells, assembly of cells in a tray and number of cells per battery, will, it is believed, be acted upon by the parent association. Standardization of practice is also considered by this committee.

While the Section as a whole may be considered as a publicity committee there are special functions, such as arranging for electric vehicle runs, participation in civic parades, etc., that occupy the attention of a special committee.

These are just a few of the many activities that logically come within the scope of the Section, and serve to illustrate the important field that must be covered if the electric vehicle is to enjoy the prominent position in transportation which it deserves.

The Chicago Section was organized in May of 1912, with George H. Jones, of the Commonwealth Edison Company, as chairman, and W. J. McDowell as secretary. In 1913 Homer E. Niesz was elected chairman and Mr. McDowell continued as secretary. For the fiscal year which ended October 5 Mr. McDowell acted as chairman, with F. E. McCall secretary.

Brief accounts of the activities of some of the other Sections follow.

New England Section.

The original society, Electric Vehicle and Central Station Association, was organized in Boston on March 11, 1909, and was run for some time as a local organization, although it included representatives from other parts of the country. After running for several months it was thought best to enlarge its scope to become national in its character, and its successor, "Electric Vehicle Association of America," was organized in New York on June 29, 1910.

Digitized by Google

The Electric Vehicle and Central Station Association continued its independent existence until April 17, 1911, when it was merged into the New England Section of the Electric Vehicle Association, and became its first Section, working under a constitution which had been approved by the parent association.

For a period dating from April 17, 1911, the New England Section has worked in connection with other electrical clubs and associations in this section to further the interests of the electric vehicle from the standpoint of all the different interests, and has held a number of very interesting meetings at which papers on live topics have been presented and very interesting discussions maintained.

The Electric Vehicle Club, which has

E. S. Marlow,
Chairman, Washington Section.

been closely allied with the Section, has done a great deal of active work in and about Boston, tending to increase the number of charging stations, to increase the parking and other road facilities, to attempt to get legislation favorable to the electric vehicle, and has also carried on electric-vehicle shows and local conventions in the interests of the electric vehicle.

The officers have been elected annually, and the present chairman is L. D. Gibbs, of the Edison Company of Boston.

At the convention in Chicago two years ago a petition was circulated among the Philadelphia delegates, and secured the necessary signatures, requesting permission to organize the Philadelphia Section of the Electric Vehicle Association.

The requisite authority having been granted there met, in December of that year, 1913, a small group of the signers, and after a discussion of ways and means, the Section was launched, and the following officers selected:

R. Louis Lloyd, chairman.
A. W. Young, vice-chairman.
J. C. Bartlett, secretary-treasurer.

The formal inauguration of the Section was accomplished by the holding of a large and well attended meeting in the Franklin Institute on January 14, 1914. President Frank W. Smith was present and made an address. Other prominent members of the Association from out of town were also on hand. Invitations to the meeting had been sent to every known owner or operator of an electric vehicle in Philadelphia and vicinity. An illustrated paper by Emlen S. Hare occupied the latter part of the meeting. The membership at this time was approximately 25.

Following this inauguration meeting committees were appointed to work on the following subjects: Membership, Papers and Publicity, Traffic and Garage. These committees immediately got actively at work and made excellent records during their terms of office. Meetings were held monthly, with a stated subject, and speakers for each. Subjects of general interest were preferably selected, and invitations extended, as before, to all electric-vehicle users.

The objects kept in mind, as essentially the work of the Association, were to improve service at public garages, to better acquaint car users with the details of car construction and care, educate chauffeurs and build up the membership and interest in electric cars generally.

Considerable constructive work has been done. The membership has been trebled. The number of garages increased considerably. The standard of service has been raised. A list of both local and foreign garages has been compiled and circulated.

The present officers of the Section are the same as above, they having been re-elected for the year 1915.

Washington Section.

The Washington Section of the Electric Vehicle Association of America was organized at a meeting held on March 12, 1914, which was attended by President Smith and 19 Washington members of the organization. Exclusive of this organization meeting the Section held three technical meetings during the spring of 1914, and during May a Sociability Run was held, in which there were 53 cars entered, and 52 actually started. This run, ending with a picnic at Rock Creek Park, was a great success. A lunch club was organized for the members of the local Section. During the first year it was natural that the work of the local Section was largely that of perfecting its organization.

Since October 1, 1914, the Section has held seven technical meetings, with an average attendance of 29 members and guests; two luncheon meetings, with an average attendance of 10 members and guests. Beginning November, 1914, it was considered desirable to replace the lunch meetings with an informal party. Since that time there have been held six parties, with an average attendance of 30 members and guests, and three entirely unofficial baseball games during the summer, when the Section's activities were discontinued. The Washington Section has been exceptionally successful in securing speakers to address the technical meetings. The policy was adopted of having one talk on a subject of particular interest to the members of the Association, followed by an address, illustrated if possible, on some subject of more general interest. For these

Harvey Robinson,
Chairman, New York Section.

latter talks there were secured a number of experts from the different departments of the government, such as the office of Public Roads. A great deal of interest has been manifested, both in the business meetings and in the social gatherings. They have thus been able to secure a more intimate acquaintance between the various men interested in the electric vehicle and other allied industries. They have been quite successful in arousing interest among the users, as well as among those interested in their sale, having several truck users who regularly attend the meetings.

In May they held the second annual Sociability Run, which was a marked success, having 50 cars entered.

Through the work of the Publicity Committee, and the co-operation of the local newspapers, they have published a number of electric vehicle sections in the daily papers, in each instance two pages being devoted to electric vehicle matters, about half of the space being advertising and the balance news items. The Section has also published several half-page co-operative advertisements in connection with the Sociability Run.

Digitized by Google

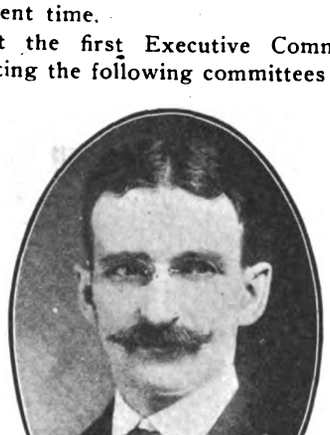
During the period prior to October 1, 1914, E. S. Marlow, Potomac Electric Power Company, was chairman; R. B. Emerson, Emerson & Orme, agents for the Detroit, vice-chairman, and C. M. Marsh, Potomac Electric Power Company, secretary-treasurer. For the year beginning October 1, 1915, R. B. Emerson has been elected chairman.

New York Section.

Going into existence when our petition was accepted by the Board of Directors at a meeting on July 15, 1914, the New York Section has little more than completed its first year of life.

At the first regular meeting of the Section, which occurred on September 30, 1914, the roll call totaled 210 members. During the year 45 new members have joined our ranks, but it was necessary, however, to accept 19 resignations during the year, cutting down our increase to a net of 26 members, and showing a total of 236 members at the present time.

At the first Executive Committee meeting the following committees were



J. W. Schrantz,
Chairman, Cincinnati Section.

formed: Membership, Papers, Publicity, Reception, Nominating, Garage, Performance and Operating Records, Traffic, Insurance, Legislation, Statistics and Employment Registration. These committees have properly organized themselves for the purposes for which they were created, and have been ready at all times to investigate and make recommendations in any of the problems brought to them for solution. The thanks of the Section membership is due in large measure to the Papers Committee, which has labored painstakingly during the year to provide papers dealing with subjects of the moment, and at the same time maintaining the policy that whatever was to be presented and discussed must be absolutely in accord with the aims and purposes of the Association; the data presented must be accurate and useful to the membership and with a note of cheerfulness and optimism revealing itself throughout. A proper start was made at the first meeting, when a paper entitled "Practical Ideals in Electric Vehicle Promotion" was enthusiastically received and discussed. The

H. W. Harrison,
Chairman, Los Angeles Section.

Section has endeavored to use the "Practical Ideal" method throughout its activities during the year. Harvey Robinson, past secretary of the Association, is chairman of the Section.

Cincinnati Section.

The Cincinnati Section was organized at a meeting held on April 22, 1914, at the office of the Union Gas & Electric Company whose president, Mr. Freeman, acted as prime mover. The officers elected seemed unable to get any action out of the members due probably to more or less friction among the local dealers. This condition existed until April 2, 1915, when the Section was reorganized and another effort was made to interest the members by holding a meeting at the Gibson Hotel on May 21, at which time A. J. Marshall delivered an address that proved very interesting to all present in that it enlightened them as to the possibilities in the electric-vehicle indutry.

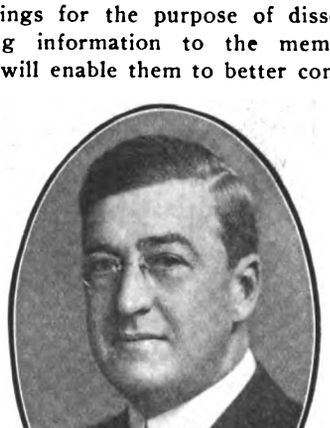
As the summer season was at hand, no further action was taken until August 30 when the Executive Committee met and laid plans to work up a schedule of activity along several lines. It was proposed to make the September meeting of the Electric Club of Cincinnati an electric-vehicle affair, but owing to the desirability of hearing from the Society of Electric Development, this plan was waived and it is now proposed that the original idea be carried out at the October meeting, which should arouse considerable interest in the Association and enable the Section to increase its membership.

It was decided that no part be taken in the Automobile Show to be held during the week of October 4-9, but to let the Electrical Exposition to be held in Music Hall during Electrical Prosperity Week, be the official Electric Vehicle Show.

It is proposed to take an active part in this Exposition and if possible to hold a Sociability Run as well as an electric-vehicle parade, all of which will go a long way towards stimulating the same interest manifested in so many other cities.

A co-operative newspaper advertising campaign is also contemplated, which can be augmented by the various manufacturers increasing their representation in this city. At the present time there are only three agents handling passenger cars and one handling trucks so that if the other manufacturers will endeavor to secure progressive agents, the burden of educating the public to the use of electric vehicles, will be distributed on a more productive scale.

Efforts will be made to hold monthly meetings for the purpose of disseminating information to the members that will enable them to better combat



J. H. Pieper,
Organizer of Los Angeles Section.

the warfare of the gas cars and place the electric in its proper sphere.

Los Angeles Section.

Prior to January, 1914, there were but two members of the Electric Vehicle Association of America in Los Angeles, both belonging to the Southern California Edison Company and being John B. Miller, its president, as official representative and J. Harry Pieper as an associate member.

Accepting an appointment on the membership committee made by Joseph H. Becker, then chairman of the membership committee, Mr. Pieper commenced gathering in a few associate members, securing these gradually until he finally petitioned for a section with 25 signers to the petition. These included the two other central stations

Digitized by Google

operating in Los Angeles, with active and associate membership, as well as most of the agents representing the leading electric vehicle manufacturers.

The petition was granted and the section immediately commenced holding regular monthly meetings. Mr. Pieper was elected chairman and served until June, 1915, at which time he was forced to resign on account of pressure of business.

The Los Angeles Section now has a total of 62 members. Regular meetings will be resumed in October and the Los Angeles Section of the Electric Vehicle Association of America is planning to participate actively in Electrical Prosperity Week. The local committees of the Section, particularly the Garage Committee, have accomplished some good work, the Garage

E. M. Jackson,
Chairman, Denver Section.

Committee bringing about a harmonious condition among garage owners and operators that had been conspicuous by its absence. A standard rate for charging, etc., has been adopted and the electric garage business has been standardized, which means successful operation.

We endeavor at all times to have a couple of papers prepared that pertain to some end of the electric-vehicle industry, also we try to get some one who has charge of a fleet of electric trucks, such as the heads of the delivery department in the department stores or any other user of electric trucks to give a talk on what conditions they are running trucks under and the relative savings they make over other forms of delivery, also if they have any suggestions how the application of the electric to their line of business could be improved upon. The same applies to the pleasure car with the individual user. Harry W. Harrison is chairman of the Section.

Denver Section.

The Denver Section of the Electric Vehicle Association of America, petitioned the parent body for the purpose of organizing the Denver Branch. Accordingly, in September, 1914, the first meeting was held, the attendance being fifteen paid up members, these members all engaged in actual electric vehicle work.

At this meeting E. M. Jackson was elected chairman; J. R. Strugnell (the father of the electric vehicle in Denver), vice-chairman, and H. A. Tewksbury, secretary.

Five committees were appointed, viz.: Papers and Program, Membership, Reception and Dinner, Garage, and Dealers.

The first efforts exerted by the branch were in behalf of the local situation as to the improvement of Denver conditions from the standpoint of the garage, the dealer and the car owner.

One of the special accomplishments of this Section was the holding of an electric-vehicle show on the main sales floor of the Denver Gas & Electric Light Company, at which show seven passenger and two commercial trucks were sold. The results of this show decided that the event would be an annual one.

Another great benefit derived by the local members has been the interchange of ideas as to successful and efficient garaging methods adopted through the investigation and research of newer ideas developed in the large Eastern cities.

One of the very interesting items on the program has been "Topic Events." This subject has been handled by a member who extracts from all the various trade journals items of interest concerning the electric car as to its performance, up-keep and development.

Another accomplishment of the local Section has been that by exhaustive effort the garages have been able to increase the rates charged to car owners, who have in turn received greater service as a result.

Prior to the organization of the Denver Section, various electric car and truck dealers experienced very keen competition among themselves, which had resulted in bitter feelings among several of the dealers. The local Branch has eliminated all of this and brought about a very fraternal feeling among all concerned in the electric vehicle industry.

St. Louis Section.

The question of establishing a St. Louis Section of the Association was first seriously considered in April, 1914. The National Association took the matter up to secure at least the minimum of 15 members so that a local Section could be authorized by them, and these were readily secured among the local electric-vehicle fraternity.

A. E. Archer, as chairman of the Advertising Committee has prepared plans for a large co-operative advertising campaign which will be participated in by the local car dealers, central stations, battery companies and accessory houses.

At the present time the newspapers are carrying a great many columns of gasoline-car publicity but it is very seldom that anything is carried pertaining to the electric vehicle and we believe this condition should be remedied.

F. E. Stevens, as chairman of the Garage Committee has made an exhaustive study of garage conditions as they exist in St. Louis at the present time and he has made a number of recommendations to our Section with the thought of having garage practice standardized. The recommendations of his Committee have been adopted by practically all of the garages operating in St. Louis.

C. E. Michel was recently appointed to prepare a map of the City which would clearly indicate at just what points charging current would be available. As soon as this map has been completed it

Will Spaulding,
Chairman, Portland (Ore.) Section.

will be furnished to all owners of electric cars in St. Louis.

It has been our endeavor at recent meetings to have a paper presented by a representative of apparatus used in the electric vehicle industry.

Portland Section.

On June 21 an organization meeting of the Portland Section was held and officers elected to serve until the beginning of the association year in October. The officers elected were Will Spalding, Walker and Milburn agent, chairman, A. N. Stanton Meier & Frank, vice-chairman and G. H. Beazan Northwestern Electric Company, secretary.

The plans for the coming year involve a monthly luncheon taking about two hours at which the regular business and a short program will be given.

We also plan to establish an electric vehicle page in one of the local papers every second Sunday throughout the winter about one-half of the page to carry ads from the different dealers and accessory manufacturers and the balance to be reading matter as much of a local nature as is possible.

Digitized by Google

The Opportunity for the Sale of Electrics.

Specific Advantages for Various Industries.

This article comments first on some of the general advantages of the electric commercial vehicle, pointing out its value in general delivery service. The specific advantages of electrics for delivery service in a few of the more common industries are then considered. Testimonials from satisfied users supplement this. Data sheets showing the actual operating costs of a number of individual vehicles in ordinary service accompany the text.

There can be no question about the serious consideration that the business man of today is giving to his haulage problems. With the advent of the efficiency idea and consequent inquiries into the cost of doing business not as a whole but as so many distinct unit operations, the searchlight of investigation was early turned on existing transportation systems. It was at first difficult to convince operators of delivery systems that the horse haulage was inefficient, largely because of inexact accounting which made it impossible to determine exactly what haulage and trucking costs were and also, perhaps, because of the feeling of sentiment which had attached itself to the horse as a servitor of man. Such sentiment no longer exists and today delivery problems are being solved solely on a basis of efficiency and economy with the result that a large proportion of the traffic, at least in all important cities, is rapidly becoming motorized.

The question of gasoline versus electric delivery naturally occurs to prospective users although in actual practice there is really very limited competition as each type of vehicle has its logical field.

In making comparisons, however, the purchaser is prone to consider the electric as a new development and it may therefore be of interest before dealing with the specific advantages of electric vehicles in the various industries, to refer briefly to the early history of this mode of transportation as so interestingly recounted in a booklet published by the Electric Vehicle Association of America.

Commercial vehicles propelled by electric current came into practical existence in 1897. The early models, of course, possessed their disadvantages, and it was natural to expect, as the machine went from one stage of development to another, that considerable improvement would result. It is consequently, important to note that within a very short time a state of stability was obtained which has not since been radically changed, although every advantage has been taken of the natural improvements in battery, tires and other equipment.

The reasons for early public unbelief in the advantages of the electric commercial vehicle may be summed up briefly as being misinformation as to the life and performance of the vehicle which could not be overcome by the data available, lack of charging facilities, cost of current, the application of the vehicle to improper fields of endeavor and finally the lack of knowledge as to the real merits and special excellence of the electric vehicle.

The first electric vehicles produced show a reliability after years of operation that is decidedly surprising. In fact, it may be said that the endurance of these vehicles, well maintained and systematically cared for, is not yet known. It is improbable that the designers of the electric commercial vehicles built from 1898 to 1905 realized the excellence of their machines. Several of the service wagons operated by the New York Edison Company have been in use for ten years; one has been used by Frederick Loeser & Company, of Brooklyn, for eleven years; one has been used by Stern Brothers, of New York City, for nine years; three of the fleet of Tiffany & Company were delivered to that firm early in 1901; three of the machines owned by Arnold Constable & Company, of New York City, were delivered in 1903, and one of the delivery wagons built for B. Altman & Company in 1898 is regularly used. There are several 1899 models still running—the original truck of the Central Brewing Company is making regular trips through the streets of New York City. The F. A. Poth & Sons Brewery, in Philadelphia, is using daily an electric truck delivered eleven years ago, and, so far as indications go, it is just as reliable and does quite as good work as it ever did. Many other examples of long service may be given.

It is to be remembered that in the development of the electric commercial vehicle there have been two distinct paths of endeavor—the storage battery and the construction of the vehicle itself. These have been pursued by different engineers, each more or less dependent on the other; that is, vehicle designers have desired batteries of comparatively light weight and large capacity to minimize the load of the machine and to obtain the power necessary to increase the radius of operation. Battery development has been independent of the vehicle manufacturer except for the benefits of experience that he has contributed. The manufacturers of batteries developed their products decidedly and quickly. Weight has been decreased, capacity increased and durability secured. In every respect, improvement has been made and the cost lessened.

During the period from 1900 to 1910, the electric commercial vehicle went through a decidedly satisfactory period of experimentation and test. The number in use increased annually—repurchases were made by concerns of large haulage requirements—more and more manufacturers entered the field and placed machines on the market. But it is within the last two years that the greatest growth has been made. In New York, between July 1, 1911, and July 1, 1912, the number of electric commercial vehicles in use grew 45 per cent, while an authority in Chicago estimates that the increase in that city during the last two years was 400 per cent. In Boston the increase in the same period of time has been 134 per cent.

Coincident with this formidable percentage of increase in the number of electric commercial vehicles has been a steady decline in the cost of the vehicle itself and the current necessary for its propulsion. In spite of the fact that fuel for other types of motor vehicles is constantly increasing in cost, the price of electric current for battery charging has decreased during the last 10 years from an average of 23 cents per kilowatt-hour to about five cents.

In considering electric vehicles for any character of delivery service there are numerous general advantages that immediately suggest themselves and that should be given thorough consideration by the prospective user. The most important of these advantages are summarized in the following paragraphs.

Electric vehicles consume no power when not in operation; they can be started instantaneously. The perfect ease of control allows any intelligent horse-driver to run an electric, and there is, consequently, no need to school a chauffeur into learning new routes. Then, too, the perfect simplicity of mechanical parts means few repairs and little attention.

As each electric vehicle is rated to

Digitized by Google

carry a certain load and to travel at a certain maximum speed, with provision for lower speeds, the driver cannot run the machine beyond the maximum speed. Due to this automatic control, tires are saved and unnecessary wear on the mechanism is eliminated.

There is no risk of fire or explosion, as an electric can be kept anywhere without affecting insurance. It is possible to run them on wharves, where other types of motor cars often are barred.

An electric can be stabled where horses are not permitted and with an economy of space. In large cities, where real estate values are apt to soar, the installation of electric trucks frequently means that stable space can be turned over profitably to other uses.

Electric commercial vehicles can go from 35 to 50 miles a day, with still greater radius where required, and are ready for the same amount of work the next day. A daily average of 15 miles is excellent for a horse, and a working horse must rest one day in five.

Besides enabling the user to widen his area of delivery the distinctively up-to-date appearance of electric vehicles has splendid advertising value. The merchant who wishes his delivery service to advertise his business can count upon these clean, noiseless, dignified and efficient delivery wagons to suggest to the public that he is the sort of merchant with whom they should trade.

Business men have come to realize that their delivery service is really their business on wheels and that the public judges them and their methods by the appearance of their delivery service. As a result, the tendency is for the merchant to make his delivery service a true reflection of the quality of his merchandise and of his store service. Electric delivery service unconsciously makes a strong impression on the public eye and instills conviction of the stability and up-to-dateness of the concerns that use it.

The advertising value of electric delivery service means more perhaps to retail establishments using vehicles of lighter tonnage than to the firms requiring heavier trucks. Here the money saved becomes the basic consideration rather than the impression made. The economy effected by the use of the electric truck in one year approximately equals the money paid for it; that is to say, that a five-ton electric truck will do the work of three horse-drawn teams, saving $12 per day on an average. Proportionate savings may be effected with all sizes of electric commercial vehicles.

There are almost innumerable other advantages that might be stated, but the prospective purchaser is finally most interested in what the specific advantages are of the commercial electric vehicle in his particular line of business and what the experiences of other users have been in this connection.

In the following paragraphs an attempt has been made to classify the usual trades employing some sort of delivery with an outline of the reasons why electric vehicles should be given consideration in each case. Supplementary testimonials selected at random from a large number of communications, indicate the success of electrics in the industries considered.

Bakeries-Confectioners.

One of the most important requisites of a satisfactory delivery system for bakeries and confectioners is cleanliness. The large establishments all appreciate this, and more and more attention is being given this item by the smaller bakeries. The exacting demands of the public that has made necessary the installation of machinery to do the work formerly performed by hand, will also extend to the delivery system and will mean the passing of the horse. There is no type of vehicle that insofar as cleanliness is concerned can compare with the electric. There is no possibility of contaminating the goods from gasoline fumes. The cleanliness of the electric is further emphasized by the practice of numerous bakeries providing their drivers with white uniforms.

Of equal importance with cleanliness is promptness and reliability, and these requirements make bakeries one of the best fields for the sale of electric vehicles. The corner grocer, baker, and delicatessen man must have regular and dependable deliveries. Their goods must come to them fresh and clean, as soon after baking as possible. And the deliveries must be made at regular intervals and on schedule time, regardless of weather conditions.

Deliveries of this character usually

GENERAL.

Name of Company—Albers Bros. Milling Co., Portland, Ore.
Business—Cereal Millers and Dealers in Grain, Hay, Flour and Feed.
Capacity of Vehicle—1.5 Tons.
Approximate Price—$3,382.50.
Make of Tire—Goodrich Special.
Tires—Solid.
Make of Battery—Edison.
Number of Cells—Sixty.
Date of Purchase—October 26, 1912.
Make of Vehicle—Detroit Electric.
Size of Tires—Front 34x4, Rear 36x5.
Type of Cells—A-6.

OPERATING DATA.

Average Daily Mileage—27.3.
Kilowatt-hours per Month—666.
Daily Hours in Use—10.
Days in Service, per Month—25.7.
Cost of Electric Power per Month—$19.98
Driver's Salary per Month—$77.00.
Cost of Repairs and Renewals for Six Months—$51.86 (Not an average).

TOTAL AVERAGE MONTHLY OPERATING COST—$105.46 (6 months' average).

GENERAL

Name of Company—Eagle Furniture Company, Memphis, Tenn.
Business—Furniture (retail).
Capacity of Vehicle—2,000 lbs.
Date of Purchase—Feb., 1912.
Approximate Price—$2,800.
Make of Vehicle—Detroit.
Make of Tires—U. S.
Size of Tires—3½x33 inches.
Tires—Solid.
Make of Battery—Edison.
Type of Cells—6-A.

OPERATING DATA.

Average Daily Mileage—30-40.
Daily Hours in Use—10.
Days in Service, per Month—26.
Cost of Electric Power, per Month—$35 (average).
Cost of Storage and Washing, per Month—$20.
Driver's Salary, per Month—$40.
Cost of Repairs and Renewals for 23 Months—Battery, $35; Other, $250.

Total Average Monthly Operating Cost—$110.

Digitized by Google

entail short hauls and frequent stops, and the superiority of the electric for such service cannot be questioned. The large bakeries of the country, such as Ward Baking Company of New York and Chicago, Schulze Baking Company of Chicago, and others depend almost entirely on electric vehicles for retail deliveries.

What the electric vehicle has done in the way of economy and efficiency for the large establishments can also be done for the small neighborhood bakery now employing one or more horse-drawn wagons. Cleanliness, promptness and reliability of delivery are just as essential to the small firm as the large, and when these features can be secured with a saving in cost, or even at the same cost, there is no reason why the antiquated horse delivery should be further countenanced.

Regarding the service which electrics are giving to bakeries, the vice-president of the Ward Baking Company, New York City, writes as follows:

We employ for bread deliveries to the retail trade in the New York field in daily use 355 electric vehicles. We find them to be economical in working. The car is stationed in the bakery exactly at the spot where it receives its load of goods each morning. When the car comes in each evening it is washed, examined for defects and if passed for service next day it goes to its place, and while there its batteries are charged in order that it may be ready for service early the following morning.

We find the mileage obtainable is quite sufficient for all city needs, and that for calling upon the trade, that is the grocer and delicatessen trade—which are within easy reach of each other, many times three and four to a city block—there is no starting or stopping of an engine, as would be the occasion with a gas car, with the result of power being wasted while the car is standing idle. There is no excessive speed in its operation, and yet it is sufficient for city travels.

The Case & Martin Company, of Chicago, wholesale pie bakers, write as follows:

The electric car meets the requirements of our service to very much better advantage than a gas car or horse vehicle.

In view of the success we have had with electrical trucks, would say we are running about 25 electric cars at the present time and putting on more as fast as we can get to it. We find they are very satisfactory for our deliveries and cannot say too much for them as we feel the electric truck is the only truck for delivering as any intelligent driver can operate them without any difficulty whatsoever and are very efficient in maintaining and up-keep.

General.

Name of Company—Geo. S. Connelly Company, Springfield, Ill.
Business—Retail Grocers, Butchers, and Bakers.
Capacity of Vehicle—1,000 Lbs.
Date of Purchase—Sept. 5, 1913.
Approximate Price—$2,500
Make of Vehicle—Argo.
Make of Tires—Motz.
Size of Tires—36x3.
Are Tires Solid, Pneumatic or Cushion?—Solid.
Make of Battery—Edison.
Type of Cells—A-4.
Number of Cells—60.

Operating Data.

Average Daily Mileage—27
Daily Hours in Use—8.
Kilowatt-hours per Month—338.
Days in Service, per Month—28.
Cost of Electric Power per Month $7.50.
Cost of Storage and Washing per Month—Car washed by driver. Stored in rear of store.
Driver's Salary per Month—$40.
Cost of Repairs and Renewals for 12 months—$50.00

Total Average Monthly Operating Cost—$90.40.

General.

Name of Company—General Electric Company, Philadelphia.
Business—Electrical Machinery and Supplies.
Capacity of Vehicle—2,000 Lbs.
Approximate Price—$2,500.
Make of Tires—Goodrich.
Tires—Solid (demountable rim).
Make of Battery—Philadelphia
Date of Purchase—May, 1910.
Make of Vehicle—General Vehicle Company.
Size of Tires—34x3½ Inches.
Type of Cells—Lead Plate (thin).
Number of Cells—44.

Operating Data.

Average Daily Mileage—35.
Daily Hours in Use—10.
Kilowatt-hours per Month—500.
Cost of Electric Power per Month—$15.
Cost of Storage and Washing per Month—$10 (washing only).
Days in Service, per Month—25.
Driver's Salary per Month—$65.
Cost of Repairs and Renewals for Twelve Months—Battery, $300; Tires, $150; Motor, $25; Other, $100 (includes inspection).

Total Average Monthly Operating Cost—$165 (includes interest on investment and depreciation and insurance charges).

Brewers and Bottlers.

It is a pretty widely known fact that the brewing industry has made a large expenditure for electric commercial vehicles and the success with which these interests have been operating this type of machine can be taken as an indication of what may be expected from motor vehicles in other lines of business. One of the strongest boosts the electric ever received came, unsolicited, from Jean A. Blaise, superintendent of the transportation department of the Doelger Brewing Company, of New York City, at the recent convention of the Electric Vehicle Association of America. Among other things Mr. Blaise stated that 58 electric trucks were saving $80,000 a year for his company. Two men, one at $23 and one at $14 per week, are required to look after the electrics. This company has disposed of its entire stable of 200 horses, and in so doing twenty-eight city lots, valued at $20,000 each, or a total of $560,000, have been released, as the horse stable, which was 350 by 350, has been replaced with an electric garage, 85 by 100 feet, and the ground formerly occupied by the horse stable will be utilized for buildings in which beer will be bottled. The delivery of beer formerly cost this firm 35 cents per barrel, but with the electrics this has been reduced so that within the eight-mile radius the cost of delivering amounts to 15 cents per barrel. It is expected that as soon as additional trucks are installed—eight of which have been ordered—there will be a further reduction made. It is also presumed that beer will be delivered with the aid of more trucks at a cost of 12.5 cents per barrel, and this company expects to pay for its complete change to electrics in three years with the saving effected. After that time it can be seen that the saving will become more in the form of an earning.

Another instance of where real economy has been effected by the use of electric trucks by the brewing trade is found in the experience of the Jacob Ruppert Company, also of New York, which has 83, purchased at intervals covering about seven years. A saving of $833.33 per machine per year is now being realized by this company. Out of 120 powerful horses, valued at $1,500 and $2,000 per team, only 50 remain in service, and in the meantime business has increased constantly. The cost of delivering beer, when the company was using 120 horses was 33.7 cents per barrel. With electrics it has been 24.75 cents per barrel, a reduction of approximately nine cents on each one. Although the horse equipment hauled about the same load as the electric—11,000 pounds—the distance traveled by each kind of equipment shows a wide variation. Horses accomplish only 12

Digitized by Google

miles a day, as against a rated battery mileage of 35 for a five-ton machine and a speed of seven miles an hour, practically twice as fast as the horses were able to go.

As in the case of the Doelger company, the Ruppert interests have trained their horse drivers to operate the electrics, but this is not a new departure from the general practice, as statistics reveal the fact that ex-teamsters are now driving electric machines for various firms in all sections of the country.

These are just two of the many examples that could be cited to show the advantages of electric trucks for brewery delivery. The fact that the electric is being extensively used by brewers in many of the larger cities of the country, and is at least being introduced in most of the smaller cities, is known to most people who are at all interested in transportation. It is said that within a very few years fully two-thirds of all city trucking will be taken care of by the electric.

The following expressions from users in this industry are selected from a large number of communications, all of which highly endorse the electric for such service.

The Peter Schoenhofen Brewing Company, of Chicago, writes:

> In response to your inquiry of the 18th instant, regarding our views and experiences as to the adaptability, economy and performance of the electric truck in our particular service, permit us to state, that we have twelve trucks which have been in continuous service since their installation in April and May, 1914, and so far they have not lost a day during this period.
>
> In a delivery service such as ours, calling for heavy loads and frequent stops, we have found this type of truck especially suited and have been clearly convinced of its economy, since we have arranged our horse routes so as to give the machine a load in keeping with its rated capacity and sufficient territory to get a fair day's work out of each truck.
>
> We can frankly state that we have found the electric cheaper to operate than any other type provided the required mileage does not exceed the limitations of the battery.

The C. Schmidt & Sons Brewing Company, of Philadelphia, writes:

> We have been using electric motor vehicles since 1903, and have added to our equipment from time to time, the number in use being now twenty-eight, in capacities from one to five tons. Our horse-drawn vehicles have been almost entirely replaced.
>
> We find the service more satisfactory and economical, and our experience is proven by the increase in the use of the electrical truck, as above.

A brewer in La Crosse, Wis., says:

Our two-ton electric truck was put into service eight years ago, and for the first five years we kept no record. We find upon investigation that our record on this machine, from March 1, 1910, to October 2, 1912, shows an upkeep expense of $631.40. These figures cover tires, batteries and replacements, as well as labor incident to making these repairs. During this period the truck has covered a distance of 11,840 miles. A 3.5-ton truck, purchased in March, has covered a mileage of 2,360 at an expense of $45. The above figures do not include current. In our experience the electric truck has proved more satisfactory and economical than a gasoline truck for city deliveries.

Coal and Fuel.

Somewhat the same conditions apply in the delivery of coal and fuel, as in the brewery business. Heavy loads are the rule, and reliability is an essential. The peak of the coal delivery business usually occurs during the severe winter weather, when the traffic conditions are usually poorest. Under such conditions there can, of course, be no question as to the utter unreliability of the horse-drawn vehicles. Horses are not only affected by severe cold, but the slippery pavements also make it decidedly dangerous and expensive, as is indicated by the large number of horses killed each winter.

For the large coal-distributing companies handling five and 10-ton shipments to outlying yards and to wholesale consumers, the gasoline truck is usually preferred, because of its greater mileage radius, but the retail delivery logically comes within the field of the electric truck.

Frequent stops of long duration in cold weather do not affect the electric, whereas the gasoline engine is notoriously difficult to start and costly delays are frequently encountered.

Department Stores.

The phenomenal increase in the use of electric vehicles by department stores is sufficient indication of the utility of this type of vehicle for a service where numerous stops have to be made. In Chicago the large department stores all pride themselves on their prompt, efficient delivery systems and practically all of them depend upon the electric vehicle for the major share of the delivery work.

Marshall Field & Company lead in the number used, the present fleet of this company aggregating over 215, representing an investment well over $1,000,000. Carson, Pirie, Scott & Company, another prominent department store, operates a fleet of 65 electrics, while The Fair and Mandel Brothers each have in use about 35 vehicles of the electric type.

The fact that these stores, which necessarily make a scientific study of transportation problems, decided upon electric vehicles and subsequently are

General.

Name of Company—Roessler & Hosslacher Chemical Company.
Business — Manufacturing Chemists.
Capacity of Vehicle—One ton.
Approximate Price—$3,575.
Make of Vehicle—Commercial Truck Company of America.
Make of Tires—Firestone (solid).
Date of Purchase—June 2, 1913.
Battery—Edison.
Size of Tires—36x3½.
Cells—60 A-6.

Operating Data.

Average Daily Mileage—20.
Kilowatt-Hours per Month—1,200.
Cost of Electric Power, per Month—$30.
Driver's Salary ,per Month—$58.
Daily Hours in Use—10.
Days in Service, per Month—26.
Cost of Repairs and Renewals, Average $30 per Month.

Total Average Monthly Operating Cost—$120.

General.

Name of Company—Commonwealth Edison Company, Chicago.
Business—Central Station.
Capacity of Vehicle—3,000 pounds.
Approximate Price—$2,500.
Make of Vehicle—Walker.
Make of Tires—United States (solid).
Battery—Exide.
Size of Tires—42x3½ and 38x3.
Cells—40 11 MV.

Operating Data.

Average Daily Mileage—25.
Kilowatt-Hours Per Month—400.
Cost of Electric Power, Per Month—$8.00.
Cost of Storage and Washing, Per Month—$22.
Driver's Salary, Per Month—$65.
Daily Hours in Use—8.
Days in Service, Per Month—26.
Cost of Repairs and Renewals for 12 Months—Battery, $192; Tires, $60; Other, $60.

Total Average Monthly Operating Cost—$121.

Digitized by Google

adding to their fleets as rapidly as possible, is an indication of the success of the electric for department-store service.

Chicago is not the only city where department stores have found the electric most suited to the specific conditions involved. The large establishments of New York, Washington, Philadelphia, Boston, and in cities throughout the West, are all enthusiastic users. In fact, statistics recently compiled indicate that in the value of investments in electric commercial vehicles department stores lead the field, with an aggregate investment of about $6,000,000. Breweries are second, with an investment totaling over $5,500,000, and public utilities are third.

Express and Haulage.

Under this classification comes, in addition to the usual run of express and transfer companies, the haulage contractor, who either rents vehicles by the hour, day or week, or undertakes a specified delivery service at contract or parcel rates. The latter field has only been slightly touched, and there is considerable opportunity for the extension of this class of business in every progressive locality. In many instances it has been found profitable to combine such a professional delivery service with a public commercial-vehicle garage.

The established express and transfer companies are rapidly motorizing their delivery systems, and electric vehicles are coming in for their share of attention. Where local distributing depots are maintained in various sections of a city the electric wagon is the ideal vehicle for such service, being much more economical and satisfactory than the gasoline type. The latter are usually employed to carry bulk shipments and to handle the parcels from the freight stations and warehouses to the distributing depots.

The leading express companies of the country, such as the United States Express Company, Adams Express Company, American Express Company, etc., all operate large fleets of electrics, and the horse-drawn vehicle is being replaced as rapidly as possible.

The opinions of a few companies regarding the serviceability of the electric are presented in the following communications:

The American Express Company writes:

Our companies find the electric motor truck, in its special service excellently adapted for the work, and, through constant supervision and care, economical in operating, furnishing a superior performance to horse-drawn vehicles wherever we have substituted it for the latter.

The Lincoln Safe Deposit Company, of New York City, writes as follows:

I will state that our reason for taking up motor vehicles eight years ago was that we realized that our patrons were yearly moving further uptown and away from us and if we were to hold the trade it would be necessary for us to compete with the prices of uptown movers; that horse-drawn vehicles were ratehr slow for this. It would have been necessary for us to increase the number of our horse-drawn vehicles or to substitute motor wagons.

Carrying very valuable property, much of which, in the event of fire, could not possibly be replaced, and being fearful of gasoline, we dismissed gas cars from our minds at once. We thoroughly investigated the electric vehicle, found that by making our own current we could very readily charge the vehicles at night at small expense; no separate garage would be required, and our insurance rate would not be affected by storing them on the ground floor of our warehouse; our engineer could readily look after the mechanical part of the vehicles and our horse drivers were quickly instructed as to the handling of the electric vehicles.

We have gradually replaced our horse-drawn vehicles, doing away with them entirely last year. Our oldest electric wagon of one-ton capacity has now been in operation for eight years and is running in as satisfactory a manner as it did when we first bought it. We now have two one-ton delivery wagons that in the busy season operate from thirty-five to forty miles per day each, delivering packages, and we have six 3.5-ton vans of about 500 cubic feet capacity which we use for hauling furniture and household goods to and from our warehouses. As a large part of the time in furniture van service is taken up with loading and unloading these are not so economical as are the delivery wagons, but it is a great satisfaction to be able to make two long trips a day with one of these vehicles, where in the past with horses we could only make one such trip. Formerly with horses it would require at least an hour from the time we opened up in the morning before all of our vehicles had left the premises. Now in five minutes after opening up all vehicles in busy time are out of the warehouse.

We believe the electric vehicle is the ideal equipment for city delivery. We do not make long out-of-town hauls. This work we contract out to those having gasoline vehicles, although we occasionally make runs of fifteen or eighteen miles into the country with our electric vans.

Grocers, Butchers and Fish Dealers.

Wholesale grocers and butchers have necessarily made a detail study of unit costs in their business, and it is safe to assume that the delivery department has come in for its share of consideration. Electric vehicles are popular in this service, for practically the same reasons as is true of bakery delivery. Cleanliness is essential, and there must be absolutely no possibility of contamination of food from gasoline fumes.

The small neighborhood grocers, of which there are many thousands, have given apparently little consideration to the delivery problem, and it is undoubtedly true that the business of many such establishments is curtailed by the limitations of the delivery service.

It would seem that this business should be cultivated, through the es-

GENERAL.

Name of Company—Palmer Bee Company, Detroit, Mich.	Make of Battery—Edison.
Business—Factory Supplies.	Date of Purchase—January 28, 1913.
Capacity of Vehicle—2 tons.	Make of Vehicle—Detroit.
Approximate Price—$3,750.	Size of Tires—3½ inch front; 4 inch double rear
Make of Tires—Goodrich (Solid).	

OPERATING DATA.

Average Daily Mileage—40.	Driver's Salary, per month—$70.
Daily Hours in Use—9.	Cost of Repairs and Renewals for 12 Months—None.
Kilowatt-Hours per Month—	
Days in Service, per Month—25	Cost of Storage and Washing; Cost of Electric Power—$55.

Total Average Monthly Operating Cost—$125, not including depreciation or interest charges.

GENERAL.

Name of Company—F. A. Poth & Sons, Incp., Philadelphia, Pa.

Business—Brewers.	Date of Purchase—1911.
Capacity of Vehicle—5 tons.	Maker of Vehicle—General Vehicle Company.
Approximate Price—$4,400.	
Make of Tires—Gibney Wireless (Solid).	Size of Tires—36x5 front; 36x 3½ dual rear.
Battery—Ironclad—48 cells.	

OPERATING DATA.

Average Daily Mileage—20.	Driver's Salary per Month—$76.00.
Daily Hours in Use—8.	Cost of Repairs and Renewals for 12 Months. $650.
Kilowatt-hours per Month.	
Days in Service, per Month—25.	Battery, $450.
	Tires, $200

TOTAL AVERAGE MONTHLY OPERATING COST—$151.

The item of $21 per month includes all service charges and entire care of vehicle which is kept in company's garage Charging current is supplied from the company's power plant

Digitized by Google

tablishment of commercial garages where such isolated vehicles could be cared for at a nominal rate. The small grocer operating one or two horse-drawn vehicles seldom realizes what his delivery service costs him.

Hardware.

Both hardware manufacturers and dealers have found the electric truck admirably suited to the needs of the business, as is indicated by the large number of installations in this field. Among the manufacturers dealing in heavy material a point in favor of the electric is the simplicity and economy of a motor-driven winch for loading, which can be economically operated from the vehicle battery. Dealers handling hardware in small packages are equally enthusiastic over the merits of the electric.

A Pittsburgh manufacturer writes as follows:

> We still have in daily use the five-ton electric truck bought seven years ago, and it is giving us the same satisfaction it has given us during its entire service. While the truck has had what we consider a long life, it is today in excellent condition and seems good for many years to come.
>
> Another dealer writes: It would seem that there is nothing better we can say than to recall the fact that we purchased our second machine after some six or seven years' service.

Paper and Paper Products.

Paper and its products weigh heavily, and for that reason particularly the electric truck, because of its ruggedness, makes such a splendid showing. It is no uncommon occurrence for a machine in this service to move three times the tonnage of a horse-drawn outfit.

The Robert Gair Company, of Brooklyn, N. Y., make the following comment relative to the service of their electric vehicles:

> We have found that the electric truck equipment which we are using—it consists of five different types—is more economical than the gas equipment where short hauls are concerned. This is particularly true in congested districts where we have several stops to make in a limited area. In the case of distance deliveries, where few stops are to be made, we find that our gas equipment is much superior to the electric, in that we cover greater mileage in much less time. Of course, to do this it means that the operation of the gas equipment exceeds the expense of the electrical equipment.

Printing and Publishing.

As in the paper business, the weight of the product handled has had considerable influence in the extensive employment of electric vehicles by printing and publishing plants.

No more convincing testimony of the serviceability and economy of the electric commercial vehicle in this service can be given than the statement of C. Ford, public printer, Government Printing Office, Washington, D. C., as follows:

In reply to your communication I inclose herewith data relative to operating expenses of electrical vehicles of the Government Printing Office.

These costs cover two years; it will be noted that the costs for the second year are higher than those for the first year, due to the renewals of batteries. The third year should about equal the first, so that an average between the two years is a reasonable number.

Generally speaking, these electric vehicles have given excellent service, and save us over $10,000 a year. The work done by them cannot be handled with twice the number of horses.

TABLE I—OPERATING EXPENSES OF ELECTRIC VEHICLES FOR FISCAL YEAR 1913-1914.

Second Year of Service.

Car No.	1791	1794	1792	1793	1790	1795	1824	1826	1825	1859
Date Installed	Dec., 1911	Dec., 1911	Dec., 1911	Dec., 1911	Dec., 1911	Dec., 1911	Nov., 1912	Jan., 1913	Nov., 1912	Jan., 1914
Capacity, lbs.	1000	1000	2000	2000	5000	5000	5000	8000	P. P. 1 Baker	P. P. 2 Rauch & Lang.
Mileage	7252	3422	6654	4425	4705	6598	4952	3423	4627	1723
K.W.-Hours Supplied	3396.7	3825.8	3773.3	3001.8	4465.2	3479.3	3064.2	5148.5	3968.1	323.8
Cost of Current @1½c per K.-W.-Hour	$ 50.95	$ 57.39	$ 56.60	$ 45.03	$ 66.98	$ 52.19	$ 45.96	$ 77.23	$ 59.52	$ 4.86
Battery Upkeep	175.53	162.38	162.56	157.41	152.90	158.76	151.19	160.45	154.60	60.97
Tire Upkeep	77.23	76.22	102.58	126.57	93.86	84.23	104.94	.....	362.23	94.73
Electrical Upkeep	17.26	20.29	16.24	4.29	16.86	125.02	10.09	4.03	14.92	20.10
Mechanical Upkeep	93.54	65.49	113.85	60.12	101.32	134.29	52.97	23.03	66.10	14.89
Inspection, Washing, etc.	202.76	202.76	202.76	202.76	202.76	202.76	202.76	203.41	202.76	79.03
Total Maintenance	$617.27	$584.53	$654.59	$596.18	$634.68	$757.25	$567.91	$468.15	$860.13	$274.58

TABLE II—OPERATING EXPENSES OF ELECTRIC VEHICLES FOR FISCAL YEAR 1914-1915.

Third Year of Service.

Car No.	1791	1794	1792	1793	1790	1795	1824	1826	1825	1859
Date Installed	Dec., 1911	Dec., 1911	Dec., 1911	Dec., 1911	Dec., 1911	Dec., 1911	Nov., 1912	Jan., 1913	Nov., 1912	Jan., 1914
Capacity, lbs.	1000	1000	2000	2000	5000	5000	5000	8000	P. P. 1 Baker	P. P. 2 Rauch & Lang
Mileage	5961	4967	5749	4202	3972	4180	4429	4274	2513	2537
K.W.-Hours Supplied	3053.2	4085.7	3595.4	3179.0	4661.0	3649.2	3029.8	5576.6	2908.1	846.1
Cost of Current @1½c per K.W.-Hour	$ 34.70	$ 41.18	$ 42.14	$ 36.09	$ 54.16	$ 42.03	$ 35.18	$ 63.72	$ 31.40	$ 9.25
Battery Upkeep	522.96	537.42	547.43	545.01	753.23	686.59	211.71	164.33	236.76	590.18
Tire Upkeep	.....	81.81	80.34	98.57	66.20	122.45	4.11	69.38	82.66	.....
Electrical Upkeep	72.60	18.16	33.84	22.52	21.13	28.81	22.93	20.55	26.17	19.50
Mechanical Upkeep	204.28	120.75	171.17	189.07	168.85	65.48	164.17	118.44	314.90	28.53
Inspection, Washing, etc.	166.82	166.82	166.82	166.82	166.82	166.82	166.82	167.52	166.82	166.82
Total Maintenance	$1,001.36	$966.14	$1,041.74	$1,058.08	$1,230.39	$1,112.18	$604.92	$603.94	$858.71	$814.28

The Curtis Publishing Company, of Philadelphia, writes:

> In reference to your letter on electric vehicles, we have found them very satisfactory and running at much less expense than the horses and wagons.
>
> When electric vehicles are put in by a company they should be checked up very closely, and the main thing to consider is the unloading and loading time and the distance that is to be traveled in making the delivery and the return.
>
> All of this was considered thoroughly here, and our equipment is a success.

Public Service Companies.

So much has been written concerning the electric-vehicle opportunity that it is doubtful if there are many utilities that do not fully realize the importance of the battery charging load and the part they are justified in taking to secure this desirable business. Certainly the central station in general has a wonderful opportunity to aid in the introduction of the electric truck because of the fact that it is in no small degree a consulting engineer to industry and commerce. It is a recognized public servant, an aid to local growth and prosperity. The central station is the logical advocate of the electric truck, and this is why the truck manufacturer asks its aid in agitating, through local advertising, and other publicity methods, its increased use.

However, regardless of the actual promotive work which the utility finds it desirable to do, all interests concerned in the development of the electric-vehicle industry are agreed that all central-station companies should at least employ electrics in their own transportation work. The public endorsement thus given the battery vehicle would have a stimulative effect on the general development and the operating records obtained by the company could be used to demonstrate the economy of electric delivery to the prospective users.

In practically all of the large cities and in a surprisingly large number of small communities, central stations are using electrics for their own deliveries and regardless of their motives in originally purchasing vehicles of this type, the resultant economies have made the subsequent purchases a matter of dollars and cents.

Digitized by Google

In Chicago the Commonwealth Edison Company operates a fleet of 127 electric vehicles of all sizes and of all types. This company has always been a strong advocate of the electric, and has spent considerable time and money in development work, but it is, of course, ridiculous to assume that an installation of 127 electrics was made on any other basis than that of economy. The following expressions from central stations give but a brief summary of the conditions in this field:

General.

Name of Company—J. L. Marcero & Company, Detroit, Mich.
Business—Wholesale Confectionery and Cigars.
Capacity of Vehicle—1,000 pounds.
Approximate Price—$2,500
Make of Tires—Firestone (solid).
Battery—Edison.
Date of Purchase—1911.
Make of Vehicle—Detroit Electric.

Operating Data.

Average Daily Mileage—50.
Daily Hours in Use—10.
Cost of Electric Power, Per Month, $45, Including Storage and Washing.
Days in Service, Per Month—26.
Driver's Salary Per Month—$60.
Cost of Repairs and Renewals for 12 Months—$460

Total Average Monthly Operating Cost—$143.

General.

Name of Company—Emergency Hospital,
City—Washington, D. C.
Business—Emergency Surgical and Medical Work.
Capacity of Vehicle—Four.
Date of Purchase—July 1, 1912.
Approximate Price—$3,500.
Make of Vehicle—Detroit.
Make of Tires—Motz.
Size of Tires—34x3½.
Type of Tires—Cushion.
Make of Battery—Edison.
Type of Cells—A-4.
Number of Cells—60.

Operating Data.

Average Daily Mileage—5.35.
Daily Hours in Use—20.
Days in Service, per Month—Continuous.
Cost of Electric Power per Month—$17.00.
Cost of Storage and Washing per Month—$20.00.
Driver's Salary per Month—$35.00.

Total Average Monthly Operating Cost (including tires, repairs, etc.) $85.00.

The Philadelphia Electric Company writes: Replying to yours, asking for our views on the adaptability, economy and performance of the electric for our particular service, wish to advise we have 45 electrics in service at this time, and we can unhesitatingly say that they are all doing good work and are capable of doing much more if we could arrange our work accordingly.

The point I wish to make is, that our average daily mileage is much less than what the vehicles are capable of making, and do not make the showing that a department store or express company would, where they can keep their vehicles moving all day, except when loading or unloading.

Nearly all of our street gangs have a vehicle practically assigned to them all the time. They do not only carry the men, but their tools and materials as well, and should they only have one or two large jobs the vehicles would be standing idle nearly all day; but if they had 15 or 20 small jobs the vehicles would be moving nearly all day, especialy if the jobs were scattered.

The advantage of the electric over the horse is, that it makes much better time between stops, therefore enabling the men to do more work in a day, and is much more reliable. The advantage of the electric over the gasoline is, that you cannot speed and are less liable to have accidents; besides, the electric is much more reliable and less expensive to maintain.

We have vehicles equipped with electric winches, operated from the battery, for loading the trucks, pulling cables underground, raising poles, hoisting large transformers on poles, pumping out manholes, raising and lowering towers, etc., etc.

We also have a portable pipe cutting and threading machine which is operated from the battery. This has proved itself to be a great labor and money saver, especially on large jobs.

Below is a list, showing the performance of several trucks in our service during the year 1914:

Class	Total Miles	Days' Service	Average Miles per Day in Service
1,000-lb. service wagon..	8,985	300	29.9
1,000-lb. electric shop....	12,553	285	44.0
2,000-lb. lamp wagon.....	11,405	361	31.9
2,000-lb. lamp wagon.....	11,686	356	32.8
2,000-lb. service wagon (old type)	4,956	294	16.8
2,000-lb. service wagon (old type)	6,227	301	20.6
4,000-lb. stake truck.....	10,864	299	36.3
6,000-lb. construction wagon	3,039	283	10.7

The New York Edison Company writes: Because of the varied transportation needs of a central-station company, electric trucks of the New York Edison Company include a miscellany of styles and types. Perhaps it is not too much to say that no other field presents such varied demands as the lighting of a large city places upon the transportation department of the electric company. There are small, light vehicles (operating on the same principle as department store wagons), which deliver lamps to customers. For the delivery of meters, specially designed wagons are provided with padded compartments in order to eliminate the possibility of damage to these delicate mechanisms. For the heavy tasks of handling cable, the trucks are provided with winches which take their current from the vehicle battery; with this equipment the time required for pulling cable into underground ducts has been considerably reduced. Another instance of the use of the winch is seen in the erection of arc light poles. For this work a special truck equipped with a derrick and boom makes the hoisting and setting of the various parts of poles a less difficult task—particularly where the press of city traffic makes close work necessary.

A further illustration of the flexibility of electrics was shown recently in the organization of a group of trucks for setting poles over a stretch of several miles. The first vehicle deposits the various parts of each pole at the designated location; a second truck set the base and erected the steel shaft; a third, equipped with a derrick, hoisted the ornamental casing over the top of the tube; a fourth mounted the lamps while a gang of painters traveled with the fifth. The foreman supervised the operation of all five by means of an electric surrey.

Emergency wagons, wagons for the supply of miscellaneous material, tower wagons for trimming arc lights, inspection wagon for supervising the street lights at night, and passenger cars make up the balance of this varied electric truck installation.

The Edison Company has been using electric trucks for more than twelve years, the fleet during that time increasing from an original installation of two cars to the present equipment of 108. The durability of the machine is evidenced by the fact that the original two are still in service.

The Commonwealth Edison Company writes: For 15 years the Commonwealth Edison Company has been using electric vehicles in the daily routine work of a large central-station company. That the experience of the company is satisfactory is shown by the fact that it had, on September 15, 1915, 127 electric vehicles in use. The classification of these vehicles, according to carrying capacity (exclusive of five-passenger cars) is shown by the following tabulation:

Number	Capacity, Lbs., Each
22	750
22	1,000
9	1,500
4	2,000
49	3,000
10	4,000
1	5,000
3	7,000
1	10,000
1	12,000
122	

As shown by the above list, the most popular size of electric truck in the service of the company has a rating of a ton and a half, while among the very large vehicles there is one five-ton truck and one six-ton truck.

Electrical readers will be interested, no doubt, in knowing the varied purposes to which these 122 commercial electric vehicles are put. This classification is shown in the following tabulation:

Hauling supplies from storerooms to customers' premises	21
Delivery of incandescent lamps to customers' premises	15
Overhead and underground line work	33
Installing and removing meters, signs, etc.	40
Hauling reels of cable, tile and other heavy work	5
Miscellaneous	8
	122

The company's experience with the work done through a long term of years has convinced it that from the viewpoints of both cost and prompt service to customers, the electric wagon is the best available means of local transportation on account of the low cost of operation and the high mileage obtainable.

The electric vehicles used in overhead and underground line work are especially economical when compared with the horse-drawn vehicle. Here the electric truck makes a good showing in the saving in the time of the workmen who are sent out with the vehicle. Sometimes there are from four to eight men on a service wagon or a construction wagon and the greater mileage of the electric truck enables the men to accomplish considerably more work in the course of a day than they would if they had to depend on a horse-drawn vehicle.

Digitized by Google

The Electric Vehicle as a Business Builder.

Characteristics of the Battery-Charging Load.

This article, which deals in an interesting manner with the immense possibilities of the battery-charging load from the central-station standpoint, was taken from a paper presented at the recent convention of the Indiana Electric Light Association by Q. A. Brackett.

If there is one subject that is more important than almost any other to the modern central station, it is the building up of the off-peak load. During the last decade, the size of central stations has increased by leaps and bounds, and the number of plants throughout the country have increased tremendously. However, nearly all this great growth has been along the line of service that adds mostly to the peak load. Great quantities of additional generating equipment have to be purchased at great expense only to have the greater part of it idle more than half the day. Increasing business inevitably carries with it increasing overhead expense, both for equipment and for service, so that the benefit is largely neutralized. This is especially true of an increasing lighting load, since so many customers of this class really bring no direct profit to the central staton, because the yearly income from these customers is too low to pay the company's fixed charges for distribution circuits, meters, meter reading, etc., that are largely independent of current consumed. It is, therefore, extremely desirable to obtain as customers those whose requirements will not only come during the off-peak period, but will be large enough to insure a real profit. It will be found that the electric vehicle owner is one of these.

There are two classes of off-peak loads, day loads and night loads. Much has already been done by central stations towards increasing the off-peak day load. This has largely taken the form of pushing the sale of electric heating and cooking appliances, and the development of the motor load. The former has the fault that it depends on the use of small units, most of which are in service but a short time on each occasion, and not every day by any means. Then, too, they are distinctly in the nature of luxuries in many cases, and this tends to limit their use. The motor load is frequently of low power-factor, and coming on and off suddenly and frequently as it does, it makes voltage regulation more difficult and introduces considerable trouble. Neither of these classes of service can be utilized by the central station itself, but it must all be sold to more or less unwilling customers.

To fill in the light load period between midnight and morning, however, little has been accomplished, although this is the period that needs attention most of all.

There is nothing so well suited for a night load as the charging of storage batteries, since it possesses almost every characteristic to be desired for an off-peak night load, viz.:

(1) It is an all-night load, filling in the worst hollow in the load curve during the small hours of the morning.

(2) It is a long-continued load, that is, not a fifteen-minute load, like cooking devices.

(3) It is a frequent load that will occur almost every night, whereas a sad-iron in many cases is used but once a week.

(4) All customers of this sort represent comparatively heavy loads, many times greater than the average lighting load, and equal to six sad-irons at the very least.

(5) Battery charging is a steady load of good power-factor and is not subject to sudden changes like a motor load.

There are a number of things that at present deter the public from using electric vehicles to a greater degree than they now do, and the principal of these is lack of knowledge and example, while the second is lack of cooperation by the central stations.

The first thing that a central station must do to increase the use of electric vehicles in its territory is to make special rates for power when used for off-peak charging, and advertise this fact conspicuously. This will not only encourage the use of electric vehicles by making their cost of operation lower than that of other types, but will psychologically help push the campaign by virtue of the advertising and because it puts the bargain idea prominently before the prospective user.

The second step should be to educate the public as to the advantages of the electric vehicle and its real economy over other types. The general public can and should be educated by a general publicity campaign, including advertisements in the papers, posters, and exhibits at the companies' showrooms, leaflets inclosed with monthly lighting bills, etc. Posters in the street cars are an effective way of reaching large masses of the people, and where the central station controls the street cars, there is no cheaper way.

There is no form of advertisement, however, so effective as example. It is, therefore, of first importance to get the use of electric vehicles started. The first and obvious method is for the central station to introduce them for their own use as repair wagons, etc. In fact, it would be rather useless to urge them upon the public if the central station did not find them worth while themselves. Then, too, their use by the electric station is self-evidently advisable for the sake of what off-peak load they give even if an actual campaign to interest the public is not thought worth while. Assuming that the central station does adopt electric vehicles for its own use, the example thereby set can be conspicuously advertised on the cars themselves, thus getting the full effect of the example.

The next step after adopting electric vehicles itself is for the central station to concentrate its efforts especially on one or more of the large interests of the city, who use a number of delivery vehicles. If one such concern can be gotten to adopt electric vehicles and if the central station sees to it that it is so coached on their care and operation as to obtain especially satisfactory results, this will be one of the most effective arguments possible in making others follow the example. There are numerous applications of this sort that have been successful in the past. These are primarily short-haul propositions, such as delivery service for department stores, wholesale houses, etc. Another successful application of electric trucks is for handling the mails instead of mail wagons. As an example of this, note the recent adoption of electric vehicles for that purpose in the City of Boston, by the company that holds the contract for transporting the mails. Not only is this expected to be more profitable for the company than the older method, but it will improve the mail service by quickening deliveries throughout the district. It was this latter consideration that caused the Post-office Deparment at Boston to so strongly advocate the adoption of electric vehicles. This shows how outside interests will, for their own advantage, often assist the central station in introducing the electric vehicle.

Another large organization that can usually be persuaded to adopt electric vehicles is the street-railway company for their repair wagons. The same is true of the telephone and telegraph

Digitized by Google

companies. In both these cases, the negotiation is made easier by the fact that since all are in the electrical business, they are familiar with the care and characteristics of storage batteries and are not deterred by the unfamiliarity with them that exists in the mind of the ordinary business man. In fact, other things being equal, these should be the easiest applications to bring about in any new territory after the adoption of electric vehicles by the company itself.

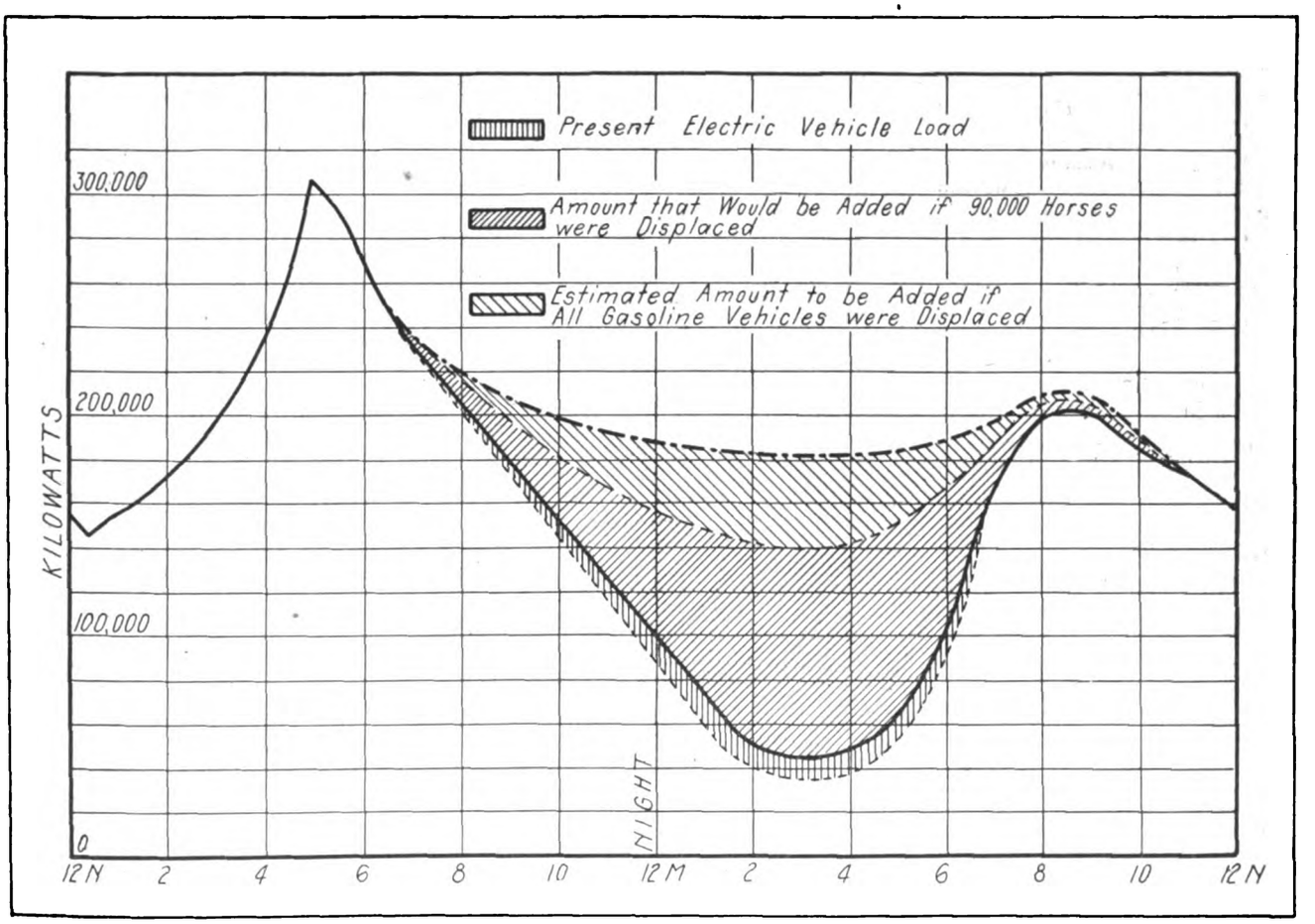
In getting the individual user to adopt the electric vehicle, it may be necessary to do even more than advertise and set an example, and furnish attractive rates for power. The first cost of charging apparatus, low as it is, may deter an otherwise converted customer. In such cases, it may even be advisable for the central station to remove this first cost entirely from the customer's mind, by providing the charging equipment itself for a nominal rental, the customer to pay all maintenance expenses. Two dollars a month would cover the interest and depreciation, for instance, on an average-size rectifier equipment. In cases where it would not conflict with a local agent, the central station might even help its customers save money, by handling the purchase of vehicles for all its customers, and giving them, in the form of a rebate later in the year, the advantage of any quantity discount obtained according to the number of vehicles sold in the district, per year. This would make all the first purchasers boost electric vehicles to their friends for all they were worth, so as to get enough vehicles sold to insure their own discount. The central station would thus have a corps of able men working for their interests for nothing, which, in most lines of endeavor, would be considered well worth while.

For a number of years, a commercial electric vehicle has always meant a fairly large and quite expensive truck which only large concerns dealing in heavy merchandise would buy. Lately, however, light electric delivery wagons, costing less than a thousand dollars, have appeared on the market, and these open a whole new field for the application of electric vehicles to the delivery service of bakeries, grocery and provision stores, light express service, etc., where the one-horse team is so common nowadays. The same conditions of economy hold here as in the cases of the larger trucks. The columns of the leading electrical papers have repeatedly shown the greater economy of operation of electric vehicles within their proper sphere over both gasoline and horse-drawn vehicles. This usually amounts to a saving of from 20 per cent to 50 per cent over the cost of operating an equivalent gasoline truck. This means a great deal in dollars and cents in the course of a year.

But the electric truck is only one phase of the electric vehicle proposition. The pleasure car is almost equally important from the central-station standpoint, although it usually represents a somewhat smaller unit and one that is charged less often. Nevertheless, the average pleasure vehicle requires about 20 kilowatt-hours per charge, and if charged 15 times a month, this represents at a five-cent rate for power an income of $180 per year from each car. This is far more than the income from the average lighting customer, in spite of all the sad-irons, toaster stoves, etc., that he may use, even at a 10-cent rate for power. And it is nearly all clear gain, since the load all comes during the small hours of the night when the load is lightest and since it requires practically no new expense on the part of the company.

In the case of the larger commercial vehicles, the load is even greater, averaging, say 30 kilowatt-hours per charge with 25 charges per month, or about $450 per year income to the central station at a five-cent rate.

The superiority of the electric pleasure car for town use, and especially for



Load Curve of the Commonwealth Edison Company Showing Importance of Battery-Charging Load.

Digitized by Google

ladies, is no longer disputed. Its quietness and air of luxury makes it especially appropriate for society use, while its utter cleanliness, its simplicity of operation, and its absolute freedom from operating troubles, such as are liable to occur with even the best gasoline engines with their valves, carbureters, ignition system, gears, etc., place it in a class by itself. This is especially true for the woman who wants to drive for herself, even when gowned in her best for an afternoon party. For doctors, also, who want a car that will be always ready, and never fail to start in an emergency, or for people of quieter dispositions, who have not the mania for high speed or cross-country touring, the pleasure electric especially appeals.

It is necessary, however, for the central station to do more than encourage the use of electric vehicles and provide attractive rates for power. It is necessary to provide facilities for charging the car batteries and to advise the owners as to the proper methods to adopt.

It is unquestionable that some customers will prefer to pay to be relieved of all trouble in caring for their batteries and will have them charged at a public garage. On the other hand, many customers will prefer to save expense by charging them themselves, or will be so situated that there is no electric garage at all convenient. The man who would charge at home, must be helped with advice as to what charging equipment he needs and must be coached in its use, so that he will get good results and not become prejudiced against the electric vehicle because of battery trouble brought on by improper charging.

The man who prefers to have his car charged at a public garage, must be looked after, by seeing to it that a sufficient number of public garages are equipped and trained to give good service along this line.

The charging equipment that is best suited for the man who charges his own car at home, is not necessarily the best for the public garage. The conditions differ widely, and a choice must be made between the various types of charging apparatus that are available.

These are divided into two main classes: motor-generator sets and mercury rectifiers. The former can be made in any size that is required, whereas the maximum capacity of the latter is 50 amperes, direct current. It, therefore, follows that for public garages, where a large number of cars are to be charged at once, the motor-generator set or rotary converter are the only devices to be considered. These should be chosen of a size large enough to take care of a reasonable growth of business during the near future.

For private garages, where only a single car need be charged at a time, the mercury rectifier is amply large enough to suit all requirements. The choice of a charging device hinges, therefore, on their relative advantages, or the preference of the user. Their relative advantages depend partly upon their inherent characteristics and partly upon the conditions under which they are to be used.

In the foregoing, the writer has endeavored to point out the advantage of developing the use of electric vehicles in the territory supplied by any central station, showing how the charging of the vehicle batteries brings about an off-peak load of most desirable characteristics and size, and occurring at the time most desirable from the central-station viewpoint, namely, during the small hours of the morning.

It has been shown that a single pleasure vehicle will bring in nearly $200 per year to the central station, while a truck will bring in $400 or $500 per year, all for current delivered during the worst part of the off-peak period.

Certainly, this would seem to warrant vigorous and unceasing effort on the part of the central stations to obtain and build up this load and to assist in every way the growth of the use of electrical vehicles. Suggestions have been made as to ways to accomplish this and as to methods of handling the load, once it is obtained.

It is only a question of time before the advantage of the electric vehicle to the central station is universally recognized, and until more systematic efforts are everywhere made to encourage its use.

Electric Vehicle Making Long Cross-Country Run.

Excellent progress is being made by the Ward special, an electric delivery wagon, which is making the long cross-country trip from New York to Cleveland. This vehicle started from the Grand Central Palace at 2:30 Wednesday afternoon, October 6, coincident with the opening of the annual New York Electrical Exposition and Motor Show. It reached Peekskill the same evening and on Thursday ran through to Albany.

According to the report of John Delahant, the expert of the New York Electric Vehicle Dealers' Association, who is accompanying the vehicle as official observer, 111 ampere-hours of current were consumed in making the run from the Palace to Peekskill, a distance of 45 miles and at Ossining the battery was given a boost of 80 amperes for one hour, because a detour was found necessary.

On Thursday this delivery wagon which by the way is carrying its rated capacity load of 750 pounds, made the run from Peekskill to Albany, stopping at Poughkeepsie to have its battery boosted.

THE NEED FOR REDUCING THE NUMBER OF STANDARD WHEEL AND TIRE SIZES FOR ELECTRIC VEHICLES.

By Paul W. Kerr.

The Society of Automobile Engineers in 1911 adopted a standard of dimensions for all truck wheels and tires. This standard provided a schedule of diameters varying by two-inch steps from 32 to 42 inches and a schedule of seven widths, varying from 2.5 to 7 inches, making 42 possible sizes in all.

The immediate adoption of this standard by all manufacturers of the lines affected, was ample proof of the value of the S. A. E. recommendation.

General practice and thorough investigation conclusively proved such a large variety of wheel diameters unnecessary for truck efficiency and impractical, for, with the expansion of the industry, tire manufacturers, especially, found it practically a physical impossibility to carry complete stocks and render efficient service in all of the 150 or more cities having at least 25 trucks. As a consequence, in the fall of 1913, the S. A. E. revised its former standard, eliminating all diameters but 32 inches, 36 inches and 40 inches, still retaining the former schedule of widths, thus making 21 different sizes. Strictly speaking, the 32-inch diameter was tentatively retained to take care of a few small electrics, but later recommended for elimination, leaving only the 36 inches and 40 inches and 14 sizes.

The general adoption of this present standard will afford even greater advantages than the former did. Such a simplification will enable tire manufacturers to carry complete stock in all service stations, thus raising the standard of tire-renewal service to the highest point of efficiency; will have a decided tendency to satisfactorily increase export business and aid the progress already made toward an international standard.

Although manufacturers of electric vehicles have not adopted these standards as rapidly as builders of gas trucks, they have showed a decided tendency in this direction. Highly efficient service and low cost for renewal parts are most vital to the success of a general intensive truck sales campaign. Nothing will do more toward bringing about this desirable condition than a complete adoption by the electric vehicle manufacturers of the present S. A. E. standard.

National Independent Telephone Association Convention.

The annual convention of the National Independent Telephone Association will be held in Hotel La Salle, Chicago, Ill., on December 8 to 10.

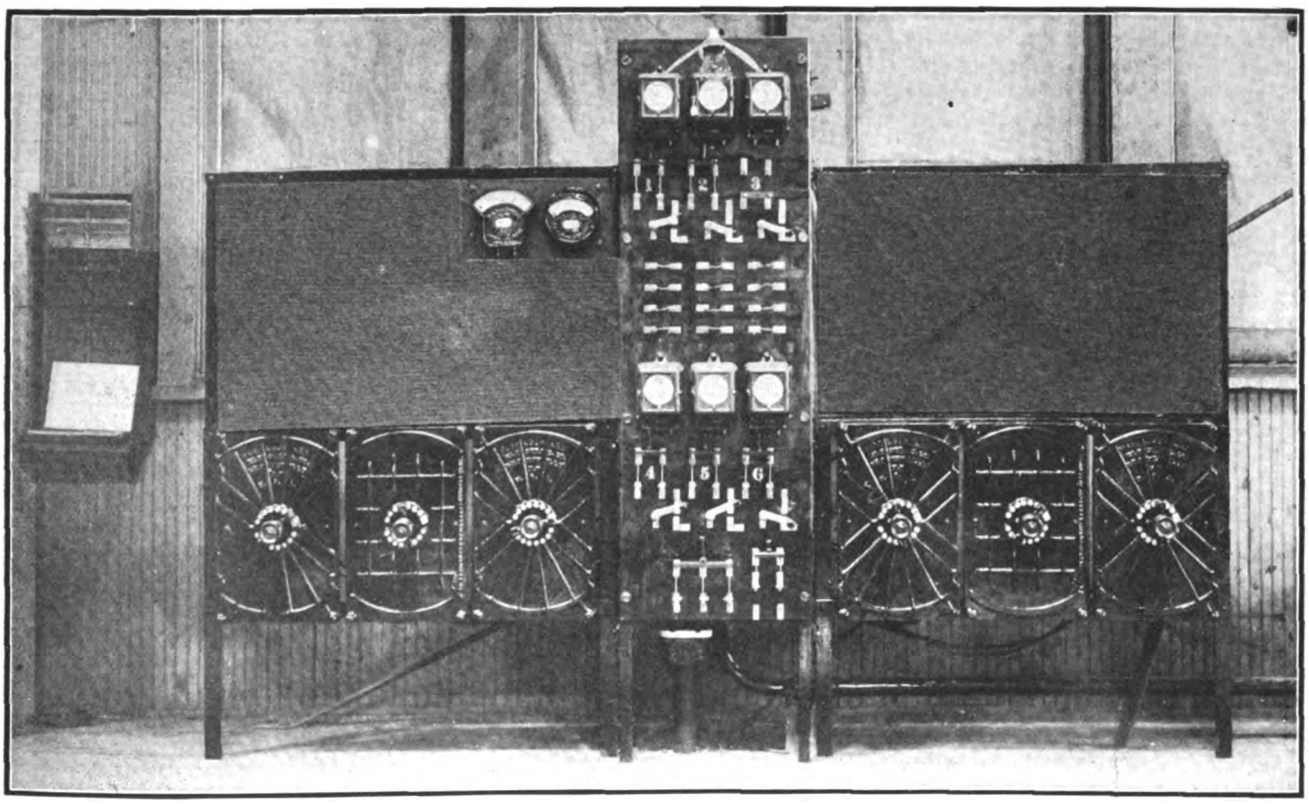
Digitized by Google

An Electric Commercial Car Garage in Chicago.

Details of an Innovation That Fills a Long-Felt Want.

An exclusively electric commercial vehicle garage recently opened in Chicago is described in this article. Rates are based on the energy consumed by each vehicle, plus a storage charge, and surprisingly low operating costs are revealed by the records which are kept by the garage for each vehicle.

There is no single item that will contribute more to the greater use of electric commercial vehicles, especially of the small package-delivery type, than the establishment at convenient points in a city of exclusive commercial garages, where such vehicles can be stored and charged under competent supervision. The small manufacturers and merchants, say those having need for only one or two light delivery wagons, will hesitate to install expensive charging equipment, even though realizing the advantages and economies that would accrue from the use of electric cars. Yet these same men could, in many cases, be interested if convenient garages were available, where the vehicles could be stored and where the batteries could be charged by competent attendants.



Charging Board in Electric Service Garage Showing Individual Meters.

Almost as essential as the garage itself is a proper basis of charging. It is obviously unfair to charge a user of a 1,000-pound wagon, who uses his car 3 or 4 hours a day, covering from 8 to 10 miles, the same rate as the 1,000-pound wagon which operates eight hours per day, covering a radius of say 20 miles. Passenger-car garages indicate their willingness to accommodate commercial vehicles, yet maintain flat rates based on the size of the vehicle, rather than on the cost of furnishing garage service to any individual user.

The "Electric Service Garage" in Chicago is the first public electric garage devoted exclusively to commercial cars, and its influence on the vehicle business in the territory it serves will be watched with interest. Previous to the establishment of this garage such electrics as were in the neighborhood either had to be stored in gasoline garages or in electric passenger-car garages. In the former case the assistants who are employed in gasoline garages are inexperienced in the proper care of the electric, and in the passenger garage proper facilities are usually not available for the repair of electric trucks, which are usually considered as a side issue to the passenger-car business and consequently neglected.

In this new exclusively electric commercial garage, where only those are employed who are familiar with electric trucks, every attention will be given to receiving the vehicle, charging or repairing it, and placing it again in satisfactory service.

Operated in connection with the garage is a machine shop equipped with modern tools and intended to provide means for making any kind of repairs to electric trucks. In fact, with the equipment installed complete trucks could be built. At present this machine shop is used for general outside repair work, but as the truck industry develops in this district it is expected that the shop will be kept busy on truck repairs exclusively. It may be stated that as such garages are established throughout a city the machine shop could well be made the permanent adjunct of such establishment, and during the early life of the garage provide a source of income that would permit of at once establishing low rates for garaging service. With the garage business of such a combination establishment developed to its highest point the machine shop would become a valuable asset for vehicle repairs and replacements alone. The average garage when confronted with repairs demanding special equipment to construct finds it necessary to send the

Digitized by Google

broken parts to similar machine shops, or even back to the vehicle factory. The vehicle consequently remains out of service, with a loss to its owner and the garage.

Located at Halsted and Fulton Streets, in the heart of a heavy traffic district, the garage is properly situated to take care of the many electric trucks plying between the downtown district and the north and west sides of the city, many of the trucks delivering and receiving at the nearby railroad freight depots.

Easily accessible from the street, and also the shipping yards of the railroad terminals, the building is so divided that the garage proper extends the extreme length of the building, the machine and repair shops being located on a balcony above, to which trucks, bodies or chassis can be easily removed by means of an electric hoist. This modern facility means much in making repairs. In the average garage, removing a body or heavy part is a phase of repair work which is often avoided, thereby leaving the damaged part inaccessible.

The balcony platform is equipped with a specially built switchboard, the rheostats and wiring being of extra heavy quality in order to carry a large amperage. As shown in the illustration, the board has six rheostats and six meters. Each meter is so connected as to indicate the kilowatts used for charging, the charging expenditure being based absolutely on a flat rate of five cents per kilowatt-hour consumed.

In order to assist truck users in avoiding delay while charging, it is possible to connect the charging outlets in pairs; two outlets in each outlet box, each box provided with a double-pole knife switch, so that each pair of charging outlets may be connected in parallel to give boosting charges of 160 amperes. This fast and heavy boosting is exceedingly valuable. Truck drivers can drop in at any time, especially during the noon hour, and place their vehicles on a quick, heavy charge sufficient to last them for the remainder of the day. The charging plugs are located and extend along the edge of the balcony and are easily accessible to the trucks below.

As soon as the vehicle has received a sufficient charge, a reading is taken from the meter. This reading, the former reading, and the kilowatt-hours consumed are recorded together with the mileage, type of truck, tire and battery equipment, on a blank card bearing the owner's name and address. Each card is tacked to a drawer and acts as a separate file when placed in the cabinet, as shown to the left of the switchboard in the illustration. At the end of the month a bill is rendered, the data on the card report showing the exact work done, and the cost of the month's operation. By the use of this unique method the truck user has a permanent record from which he can estimate the saving or loss arising from his vehicles.

The accompanying records are typical of the costs of vehicles kept in this garage. Reference to these records will emphasize the unfairness of charging a flat rate, even for vehicles of exactly the same size. It may be added that even with the low rates indicated by the records the business is profitable to the garage.

TYPICAL GARAGE RECORD
ONE-HALF TON VEHICLE — LIGHT WORK.

TOWEL DELIVERY.

NAME ____ ADDRESS 364 W. Randolph DATE 10/31/14

CAR C TYPE Cov Top RATED CAPACITY Half-Ton TIRES TYPE W.T.X

BATTERY C CELLS 32 PLATES 13

DATE	MILEAGE TOTAL	MILEAGE TRIP	SPECIFIC GRAVITY IN	SPECIFIC GRAVITY OUT	START TIME	START AMP.	FINISH TIME	FINISH AMP.	K. W. H. CHARGE	AMP. HR. METER DISCHARGE	AMP. HR. METER CHARGE	REMARKS
1												Wash
2												
3					1282	1Pm.	27	9 Pm.	7	12	102	0
4					1279	1 "	27	9-	8	12	105	12
5					1273	1 "	20	4-	5	8	62	0
6												Wash
7												
8												
9					1278	1Pm.	20	8-	5	11	93	15
10												
11					1285	1.20	15	10-	7	15	125	16
12												
13					1290	1.0	20	8-	7	11	93	6
14												Wash
15												
16												
17					1279	12	20	9-	8	14	115	3
18												
19					1288	1.0	15	9-	8	15	120	18
20					1280	1.0	20	9-	8	9	70	0
21												Wash
22												
23												
24					1290	1.0	27	10-	7	15	115	0
25												Wash
26												
27					1290	12.0	27	10-	7	15	115	0
28												
29												Storage 18.00
30												149 KWH @ 5¢ 7.45
31												
					1285	12.0	27	7-	5	12	95	0
							Total		149 KWH.			$25.45

Blank sheets like this will be mailed upon request. Commonwealth Edison Company 139 West Adams Street

TYPICAL GARAGE RECORD
ONE TON VEHICLE — PARCEL DELIVERY

WHEN LEAD CELLS BEGIN TO GAS FREELY, REDUCE THE CURRENT

NAME ____ ADDRESS 1279 Milwaukee Av DATE 11/2/15

CAR W TYPE Covd Cab RATED CAPACITY One Ton TIRES

BATTERY 60 Cells CELLS 6 PLATES 6 TYPE A

DATE	MILEAGE TOTAL	MILEAGE TRIP	SPECIFIC GRAVITY IN	SPECIFIC GRAVITY OUT	START TIME	START AMP.	FINISH TIME	FINISH AMP.	K. W. H. CHARGE	AMP. HR. METER DISCHARGE	AMP. HR. METER CHARGE	REMARKS
1												
2												
3					7 Pm.	40			26	195	0	
4	41.8				X	"			28	210	0	
5	43.5				7	"			25	270	0	Worked every night
6	57.4				7	"			23	165	0	
7	35.0				9	"			34	255	1	
8	14.6				7	"			25	200	0	
9	42.2											
10												
11	42.7				8	"			23	180	0	
12	57.4				7	"			37	285	0	
13	5.9.				8	"			34	270	0	
14	56.0				8	"			35	270	0	
15	5.2				8	"			20	150	0	
16	43.				8	"			35	270	0	
17												
18	57.3				8	"			26	190	0	
19	60.0				8	"			32	260	0	
20	39				6	"			29	225	0	
21	55.				7	"			30	240	0	
22	34				7	"			32	255	0	
23	57				7	"			49	505	0	Boost at noon
24									40			
25	43				7	"			35	275	1	Boost "
26	61				7	"			44	350	0	" "
27	65.7				8	"			40	353	1	" "
28	57.				10	"			42	360	0	" "
29	60				9	"			40	350	0	" "
30	226	miles							794			
31												

Total K. W. H. 749 KWH @ 5¢ 39.70

Storage Per 4 Washing 25.00

$ 64.70

Records Kept by Service Garage.

Digitized by Google

Electrical Exports for July.

The following data on the electrical exports of the United States for July are obtained from the monthly summary of foreign commerce for that month just issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

In July the total value of the electrical exports exceeded that of all months since December, 1913. For the four classes for which the number of articles exported is reported there were shipped the following: Fans, 2,234; arc lamps, 19; carbon-filament lamps, 86,757; metal-filament lamps, 358,606.

In the following table are given the detailed figures for last July and for the corresponding month of a year ago:

Articles	July, 1915	July, 1914
Batteries	$ 91,344	$ 59,714
Dynamos or generators.	156,191	195,983
Fans	28,438	23,629
Insulated wire and cables	187,379	127,697
Interior wiring supplies, etc. (including fixtures)	80,933	45,077
Lamps—		
Arc	433	1,672
Carbon-filament	9,715	3,143
Metal-filament	55,929	13,581
Meters and other measuring instruments	55,463	31,585
Motors	381,695	161,798
Telegraph instruments including wireless apparatus)	8,536	5,340
Telephones	101,277	59,347
Transformers	73,292	72,443
All other	916,682	614,351
Total	$2,147.307	$1,415,360

Lynn Section Meetings.

The first meeting of the Lynn Section, American Institute of Electrical Engineers, for the season was held October 6, when H. A. Hornor, electrical engineer, New York Shipbuilding Company, gave an interesting lecture on the subject, "Battleships—Their Fabrication and Electricity's Part Therein." By means of lantern slides the descriptions were made very clear to the large audience.

The program for the balance of the season will be:

October 20—"Glaciers of Alaska," lecture by C. A. Adams, professor at Harvard University.

November 3—"War Surgery in France," by Edward Hall Nichols, surgeon and professor in Harvard Medical School.

November 7—"A Trip to the Argentine Republic," by J. A. Shipton, U. S. A.

December 1—"American Shipbuilding," by J. W. Powell, president of Fore River Shipbuilding Company.

December 15—"The Effect of Legislation Upon Our Industries," by A. G. Duncan, president, National Association of Cotton Manufacturers.

January 5, 1916—"Telescopes," by John A. Brashear.

January 22—Banquet.

February 2—"How New York Gets Its Electric Light and Power," by H. H. Barnes, Jr.

February 16—"Illumination at the Panama-Pacific International Exposition," by Walter D'Arcy Ryan, chief of illumination. Joint meeting with the New England Section of the Illuminating Engineering Society.

March 1—"Light, Shade and Color in Illumination," by M. Luckiesh, Nela Research Laboratory.

March 15—Lecture by Elihu Thomson.

Convention of Colorado Association.

The thirteenth annual convention of the Colorado Light, Power and Railway Association was held at Glenwood Springs on September 23, 24 and 25.

The party left Denver in three special Pullman sleepers and a club car the night of September 22 over the Denver and Rio Grande Railroad, and arrived at Glenwood Springs the next morning. There was a total in attendance of 92.

The first session was called to order by President Raber at 2 p. m. on Thursday. The first paper presented was entitled "Keeping Appliances in Use After They are Sold," and was presented by Miss Jane Aldred, of the Colorado Power Company. Miss Aldred dwelt on the different methods of selling appliances, demonstration thereof and the necessity of the central station keeping after appliances after they are sold so that they will be used.

The next paper presented was "Rate Making to Stimulate Other Than Lighting Uses," by Franklin P. Wood, of the Trinidad Electric Transmission, Railway and Gas Company. Mr. Wood went in some detail into the method of his company to attract power users, particularly the smaller user, and suggested the use of a sliding scale of prices so that, as the power bill tended to increase, the rate would drop off, which would encourage the use of a greater amount of current.

Mr. Hammond of the Colorado Power Company did not agree with Mr. Wood and maintained that such a rate would tend to confuse the small consumer as he would not readily grasp such a rate. Mr. Hammond offered as a substitute the rate published by his company. This rate, which Mr. Hammond said was becoming very popular on his lines due to its ease of comprehension, consisted of a twelve-cent rate for the first ten kilowatt-hours and a six-cent rate for all in excess, both being subject to a ten-per-cent reduction for prompt payment.

Mr. Doane, of the National Lamp Works, agreed that Mr. Hammond was working along the right lines, but said he believed in some future time the rate to the consumer would be based on the value of the service to the consumer rather than on the basis of its cost to the central station for manufacturing. Mr. Doane also stated that a rate which should be satisfactory to all parties would be one whereby a set charge was made per room for residential consumers.

Following this discussion was a paper by W. N. Casey, of the Denver City Tramway Company, entitled "Present-Day Problems of the Street Railway." In this paper Mr. Casey went into some detail on the inroad the jitney bus was making in the receipts of some street-railway companies and also took up the effect of the automobile upon the earnings of the street-railway companies.

Friday was given over to the reading and discussion of papers prepared and presented by the Colorado Public Utilities Commission, as follows:

"Valuation of Public Utility Properties," by F. J. Rankin, engineer of the Commission.

"A Uniform System of Accounting," by F. W. Herbert, auditor of the Commission.

"The Indeterminate Franchise and the Certificate of Public Necessity and Convenience," by M. H. Aylesworth, attorney for the Commission.

"Depreciation as Affecting Valuation and Assessments," by D. W. Knowlton.

An evening session was made interesting by the presentation of a paper, "The Electric Range," by B. S. Manuel, of the Westinghouse Electric and Manufacturing Company.

C. N. Stannard, of the Denver Gas and Electric Light Company, went into the details of the "Electrical Prosperity Week," for the benefit of the members of the Association who did not thoroughly understand what was being attempted.

Saturday morning was given over to the presentation and discussion of two papers.

"Improvements in Mazda Lamps," by S. E. Doane, of the National Lamp Works. Mr. Doane spoke to some extent on the type C lamp, explaining the reason of manufacture and speaking of the possible improvements.

The second paper, "Modern Store and Window Lighting," by R. Arnold Lewis, of the Edison Lamp Works, went into some detail regarding the design of several different typical installations and gave tables for determining the illumination of stores and windows.

The last session of the convention was the executive session, at which John J. Cooper, of the Arkansas Light and Power Company, was elected president of the Association for the ensuing year, with L. P. Hammond, general manager of the Colorado Power Company, as vice-president.

Digitized by Google

Electrical Construction

TESTS OF SPLICES IN GALVANIZED IRON WIRE.

By Terrell Croft.

The following paragraphs record the results of a series of tests made by Warren S. Simmons and the writer in the laboratories of Pratt Institute, at Brooklyn, in 1902, while they were students at that institution. The gist of the information thereby obtained appeared in the Pratt Institute "Science and Technology Annual for 1901 and 1902." Extracts from this report have in several instances been printed in the electrical magazines. Inasmuch as requests for additional information regarding these tests have been received, a fairly complete description of the tests made and an outline of the conclusion reached is given herewith.

In practical line construction there are several types of twisted wire joints in use, each of which has its advocates. The intention of this investigation was to find, if possible, which of these is the stronger and better, and at the same time to find the dimensions for the most efficient splice for each of the sizes of wire generally used. The joints were tested unsoldered at first, as in many cases it is unprofitable so to treat them, especially where the wire is used only to support a strain, as in guying, where the electrical conductivity is not a factor.

Unfortunately in the laboratory it is impossible to exactly reproduce conditions met with in practice. As a rule when wires are broken out on the line, the rupture is caused by a sudden strain such as a tree falling on the middle of a span or a pole toppling over. In these cases the strain comes so suddenly that probably the wire would break before a joint would have time to untwist, even if the joint were made ever so poorly. It is practically impossible to measure accurately in the laboratory the force of a sudden blow, so the joints could not be tested in this way. But the tests were made on an Olsen testing machine, on which the load steadily increases until the specimen breaks. A machine of this kind reproduces a strain such as a guy wire would be called upon to sustain, or such a one as would be caused by changes of temperature. At any rate, when we have a joint that will sustain as much as the wire itself, we have all that can be desired of it, and the tests were therefore made to find out how the different joints compared in tensile strength with this standard.

In Figs. 1, 2, 3, and 4 are shown some of the types of joints in use. From the illustrations it is evident that there are two components in a twisted joint: *first*, the short turns around the wire at each end, and *second*, the long twists in the middle or the "neck." The effect of each of these was tested separately. No. 12 iron wire, which was found to break at 475 pounds, was used in preliminary tests.

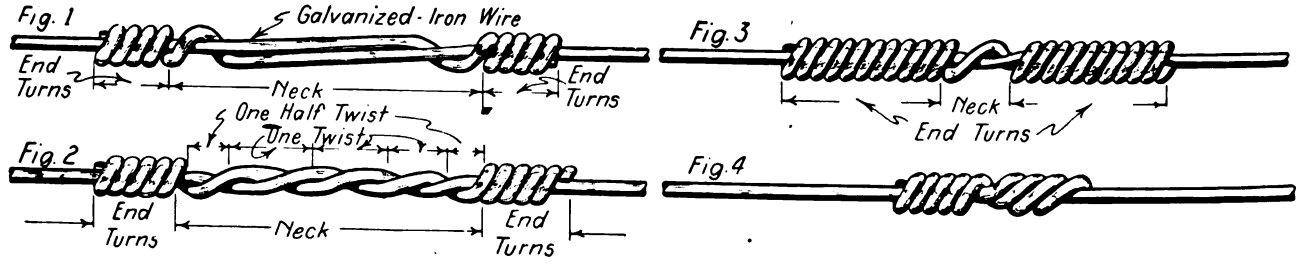
To find the effect of the short turns, the tests shown in Table I were made The specimens were all wrapped with one twist in the necks and the short turns at the ends were varied as stated in the table. The results shown are the average of several tests for each type of joint. Referring to Table I, in breaking the joints, with three exceptions out of the thirty-five tested, the joints untwisted down to one short wrap before they broke. When a strain is applied to a connection of this type the wires are gradually pulled apart, the length of the joint decreasing, the short turns turning around the main wires as the tension is increased, and usually, if the stresses are continued, the wires will untwist entirely, although in some cases, especially with the large-size wires, they may break when there are but two or three of the short turns left.

From the results it is evident that it would be impossible to make a joint of this type, of reasonable size, the strength of which would even approximately equal that of the wire of which it was made. Also it is apparent that increasing the number of short turns above four or five does not strengthen the splice materially.

To find the effect of the twists in the neck of the joint the tests shown in Table II were made. Specimens for these tests were all wrapped with two short turns at each end, and the twists in the neck were varied as shown in the table. In each case a neck four inches long was used, this being considered the average length used in practice for No. 12 wire, its length being in about the right proportion to this size wire.

Evidently, from the results shown in Table II, a safe joint, that is, one which will hold as much as the wire of which it is made, should have five or six twists in a four-inch neck.

Where four turns or less were used, the joint would start to slip at a load about one-half the breaking load of the wire; would continue to slip at this



Examples of Splices Which Will Fail Before the Wire Breaks. Fig. 4 Shows What Results to the Splice Shown in Fig. 2 When Subjected to Tension.

TABLE I. (NO. 12 GALVANIZED IRON WIRE).

No.	Number of Short Wraps.	Breaking Load in Pounds.
1	3	195
2	3	242
3	4	264
4	6	266
5	8	240
6	10	247

TABLE II. (NO. 12 GALVANIZED IRON WIRE).

No.	Number of Twists in Neck.	Breaking Load in Pounds.
1	3	230
2	4	230
3	5	475
4	6	475

Digitized by Google

load or less until it untwisted entirely, or after having pulled down to the short wraps it would break. An example of this is Fig. 4, which shows a specimen of a No. 6-wire joint that had four twists in a seven-inch neck before it was placed in the testing machine. At time of breaking these four twists had pulled entirely down to the short wraps. When a wire breaks after having untwisted from a joint such as the one shown in Fig. 4 was originally, the breaking strength is a little over half the breaking strength of the uninjured wire.

The joints shown in Fig. 5 were made in accordance with the above conclusions, and are probably the most efficient joints for the sizes of wire used. As a few short turns at the ends undoubtedly somewhat increase the strength of the splice and add to its appearance, five of them were placed at each end. Judging from results obtained, there is no benefit from increasing this number.

After the above described tests on No. 12 wire were completed, the other sizes, viz.: No. 14, No. 10, No. 8, No. 6, were considered. The object sought in the tests on these sizes was to find the number of twists in the neck of the splice necessary to make it as strong as the wire of which it was composed.

The results for the different sizes of wire were so nearly the same that it does not seem necessary to treat each size separately.

It was found that for all sizes of iron wire tested, in order to make a splice of a strength equal to the wire of which it is made, there should be at least five twists in the neck and about five short turns at each end, although joints made with but two or three short turns at the ends often appear to hold as well as those made with more.

In determining the length which the neck should have there are two things that it seems necessary to consider; if the neck is made too short it will not be possible to make the five turns in it (which, judging from results obtained, are necessary) without either "burning" the wire or exercising an unnecessary amount of labor; and secondly, if the neck is made too long, wire will be wasted, and after a certain limit the joint will be weakened. In other words, the proper length of neck is the shortest length that will contain five twists without injuring the wire or making the joint too hard to twist.

The lengths used for joints shown in Fig. 5 are as follows:

No. 14 wire	3.5	inches
No. 12 wire	3.75	inches
No. 10 wire	4	inches
No. 8 wire	6	inches
No. 6 wire	7	inches

To find what effect soldering had on the strength, a few joints were soldered and broken in the testing machine, and it was found that for No. 14 and No. 12 wire even a joint with one twist in neck and one turn at each end would sustain its load, if soldered, while the wire of which it was made would break. On account of lack of time soldered joints of other sizes of wire were not tested.

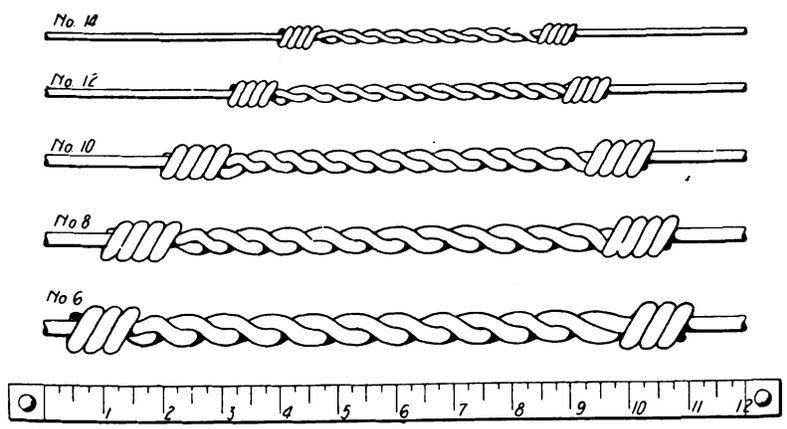


Fig. 5.—Properly Made Joints in Wires of Different Sizes. These Splices All Have Five Twists in Their Necks.

The splices used were made in the following manner. First, the ends of the wires to be joined were held in the connectors, and with the fingers a length of the wire equal to the length of the neck wanted was given one long twist around the other wire.

Second, the loose end was grasped with the pliers and turned round until the number of twists wished in the neck were formed. Third, the short turns at each end were made.

In making the specimens it was found that unless care was taken to twist the two wires composing the neck equally, more strain would come on one wire than on the other, and the joint would slip or break, whereas if the joint had been properly made with an equal twist in the two wires, the wire itself would break before the splice would give. It was found, however, that when making a splice, if the connectors were held firmly in one hand, and if, while making the twists in the neck with the pliers, they were pulled away from the connectors, putting an equal strain on both wires, the twists could be made to come quite evenly.

Splices of the type shown in Fig. 1 will first pull together as shown in Fig. 3 and then will untwist entirely or break. The joint shown in Fig. 2 is all right as far as it goes, but it will probably stand no more than those of Figs. 1 or 3 because it has not a sufficient number of turns in its neck. The joint shown in Fig. 3 under strain will untwist entirely or break at a comparatively small load after partially untwisting.

Among the Contractors.

The Mid-Western Electric Manufacturing Company, of Baraboo, Wis., headed by M. Debrey, has been awarded a contract for the installation of the electric light and power distribution of the village of Dane. This contract includes installations of street lighting, commercial lighting lines and substation, which will be supplied by current from the Wisconsin Power Company, of Prairie du Sac.

Plans have been completed by Joseph J. Moebs for a new and commodious business property to be occupied by the Carroll Electric Company, Washington, D. C. The structure, which will stand at 714 Twelfth Street, Northwest, will be three stories high, of tapestry brick, trimmed with limestone and bronze plaques and cornices. On the first floor will be located the store and showrooms, the front containing two large show windows, between which will be located the main entrance. More light will be admitted through a mullioned window running entirely across the front of the building above the entrance. The showroom will be 21 feet high. In the rear will be large storage rooms. The offices will be on the second and third floors. The new building will have a frontage of about 40 feet and a depth of 155.

Electric Branding Iron.

For branding hams, bacon and other packing-house products, a new electrically heated iron has been invented, which receives its current from an ordinary lamp socket at a cost of but one-fourth of a cent an hour. The heating element is a strip of resistance ribbon sealed in a head, similar to that used in electric flatirons. Around the edge are arranged the numerals which also receive the heat, and are used to mark the weight on the goods.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The meetings of the New York Section, which had been discontinued during June, July and August, were resumed on Monday evening, September 13.

With exception of the months indicated, the meetings are held in the Municipal Building, on the second Monday of each month. The attendance must be cofisidered good when the unusual spell of sultry weather which we are experiencing this month is considered. Also, many members have not yet returned from vacations.

G. E. Bruen, superintendent of the Suburban Fire Insurance Exchange, presided. The Committee on the Advisability of the Use of Copper for Fuses of over 20 Amperes Capacity reported, as did also the Committee on Outlet Boxes.

All present, however, were looking forward to discussion on the scope and application of the new city ordinance licensing electrical contractors, which goes into effect November 1.

Hubert S. Wynkoop, electrical engineer of the Department of Water Supply, Gas and Electricity, who for many years labored for the enactment of some such measure, explained fully the proposed application of the ordinance and the opportunity it places with the department to check incompetents.

Hugh Wood, inspector for the City Department, Brooklyn, and Alfred E. Braddell, of the Sprague Electric Works, brought out items of interest.

A feature of the meetings this season will be talks by well known representatives of the electrical industry on subjects of interest to electrical inspectors.

The Eastern Massachusetts Section, meetings of which were suspended during July, August and September, held its first meeting of the season at the office of the Commissioner of Wires, City Hall Annex, Boston, with 18 members present.

The subject of the meeting was the new licensing statute and its operation. This was thoroughly talked over, and it was the unanimous sentiment that the new state board organized under it was meeting the many new and difficult problems presented to it in a thoroughly satisfactory way, and all anticipated a much more satisfactory state of affairs, as a result, than has been found in years past.

The Section holds its next meeting and election of officers on November 12.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Independent Grounding.

Question 312.—Our supply company makes a specialty of attaching a No. 4 copper wire to the neutral of its secondary system at service switch, and after bonding this to the circuit of service, direct connection is made to city water service in premises. As a contractor I grounded the armor of my installation to this No. 4 wire. Both inspector and supply company insist I must run directly to water pipe and make my own grounds. Can Code insist on this?

Answer 1(O). Fine-print note under paragraph five of Rule 28*f*, prohibits the use of the conduit ground for grounding the secondary of the transformer system. This would seem to indicate that the conduit ground and the secondary ground should be independent one of the other; in fact, an amendment to Rule 12*f*, will appear in the 1915 Code, which will call for the service conduit, if grounded, to be grounded independently of the conduit within the building. The inside conduit system should be independently grounded, so that it would be a complete and approved conduit system, even if the service wires were removed.

Answer 2(R).* Providing the ground is permanently and securely made, the Code does not specify the use of separate attachments. In this section there have been special rules formulated making it mandatory to insulate the interior conduit system from the exterior.

Answer 3(T). I cannot find wherein the Code would make an exception to the attachment of ground wire from conduit or armored cable system to ground wire from neutral of a three-wire system, provided ground wire was at least No. 4 B. & S. gauge and grounded in an approved manner.

Answer 4(P)*. No. If the company has provided a "suitable ground" (see Rule 27*c*). Owing to the possibility that the ground clamp at the water service may become defective, it is better practice to carry the armor ground wire independently to the water pipe.

Answer 5(M). The ground of the supply company is evidently the supplementary ground required other than that at the central station. I can see no objection to contractor attaching ground of conduit system to this.

Digitized by Google

Answer 6(S)*. I do not find anything in the 1913 Code that would require both ground wires carried separately to the water pipe. Rule 28*f* requires that the metal of the conduit must be grounded to water piping, gas piping or other suitable grounds. The contractor in this case has decided that the supply company's wire is a suitable ground. "The ground on the conduit system is not to be considered as a ground for a secondary system." (See fine-print note.) In the above case the order is reversed and should be approved.

Answer 7(F and G). The fine-print note at the end of Rule 28 *f* states that the ground on the conduit system is not to be considered as a ground for a secondary system. In our judgment this clearly requires a separate ground connection for each.

Answer 8(B)*. As the company supplying current installed the ground wire referred to it is justified in objecting to any party connecting or utilizing same for any purpose whatever. In so far as objections on the part of the inspector to the attaching of a wire to the ground wire of a secondary system by a contractor for the purpose of grounding a conduit or the armor of a cable installed by him are concerned, would say that while the Code does not prohibit same, and, while, theoretically, it may appear to be all right, I do not believe that inspection departments should permit contractors or others to connect to or interfere in any way with ground wires installed for the specific purpose of grounding secondary installations. If they are permitted to interfere with same in any way, it appears to me that there will thereby be a divided responsibility for the continuity and efficiency of ground wire attached to.

Answer 9(D). The rules would not prevent the use of a secondary ground as a ground wire for the conduit or cable armor.

Answer 10(U). I see no reason why you cannot ground to the No. 4 copper wire, provided it is connected to the service side of water shut-off cock.

Answer 11(N)*. A ground wire installed by a supply company is just as much its property as meter, service switch, etc. It becomes responsible for its condition, and is entirely and absolutely justified in refusing to allow any other connection to be made to it.

As to the inspector: Rule 28*f*, fine-print note, states that the conduit ground is not to be considered as a secondary ground, and if it is attached to the secondary ground wire it certainly forms a divided circuit, with the remainder of the secondary ground connection, and is technically a part of it.

Answer 12(E). The Code in its present state of wording requires but No. 6 ground wire for low-potential systems; it is, however, permissible to connect conduit and other forms of metal construction of the ground wire of the low-potential systems. The new Code, when issued, however, rules against this, suggesting two distinct grounds. Note the question states the ground is at service switch; the rule requires it ahead of the cutout, which is itself ahead of the switch.

Separate Conduits for Two Phases.

Question 313.—Does Rule 26p prevent the use of two conduits for a two-phase, four-wire circuit, the two wires of one phase being placed in the one conduit?

Answer 1(O). If the two wires of one phase of a two-phase system constitute a complete circuit these two wires may properly be placed by a separate pipe; the magnetizing effect of the current in either wire must be neutralized by a current of the same value in the other wire.

Answer 2(R)*. In this territory we ask that the installation shall be so arranged that all wires of a two-phase circuit be contained in the same conduit. These two phases are in quadrature and should be maintained in the same inclosure.

Answer 3(T). Code rule 26*p* does not prevent the use of two conduits for a two-phase, four-wire system, provided the two wires of one phase be placed in the same conduit.

Answer 4(P)*. I should rule that the two wires of one phase constitute a circuit within the meaning of the Code, and that Rule 26*p* does not prevent the use of two conduits.

Answer 5(S).* Each phase of a two-phase system should be treated as a single-phase circuit, and as such may be installed two wires in each conduit.

Answer 6(M). There is no objection to the use of two conduits for a two-phase, four-wire circuit where the wires of each phase are placed in individual conduits, provided both wires of a phase are so incased in the same conduit.

Answer 7(F and G). Rule 26*p* states that wires must for alternating current have the two or more wires of a circuit drawn in the same conduit. This is required on account of the inductive effect that is present when only one wire of a circuit is contained in a conduit. This effect is neutralized when a current flow of the same amperage travels in an opposite direction, as is the case with single-phase and direct-current circuits.

Two-phase circuits are made up of two single phases bearing a certain time relation to each other, and can properly be treated as single-phase circuits.

Answer 8(B)*. Rule 26*p* requires all wires of an alternating circuit, whether two or more, to be run in the same conduit. This would not, however, prevent two separate and distinct two-wire circuits feeding from a four-wire two-phase circuit being run in two conduits, the two wires of a phase being in the same conduit.

Answer 9(D). The rule would not prevent the use of a single conduit for each phase.

Answer 10(U). No, certainly not.

Answer 11(N)*. In this case each phase is entirely separate from the other. Each is derived from an independent armature winding, and each should be treated like a single-phase circuit, regardless of the other, though, of course, all four may be placed in the same conduit.

Answer 12(E). I have never seen this point raised before, all of my contractors being interested in the economic side of installation problems. There being no objection to having all wires of both phases in the conduit we have always found them there.

Soil Exposition.

The International Dry Farmers' Congress and Soil Exposition, which is being held in Denver, has a number of interesting exhibits illustrating how electricity is becoming every day of more importance to the farmer. There are several milking machines operated electrically. Nearly every separator in the exhibition is electrically driven, and besides these specific cases there are pumps, ditch diggers, nail machines, fire sirens, etc., all operated electrically. The exposition is illuminated thruout with type C Mazda lamps.

Wisconsin Electrical Code.

The Railroad and Industrial Commissions of Wisconsin will hold a hearing at the State Capitol in Madison on October 22, 10 a. m., with reference to standards of electrical construction and operation.

Digitized by Google

Among the Supply Men

Chicago Jobbers Stage Big Golf Party at Belmont.

Forty of the leading electrical supply jobbers of Chicago, with a number of manufacturers' representatives, braved the icy winds on Thursday, October 7, at the Belmont Country Club, Chicago, Ill. The party was arranged by N. G. Harvey, general manager of the Illinois Electric Company, and the commissary was in charge of Arthur J. Selzer, sales manager of the Central Electric Company. Despite the lowering skies and piercing winds, eight foursomes played some mighty fine golf, turning in remarkably low scores.

After a quickly eaten lunch the sturdy golfers donned their fighting togs and sallied forth. The official photographer braved the elements and lugged around a mighty press Graflex which had never been known to fail before. The golfers posed in many striking attitudes, and at the conclusion of the 18 holes gathered in the wintry blast with bared heads for a group photograph. It is sad indeed to relate that there was not light enough at any time to affect a highly sensitized film, and the picture making was the only disappointment of a splendid affair.

Willard W. Low, president of the Electric Appliance Company, who has recently recovered from an operation for appendicitis, was out for the first time, and played a great game. Despite some nasty rubs, he turned in a very creditable score, and earned the plaudits of the crowd for his game exhibition, after being so long out of condition. Low man was W. W. Smythe, Jr., who turned in an even hundred over a very difficult course. He was pressed close by Homer E. Niesz, Harry L. Grant and L. M. Joslyn. The two tyros, Thos. G. Grier and J. G. Pomeroy, working only with midiron and mashie, were not so far behind the seasoned players, and, judging by the enthusiasm with which both approached the nineteenth hole, it is a fair guess that full sets of clubs have already been ordered. The shock of the wintry winds was tempered to some degree by the heroic efforts of Harry Winder and Billy Fairclough, who administered sustenance to the rapidly fatiguing players just when relief was urgently needed. A sweepstakes aggregating $70 in cold cash was divided among eleven players. The prize winners were Messrs. Smythe, Schmidtbauer, Patton, Hoagland, Pierce, Bennett, Pomeroy, Merrill, Doherty, Low and Vogelsang.

The first four left on its round at 1:30 p. m., turning in its card at the end of 18 holes by 3:30. The last four turned in its card at 4:30 and the handicaps were made up and the prizes awarded by 4:45. This constitutes a record for a jobbers' tourney.

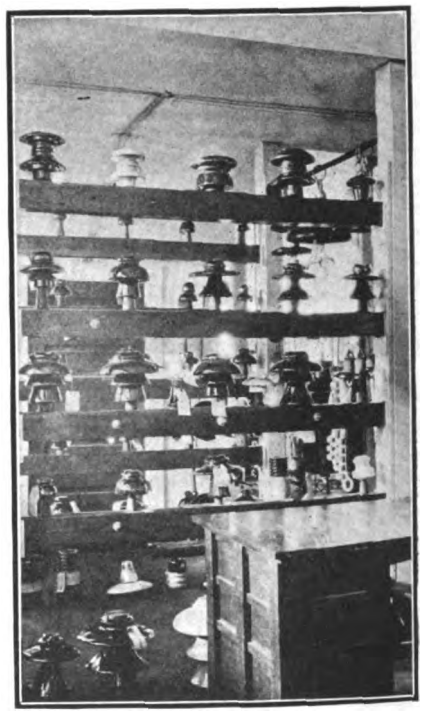
Many of the visitors were so enamored of the hospitalities tendered by the genial "Nate" that they remained over for dinner, reaching the city limits in the wee small hours of the morning after.

The party was made up of the following athletes: Walter E. Bischoff, W. N. Matthews & Bro.; C. E. Browne, American Electrical Supply Company; I. A. Bennett, I. A. Bennett Company; P. R. Boole, Electric Appliance Company; W. A. Browne, M. B. Austin & Company; W. H. Colman, General Electric Company; P. J. Cratty, Henry D. Sears Company; W. J. Doherty, W. J. Doherty Company; W. G. Fairclough, Commonwealth Edison Company; Thos. G. Grier, Thos. G. Grier Company; H. L. Grant, Western Electric Company; N. G. Harvey, Illinois Electric Company; W. G. Hoagland, Western Electric Company; M. L. Joslyn, Independent Arm & Pin Company; J. S. Jacobson, Trumbull Electric Manufacturing Company; E. B. Kittle, Sprague Electric Works; S. E. Kennedy, Central Electric Company; H. S. Lyon, Cutler-Hammer Manufacturing Company; R. G. Lane; Willard W. Low, Electric Appliance Company; A. S. Merrill, Chicago Fuse Manufacturing Company; H. F. Mac Guyer, D. & W. Fuse Company; A. L. Millard, Westinghouse Electric & Manufacturing Company; H. E. Niesz, Commonwealth Edison Company; E. K. Patton, Bryant Electric Company; F. M. Pierce, Manhattan Electrical Supply Company; J. G. Pomeroy, Warren Ripple, George Cutter Company; H. A. Selzer, Central Electric Company; J. C. Schmidtbauer, Julius Andrae & Sons Company; W. W. Smythe, Jr., Fiber Conduit Company; Fred P. Vose, John Vogelsang, Harry Winder, American Conduit & Manufacturing Company.

Effective Display of Line Material.

In a large electrical supply house an effective method of displaying line material is utilized by mounting four pairs of cross-arms underneath a stairway connecting the main showroom with the second floor, and between two passageways often traversed by customers and other visitors to the establishment.

The open space between the posts supporting the stairs affords excellent opportunity for mounting insulators and pins of different types and sizes, far enough apart to make a striking exhibit. Suspension insulators are shown hanging from rods placed at right angles to the cross-arms.



Display of Line Material.

Southwestern Association Will Meet at Galveston Again.

The twelfth annual convention of the Southwestern Electrical and Gas Association will be held at Galveston, Tex., May 17, 18, 19 and 20, 1916, the Hotel Galvez being the convention headquarters, as heretofore.

The selection of Galveston again for the convention is in response to the almost unanimous demand of the members of the association and by vote of the Executive Committee.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The Merchants Heat and Light Company was authorized to issue stocks and bonds aggregating $340,000, to reimburse its treasury for money expended on improvements and betterments of the company's plant during the period between March 31 and August 1.

NEW JERSEY.

The Delaware and Atlantic Telegraph and Telephone Company applied for approval of a franchise granted by the city of Absecon, which authorized the construction and operation of a telephone system in the city. The Board finds, however, that there is an agreement between the city and the company that in consideration of the granting of the franchise, the company is to furnish the city with certain free telephone service; and the Board concludes that, in view of the decision of the Supreme Court in **Public Service Electric Company** vs. **Board of Public Utility Commissioners and City of Plainfield** (93 Atlantic 707), it is "impelled to withhold its approval of the ordinance." In the Plainfield case, the Board ordered the electric company to fulfill the terms of its franchise which called for the rendering of free service to the city. Upon appeal, the court held in effect that such contract providing for free service to the city was discriminatory and therefore void.

NEW YORK—Second District.

The Lockport Light, Heat & Power Company was authorized to increase its rates on its showing that it was not earning a fair return on capital employed in the service of the public.

During the hearing, representatives of the city and the company agreed that the actual fixed capital of the company employed in the electric business was $467,435.66, not including working capital or intangibles. The Commission finds that even upon this "bare bones" valuation the shareholders could get but a little over two per cent on their investment. The Company is entitled to working capital of at least $25,000. Assuming that the company is entitled to earn seven per cent upon a valuation of $492,000, its income available for interest and dividends should be $34,435 per annum.

In regard to the present rates, the Commission said: "It appears from the record that the rates in the city of Lockport are as low or lower than in the nearby cities; in fact it must be admitted that some of the rates are much lower than the company is warranted in giving. This is particularly true of the commercial power and the wholesale power rates. It is these rates which ought properly to be advanced in order to give the company a fair return for its service. Some increases are also justified in the rates for residence and for commercial lighting."

It was estimated that the schedule fixed by the Commission would enable the company to earn an increased revenue of $41,667, "if it is able to retain all its present customers. If it loses any of them then it will not increase its earnings to that extent unless the remaining customers give the company more business or it obtains new customers to make up for those who cease to use its service."

The rates prescribed for residence lighting provide a consumer charge of 75 cents net per month per meter, and an energy charge of 5 cents net per kilowatt-hour for the first 35 kilowatt-hours per month and 2 cents per kilowatt-hour for all excess. Ten cents is added to the consumer charge if bill is not paid within ten days.

The commercial lighting rate is 10 cents per kilowatt-hour for the first 60 hours' use per month of demand. 5 cents for the next 60 hours' use, and 2 cents for all excess, subject to a minimum charge of $1.00 per month per meter. The demand is considered as 90 per cent of connected load.

For commercial power, the net rate is 7 cents per kilowatt-hour for the first 40 hours' use per month of demand, 4 cents for the next 40 hours' use and 1 cent for all excess. The minimum charge is $1.00 per horsepower per month for the first horsepower installed and 75 cents per month per horsepower in addition. The demand will be considered as 75 per cent of installed capacity if in one motor and 65 per cent if in more than one motor.

The wholesale light and power rate provides a net demand charge of $2.50 per month per kilowatt for the first 5 kilowatts of maximum demand and $1.25 per month per kilowatt for each additional kilowatt of maximum demand, and a net energy charge of 1 cent per kilowatt-hour.

A primary power rate applicable to consumers guaranteeing a use equal to 60 per cent of the maximum one-minute peak is as follows: $22 per horsepower per year for from 50 to 100 horsepower peak; $20 per horsepower per year for from 100 to 500 horsepower peak; $19 per horsepower per year for from 500 to 1,000 horsepower peak; and $18 per horsepower per year for all excess.

It is stated that the case is a notable one, in that all parties agreed as to the necessity for the increase and all the engineers agreed as to the justice of the scale worked out.

The Middleburg and Schoharie Electric Light, Heat and Power Company has been authorized to issue $20,000 six per cent first-refunding-mortgage bonds at par, under a $30,000-mortgage to the Albany Trust Company. The proceeds of the bonds are to be used to refund $9,000 outstanding first-mortgage five-per-cent bonds and to reimburse the treasury for expenditures properly chargeable to capital account between 1911 and 1914.

OREGON.

The Western Telephone Company. The Commission has approved a new schedule of rates, higher than that now in effect. The finding is, however, predicated upon the ability of the applicant to bring about the proposed consolidation with its competitor, The Favorite Telephone Company. The value of the consolidated plant, exclusive of certain duplicate equipment, was used as a basis for the new rates.

Denver Jovians Organize.

The Denver Jovian League has lately been organized, with Bert Wasley, of the Albert Sechrist Company, as president; H. S. Russell, of the Denver Gas and Electric Light Company, as vice-president, and L. D. Hammick, of the same company as secretary. Weekly meetings are held at Albany Hotel.

Electric Power Club Meeting.

The Electric Power Club will hold a meeting at the Homestead Hotel, Hot Springs, Va., on November 8, 9 and 10. The secretary is C. H. Roth, 1410 West Adams Street, Chicago.

Digitized by Google

A NEW MAXIMUM-DEMAND METER.

Monthly Meeting of the American Institute of Electrical Engineers.

The 312th meeting of the American Institute of Electrical Engineers was held at the Engineering Societies Building, New York City, on the evening of Friday, October 8. President John J. Carty occupied the chair. A paper was presented by Paul M. Lincoln, entitled "Rates and Rate-Making."

This paper pointed out the importance of the load-factor and of maximum demand in determining the cost of supplying electric service, and then described an instrument devised by the writer for measuring maximum demand. This meter depends upon the heating effect of the current and heat storage. The indications are proportional to kilowatt-hours, but the instrument may be modified so as to indicate kilovolt-amperes, thus including the effect of power-factor. Its indications depend upon the differential expansion of the liquid in two closed chambers, the difference in the heat generated in the two being proportional to the power consumed in an alternating-current circuit. The introduction of heat storage causes a lag in the indication of the meter and the quantity registered is what the author calls a logarithmic average. The design and adjustment of the meter can be varied to make this average cover any predetermined interval. The theory and the details of construction of the instrument are given. It is pointed out that this logarithmic average corresponds to the capacity of generators, cables, transformers, etc. Comparisons are made with other demand instruments and the defects of the Wright demand meter in particular are pointed out. Such meters as are satisfactory in operation are high in cost. Three appendices give the mathematical theory of the instrument.

The discussion was opened by William McClellan, who admitted the need of a satisfactory type of demand meter, but pointed out that it is not applicable to the large mass of consumers of electric service. The customer charge is the important element in residential service and this would be increased by the installation of a demand meter. It would also be difficult to explain to the ordinary consumer a rate based upon demand. Political and other reasons make its application inexpedient. Rate-making is more of a commercial than an engineering matter, and the value of service is quite as important as the cost of service.

Edward J. Cheney pointed out that it was not practical to make a schedule of rates, involving all the elements which enter into the theoretical cost of service. The consumer charge is more important than the demand cost with the average consumer, and anyhow the measured demand of residences is not the quantity that determines the cost of production, due to the diversity of this demand and to the importance of the time of use.

Philander Betts spoke of the difficulty of applying a logically correct schedule. Anything that involves an increase in the cost of meter reading, billing, etc., increases the customer cost.

John W. Lieb said that load-factor is considered in the classification of customers and does not require separate measurement for each customer, although it may be useful and desirable to have information as to maximum demand. While individuals depart from the average assumed for the entire class, such variations do not invalidate the rate schedule, which is much simplified by taking averages. If changes in residential load due to the use of household devices become necessary, a low secondary or tertiary rate will meet the requirements, without the installation of demand meters, especially since the time at which the demand occurs is more important than its maximum value.

H. G. Stott spoke in tribute to Mr. Lincoln's excellent work in developing the meter. He said that the cost of making power is a very complex quantity and illustrated its constituent elements by curves. Load-factor is an important element. The principal application of the demand meter would be to wholesale customers.

C. I. Hall described the Type H demand indicator and compared it with the instrument proposed by the author. This instrument has a straight line instead of logarithmic curve as a time element. He had tested it with different sizes of leads, which Mr. Lincoln had given as a factor affecting the Wright demand meter, and found the effect less than 1 per cent. There are special conditions under which any existing form of demand indicator will not give a good indication. He pointed out that the heating of generators, cables, transformers, etc., is dependent upon the current rather than the kilowatts and a demand meter registering in amperes is preferable for this reason.

J. B. Taylor said there are too many elements entering into a theoretically correct rate to consider them all and it is not logical to pick out the demand as the one factor to be measured. Only the demand of large customers is of any importance to the central station.

H. W. Peck said that central-station companies desire a good maximum demand meter and have use for them for about 20 per cent of their customers.

Harold Goodwin, Jr., inquired as to whether the meter could be used with direct current, since it involves a transformer.

Mr. Polokov pointed out other elements of cost in serving the customer aside from that of generating power, as the fixed charges on the local equipment, such as underground conduit, and the general overhead expenses.

Theodore I. Jones said that to get business it is necessary to have rates which customers can understand. He had 15,000 customers with monthly bills averaging less than $1.50 who are not interested in demand and whose customer charge is the largest element of cost. Diversity among such customers makes the individual demand of little importance. With big power users the element of demand is important, but of greater importance is the question of whether this demand comes at the time of peak load. The Brooklyn Edison Company secured the business of the American Manufacturing Company, twine manufacturer, only by offering it an off-peak rate. This was accepted although it involved closing the factory early during the winter months. The contract with this customer involves over a million dollars. He said that there are plenty of excellent demand meters in the larger sizes, but that he was waiting to see a good one of small size produced by the manufacturers.

Mr. Burke, of Wilmington, pointed out the use in Europe of the excess watt-hour meter, which registers separately the current taken when the demand exceeds a specified amount. Such energy is paid for at an increased rate. This arrangement has proved successful in Europe, where five different manufacturers are making such meters.

Written discussion was also presented by Alex Dow, J. G. DeRemer, F. H. Sager, E. P. Roberts, I. E. Moultrop, Frank H. Taylor, R. A. Philip, H. L. Wallau, R. A. Lindquist, Louis R. Lee and J. D. Mortimer.

In closing the discussion Mr. Lincoln said that in many cases maximum demand was of more importance and was a larger element in the cost of service than the energy consumption, and, in many cases, it would be more logical to use the demand meter even without a watt-hour meter. As regards the importance of value of service, he pointed out that this value can never be greater than the cost of supplying service by the customer himself, so that even on this basis rates must consider the elements of cost of service. He agreed that the maximum-demand meter cannot be successfully

Digitized by Google

applied to residence service. While simplification of rates is important, it is not desirable at the expense of justness and fairness. He said that while the principle of the meter was applicable to direct currents, this is not practically feasible on account of the excessive power which would be consumed in the meter itself.

At the regular monthly meeting of the Board of Directors on Friday afternoon, the secretary announced the following additional committee appointments made by President Carty since the last meeting:

Committee on Use of Electricity in Mines: Wilfred Sykes, chairman, C. W. Beers, Graham Bright, William A. Chandler, F. J. Duffy, Martin H. Gerry, Charles Legrand, Charles E. Lilley, Charles M. Means, K. A. Pauly, G. B. Rosenblatt.

Iron and Steel Industry Committee: T. E. Tynes, chairman, A. C. Dinkey, Gano Dunn, C. T. Henderson, W. O. Oschmann, K. A. Pauly, J. C. Reed, Wilfred Sykes.

Upon the recommendation of the Board of Examiners 59 applicants were elected to the grade of Associate, 27 students were ordered enrolled, two members were elected and nine associates transferred to the grade of Member.

Big Electrical Prosperity Week Meetings.

Four hundred electrical men, city officials, and others interested in Electrical Prosperity Week in the Pittsburgh district, attended a rousing get-together meeting at the Fort Pitt Hotel on Friday, October 8. It was one of the most enthusiastic of the many similar meetings which have been held throughout the country in the interests of the great nation-wide campaign.

R. S. Orr, vice-president and general manager of the Duquesne Light Company, who was to preside, was suddenly called away, and L. M. Dunn, manager of the Western Electric Company's Pittsburgh office presided.

The principal speakers of the evening were J. M. Wakeman, general manager of the Society for Electrical Development, and H. W. Alexander, director of publicity.

Other speakers were A. C. Terry, division commercial manager of the Western Union Telegraph Company, and W. A. Donkin. Mr. Terry pledged the support of his great company, stating that the 27,000 Western Union offices would gladly co-operate in the campaign by displaying the "Electra" posters in windows. The New York executive offices of the telegraph company have promised the support of the company everywhere.

Interests other than electrical are getting behind the big campaign every day. At Scranton, Pa., on Friday evening, October 8, A. J. Edgell, of the Society's Display Service Bureau, addressed the newly formed Anthracite Section of the International Association of Display Men. The first official act of this organization was to endorse Electrical Prosperity Week.

At a meeting of electrical interests in Philadelphia, on Friday evening, October 8, G. W. Hill, of the Society's staff, addressed a large audience on Electrical Prosperity Week.

The Edison Electric Illuminating Company of Brooklyn has voted an appropriation of $5,000 to advertise the house-wiring plan agreed upon by local contractors and the Edison Company. The Edison Company now takes contracts for house wiring on a flat-rate-per-room basis and sublets to the contractors. The Electrical Prosperity Week campaign plan provides that each interest, the Edison Company, the fixture companies and the contractors shall deduct 10 per cent from their regular charges on all orders placed during the week of November 29.

Empire State Meeting.

The eleventh annual meeting of the Empire State Gas and Electric Association was held in the Engineering Societies' Building on Thursday and Friday, October 7 and 8. In the absence of the president, who was detained returning from the Gas Institute meeting in California, Vice-president E. H. Palmer presided at the meeting on Thursday.

The morning session was devoted to reports of officers and committees.

The secretary read a résumé of the work of the Association during the past year, and the treasurer submitted his report showing a successful year from a financial standpoint.

On behalf of the Accounting Committee, E. C. Soobell stated that the Committee had been in conference with the statistician of the Public Service Commission, Second District, in reference to certain modifications in the accounting order of the Commission. He read a number of suggestions which are being considered and expressed a belief that changes would be made in the order which would be found by the companies to be of benefit in their accounting methods.

C. G. Durfee, chairman of the Electric Meter Committee, read a report describing new types of electric meters which had been placed on the market. In discussing his paper it was brought out that the electric companies are in a better position at the present time than ever before in reference to more scientific methods of rates, on account of improvements in the meter devices which have been effected largely through the efforts of the meter committees of the various associations.

The afternoon session started with an address by E. W. Lloyd, president of the National Electric Light Association, on co-operation between state and national associations. Mr. Lloyd called attention to many of the activities of the national association and the importance of them to individual companies in the different states.

H. B. McLean, president of the National Commercial Gas Association, followed Mr. Lloyd on the same subject and on behalf of his Association stated that they were very much in favor of some scheme of co-operation.

The secretary explained that he had asked Mr. Ramsdell, the secretary of the American Gas Institute, to invite whoever might be elected president at the meeting in California, but had not heard anything from him. Mr. Addicks, past-president of the Institute, although not speaking officially expressed himself as very strongly in favor of some method of co-operation between the various organizations to avoid duplication of effort. There was considerable discussion on this question and Mr. Lloyd and Mr. McLean stated that they would take the matter up with their directors at the earliest possible date.

The morning session on Friday was called to order by Mr. DeLong, who had arrived the night before from California.

C. A. Graves read a paper on "Method of Analyzing Cost of Service," submitting forms applicable for use in this connection for both gas and electric companies. The discussion following the reading of the paper dealt mostly with electric matters, the gas companies having apparently done comparatively little in the matter.

Luncheon was served to the members at one o'clock in the Engineers' Club, after which the meeting reconvened and listened to a paper by J. T. Hutchings on "Insurance Under the New York Workmen's Compensation Law." Mr. Hutchings stated among other things that he felt that the risk of the gas and electric business had been very much overrated. The record of the Utilities Mutual Insurance Company, composed entirely of gas and electric companies, showed losses amounting to only slightly over 16 per cent of the premium. The statistics which have been kept giving the figures of the different branches of the business were read by Mr. Hutchings and were apparently of very considerable interest to the members.

The Nominating Committee submitted its report and the following officers were regularly elected: president, J. C. DeLong; first vice-president, Stuart Wilder; second vice-president, H. M. Beugler; treasurer, C. A. Graves; secretary, C. H. B. Chapin.

Digitized by Google

Flood Lighting of Building Fronts from Ornamental Cluster Posts.

During the last few years important developments have been made in methods of lighting building exteriors. Outline lighting had been brought to an attractive point in many installations, but it was realized that it could scarcely produce an illumination of an entire building front at all comparable with the daylight effect. The advent of high-efficiency lamps giving white, steady light from a concentrated source has resulted in the development of flood lighting, of which there have been produced some notable installations with strikingly attractive effects. In order to produce an effective and reasonably economical result, this method of lighting has required special projectors for the lamps, which are built of a type resembling modified headlights.

Although not an imposing structure architecturally, the building occupies a commanding position because of its location on the island between these three busy intersecting streets.

To enhance this strategic position among competing mercantile concerns, the idea was conceived of effectively lighting the entire exterior of the building. To accomplish this economically and with a relatively small number of lamps, as compared with outline lighting, required the selection of flood lighting. Mounting of projector lamps on the opposite buildings involved many difficulties, among other things, the finding of locations for the lamps that would be free from glare. After careful study of the problem by an illuminating engineer acting in a consulting capacity to the owners, a solution was worked out whereby the top lamp reflector is mounted in the inverted position and slightly tipped toward the building as shown in Fig. 2. The lamp in the top globe is a 1,000-watt gas-filled tungsten lamp. To secure proper ventilation for the unit there are 12 one-inch holes in the lower part of the cast-iron bowl that serve as inlets. From these the cool air passes through the neck of the reflector, around the lamp and mogul receptacle, and then down along the inner surface of the glass upper bowl and out through the 36 one-half-inch outlet holes just below the middle of the globe. This ventilation has been found to be ample.

The installation consists of 17 posts spaced about 25 feet apart along the curb; 7 are along Milwaukee Avenue and 5 each along Division Street and Ashland Avenue. Each of the 4 pendent lamps on each post is a 100-watt

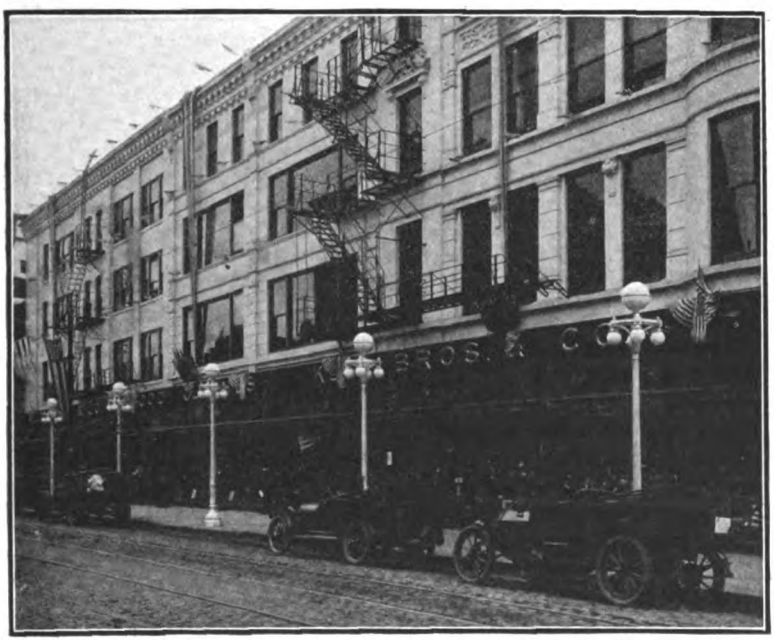


Fig. 1.—Day View of Installation Taken Along Milwaukee Avenue.

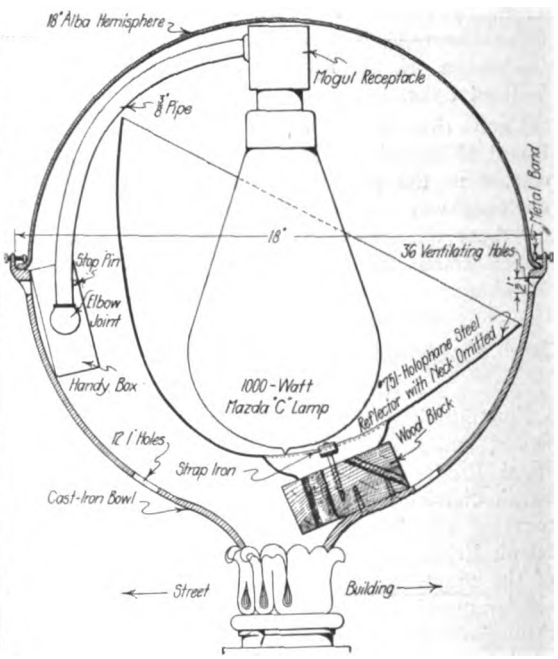


Fig. 2.—Internal Arrangement of Upper Globe.

A noteworthy departure from this practice is the installation completed a few weeks ago for a Chicago mercantile establishment. Here no elaborate projector lamps are provided, but instead of these ornamental cluster posts of standard type have been ingeniously adapted for flood-lighting service by placing a reflector in the upper globe in a comparatively inconspicuous manner which does not detract from the appearance of the post by day or night.

This installation is at the men's clothing store of Klee Brothers & Company in the northwestern part of Chicago. The building is a four-story structure, all of the ground floor and most of the upper floors of which are occupied by the clothing firm. The building is in the form of a right-angled triangle fronting on three very important thoroughfares, namely, Milwaukee Avenue, Division Street and Ashland Avenue. of the standard five-light Chicago ornamental post could be utilized as a projecting lamp. Since the specifications of these ornamental posts are defined by municipal regulations, approval was necessary for the proposed modification of the top globe.

From the day view of this installation, Fig. 1, it is seen that the appearance of the top globe was not radically altered. The new diameter is 18 inches instead of 12. Fig. 2 shows the internal arrangement. The lower part of the globe is a hemispherical cast-iron bowl; the upper part is an Alba glass diffusing hemisphere; the cast-iron globe is painted white to harmonize with the glass globe. An enameled-steel reflector of the Holophane-D'Olier angle type acts as the projecting element. This reflector was chosen on account of its distribution curve meeting the prevailing conditions when the gas-filled tungsten lamp in a nine-inch Monax glass diffusing globe. The total connected load is thus 23.8 kilowatts. The top lamps and the pendent lamps are separately controlled so as to permit independent operation, if necessary. All lamps are Buckeye Mazda lamps. Current is supplied by the Commonwealth Edison Company.

The night views, Figs. 3 and 4, give an inadequate idea of the striking effectiveness of the building illumination. Although the brightness of the white-painted wall surface is high, it is not trying to the eye and there is a complete absence of glare from the light sources. The illumination is also surprisingly uniform, considering that on the upper three stories it comes from but a small number of powerful lamps; this uniformity is due to the diffusing globes spreading the light evenly over the wall surface. From

Digitized by Google

the pendent lamps the light is of the same white color as from the large projecting units. The diffusing globes on the pendent lamps screen their bright rays and greatly reduce the tendency to glare. These lamps serve to illuminate the lower store front, sidewalk and street surface, and their effect blends very well with that of the powerful lamps in the upper globes. Although the lower part of the globes for the top lamps is opaque, this fact is scarcely noticeable. The black wavy streaks that appear on the night views are due to banners on the trolley poles that were put up for a week's carnival to boost the district.

The entire effect is very striking without being tiring to the eye. A distinctive feature is that the bright illumination of the building front does not detract from the effectiveness of the large electric signs on two corners of the building, nor from the attractiveness of the window displays. As shown in the illustrations, the entire building stands out prominently against the background of the dark sky.

The installation was designed by J. R. Cravath, illuminating engineer, Chicago. The erection and wiring was done by the Freeman-Sweet Company, electrical contractors, Chicago. The posts were supplied by the King Foundry Company, St. Joseph, Mo., through its Chicago office.

Fig. 3.—Night View of Ashland Avenue and Division Street Fronts.

Fig. 4.—Night View of Division Street and Milwaukee Avenue Fronts.

Exhibitors at New York Electrical Show.

In a year during which the great undertakings of war have held public attention, achievements of peace command, at best, only a secondary acknowledgment. Yet 1915, in spite of what is charged against it in war's destruction, has to its credit, one great commercial feat worthy a page in history.

During the campaigns of the early months of the war in Europe, engineers in America were fighting their way over mountain passes, through deserts and across streams. The spring the year saw their work accomplished; the East was connected with the West by telephone, and it became possible to talk over a distance of 3,000 miles.

At the New York Electrical Exposition, which opened on October 6, a demonstration was made of the new transcontinental telephone. Wires run direct to the Panama-Pacific Exposition, and at hourly intervals the message of the West comes east.

There are also displays which portray the work of electricity in war—an exhibit of electrical apparatus tells of accomplishments in the field of therapeutics—exhibits of domestic appliances show the home comforts that are possible through the use of current, and industrial exhibits demonstrate the great part that electricity plays in the commercial activities of this country.

Among the exhibitors of interest to the electrical trade are the follows:

Aladdin Lamp Corporation, American Telephone & Telegraph Company, Anderson Electric Car Company, Atlas Sales Agency, R. & L. Baker Company, Bell Electric Motor Company, Cooper Hewitt Electric Company, Harvey Deschere & Company, Edison Electric Illuminating Company of Brooklyn, Edison Storage Battery Company, Electric Fountain Company, The Electric Meter Corporation, Electrical Review Publishing Company, Incorporated; Electric Storage Battery Company, Electrical Testing Laboratories, Electrical Refrigerating Company, Incorporated; *Electrical World*, Federal Sign System (Electric), Frantz Premier Company, General Electric Company, General Vehicle Company, Incorporated; The Goulds Manufacturing Company, Habirshaw Wire Company, Hamilton-Beach Manufacturing Company, Wallace B. Hart, The Hoover Suction Sweeper Company, Hotpoint Electric Heating Company, Innovation Electric Company, Incorporated; Kinetic Engineering Company, Landers, Frary & Clark, Lux Manufacturing Company, Manhattan Electrical Supply Company, Metropol-

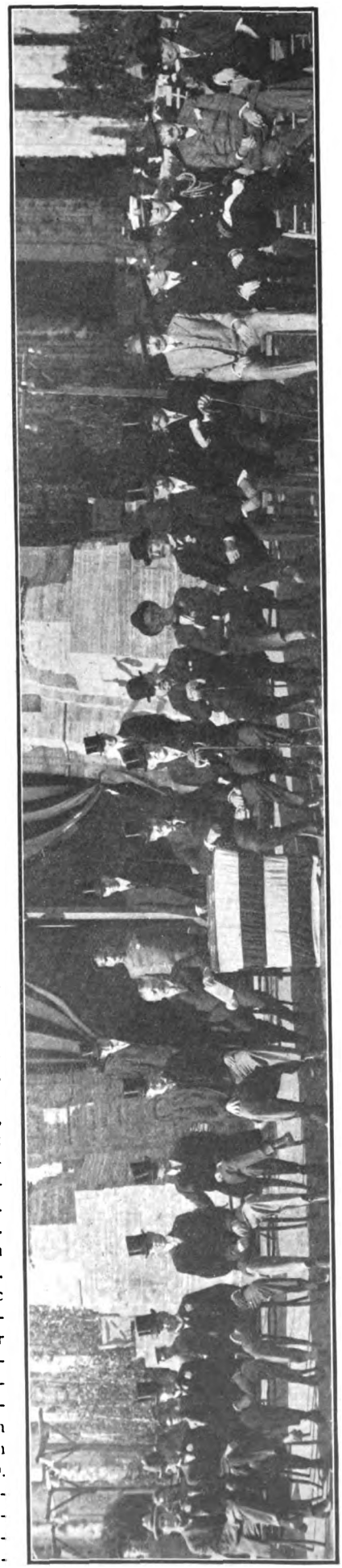
Digitized by Google

itan Electrical Products Company, Incorporated; Metropolitan Engineering Company, The Morgan Crucible Company, Limited; National Lamp Works, National Scale Company, New York & Queens Electric Light & Power Company, The New York Edison Company, New York Electric Garage Corporation, New York Electric Vehicle Association, New York Service Company, Northwestern Electrical Equipment Company, Otis Elevator Company, Phila Storage Battery Company, Pittsburgh Electric Specialties Company, Pittsburgh Transformer Company, Sangamo Electric Company, Frank Ridlon Company, Safety Insulated Cable & Wire Company, Shelton Electric Company, The United Electric Light & Power Company, Wallace Novelty Company, Incorporated; Ward Motor Vehicle Company, Western Electric Company, Westinghouse Electric & Manufacturing Company, Roger Williams, L. J. Wing Manufacturing Company, The Yonkers Electric Light & Power Company.

Exposition Engineers' Day at the Panama-Pacific International Exposition.

To commemorate the efficient work of the engineering staff of the Panama-Pacific International Exposition, a day, September 24, was set apart for public tribute to the men under whose charge came the construction of the great Exposition. The day was called Exposition Engineers' Day.

In addition to the Exposition engineers, all of whom are seen upon the left of the photograph, other notable figures in the history of the engineering work of this country were in attendance. Those shown in the group herewith, sitting, from left to right are: L. F. Laurey, assistant electrical and mechanical engineer. H. D. Dewell, chief structural engineer; Shirley Baker, chief of construction; W. O. Waters, superintendent of building construction; Guy L. Bayley, chief electrical and mechanical engineer; A. H. Markwart, assistant director of works; Harris D. H. Connock, director of works; William H. Crocker, chairman of Committee on Buildings and Grounds; Charles C. Moore, president of the Panama-Pacific International Exposition; John A. Britton, vice-president and general manager of the Pacific Gas and Electric Company, and vice-president of the Panama-Pacific International Exposition; Frederick J. V. Skiff, director in chief; John A. Brashear, president of the American Society of Mechanical Engineers; C. D. Marx, president of the American Society of Civil Engineers; J. J. Carty, president of the American Institute of Electrical Engineers; C. C. Vogelsang, commissioner of the Panama-Pacific International Exposition; F. L. Hutchinson, secretary of the American Institute of Electrical Engineers; Calvin W. Rice, secretary of the American Society of Mechanical Engineers; Clark Howell Woodward, naval aide to President Moore; Charles Warren Hunt, secretary of the American Society of Civil Engineers; Howard H. Holmes, consulting engineer and designer of the Exposition ferry slips.



Group of Engineers and Officials at Panama-Pacific Exposition on Engineers' Day.

Standing, from left to right: C. S. Scott, Exposition Special Events Department; Theodore Hardee, chief of the Department of Liberal Arts; Carl S. Herman, Exposition Special Events Department.

Electric Railway Associations Elect National Officers.

Charles L. Henry, of Indianapolis, Ind., was elected president of the American Electric Railway Association at the close of its 34th annual convention which was held at San Francisco, Cal., October 4 to 8. The affiliated organizations comprising the Claim Agents' Association, Accounting Association, Engineering Association, Transportation and Traffic Association and Electric Railway Manufacturers' Association, all held their annual meetings at the same time. On behalf of Governor Hiram W. Johnson, Chester C. Rowell welcomed the delegates to the electric railway convention. A splendid array of reports and papers were presented at the business sessions, and the visitors participated in a series of elaborate entertainments.

The following officers were elected:

American Association: President, Charles L. Henry, Indianapolis; first vice-president, L. S. Storrs, New Haven, Conn.; second vice-president, Timothy S. Williams, Brooklyn, N. Y.; third vice-president, John J. Stanley, Cleveland, O.; fourth vice-president, John H. Pardee, New York, N. Y.

Accountants' Association: President, T. P. Kilfoyle, auditor, Cleveland Railway Company, Cleveland, O.; first vice-president, L. T. Hixson, auditor, Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.; second vice-president, H. A. Culloden, secretary and auditor, Pacific Electric Railway Company, Los Angeles, Cal.; third vice-president, George G. Whitney, Washington Railway & Electric Company, Washington, D. C.; secretary, M. R. Boylan, general auditor, Public Service Railway Company, Newark, N. J.

Claim Agents' Association: President, George Carson, Seattle, Wash.; first vice-president, R. E. McDougall, Rochester, N. Y.; second vice-president, S. B. Hare, Altoona, Pa.; third vice-president, B. F. Boynton, Portland,

Digitized by Google

Ore.; secretary-treasurer, B. B. Davis, Columbus, O.

Engineering Association: President, John Lindall, Boston, Mass.; first vice-president, F. R. Phillips, Pittsburgh, Pa.; second vice-president, G. W. Palmer, Jr., Boston, Mass.; third vice-president, W. G. Gove, Brooklyn, N. Y.

Transportation and Traffic Association: President H. A. Nicholl, Anderson, Ind.; first vice-president, L. C. Bradley, Houston, Texas; second vice-president, R. E. Danforth, Newark, N. J.; third vice-president, W. H. Collins, Gloversville, N. Y.

Manufacturers' Association: President, Thomas Finigan, San Francisco, Cal.; vice-president in charge of relations, Charles C. Peirce, Boston, Mass.; vice-president in charge of finance, L. E. Gould, Chicago, Ill.; vice-president in charge of exhibits, Daniel W. Smith, Detroit, Mich.; vice-president in charge of entertainment, E. F. Wickwire, Mansfield, O.; secretary-treasurer, H. G. McConnaughy, New York, N. Y.

The officers of the affiliated associations, with the exception of the Manufacturers' Association, are members of the Executive Committee of the American Electric Railway Association.

Chemical Engineers to Meet in Baltimore.

The winter meeting of the American Institute of Chemical Engineers will be held in Baltimore, Md., January 12 to 15, 1916. A number of papers on recent and important developments in the chemical industry are being arranged. The secretary is J. C. Olsen, Cooper Union, New York City.

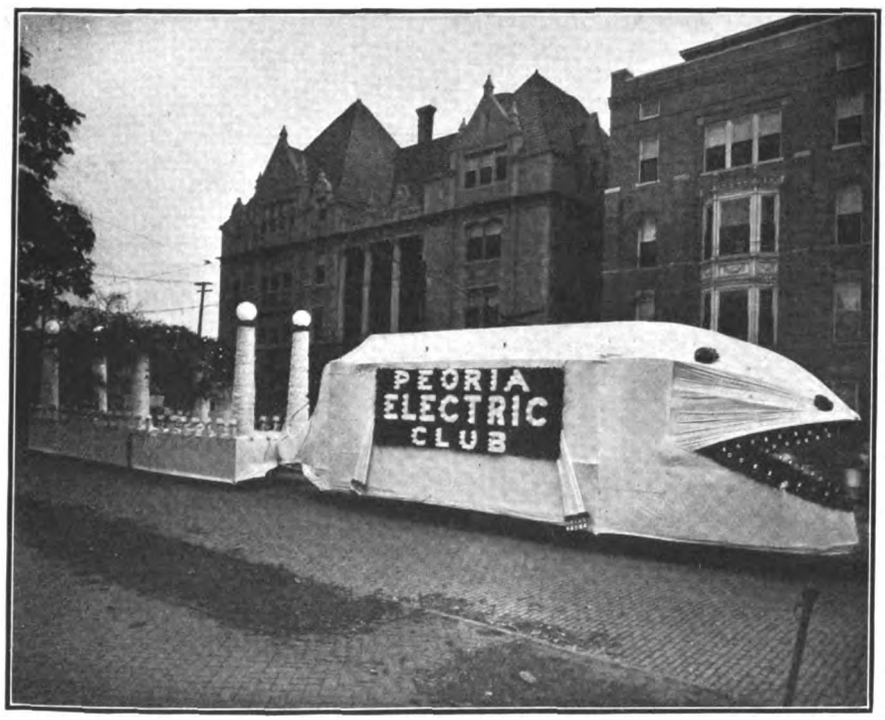
Peoria Club Wins Prize.

The illustration shows the float of the Peoria Electric Club which took first prize in the Civic Parade in Peoria, Ill., on the evening of October 4.

Instead of each of the electric companies making a float, the club entered the float as a joint effort. All work was done by members of the club, who donated their services. The idea was a dragon drawing a float in which was seated "Electra."

The total length of the float was 60 feet. The dragon was built over a work car belonging to the railway company. The mouth of the dragon was lined with red lamps. The sign on each side was made from white lamps backed with a pale green paper.

The photograph was taken late in the afternoon and does not show the float to as good advantage as it appeared after nightfall. The four pillars each had an electric light on them and the pergola was covered with flowers, growing out of a large flower pot in front, and a bunch of roses. In each rose was an electric light. In all 600 lamps were used to illuminate the float.



Float of Peoria Electric Club.

This parade was given as an added attraction to the visitors to the Implement Fair and was a huge success. Over 683 vehicles and 250 floats were in the parade, including 17 floral floats. The parade was seven miles long and took over three hours to pass. Electricity was used to illumine several other floats and there were no storage batteries to be had that day.

The lighting company and the street-railway company co-operated with the contractors to make the float a success, and the winning of first prize was no small thing in view of so many floats being entered.

The Electric Club has put itself in public view and all who saw the parade will remember the club. This is another way of helping the electric business along towards Prosperity Week.

Municipal Electric Power System of Sydney, Australia.

As might be expected in a city of almost 800,000 inhabitants, electrical power is available in Sydney to consumers throughout the municipal area. The city council and not a private company controls the power plant, the chief electrical engineer being H. B. Forbes Mackay, who combines with his duties as electrical engineer the administration of the power-sales department. The total capacity of the plant in kilowatts is 15,000 alternating current and 15,000 direct current. The alternating current is of 50 cycles frequency and three-phase supply is ordinarily used for motors. The voltage customarily used for motors is 240 for either alternating or direct current.

The municipal council is not engaged in the importation and sale of motors to consumers, this business being exclusively in the hands of regularly established commercial houses, some of which carry fairly extensive stocks and others import on indent only. Australia being a British dependency, British makes of electric motors are in firm request, but there would appear to be a fairly good field for American wares if the interested manufacturers were prepared to wait some time for results.

It is safe to estimate the number of local manufacturing plants that use electric power at over 400, with a power consumption of about 2,500 kilowatts. There are no industrial plants generating their own electrical power in the city. Although not primarily a manufacturing community, recent years have witnessed considerable development in this direction, and there are now in operation numerous relatively small factories for the production of ordinary necessities. Machine shops of the local shipyards and government-owned railways are well equipped, and offer an attractive field for investigation by the American manufacturer of electrical lines.

Electrically illuminated street signs of novel design are being tried out in San Francisco. The sign is made of heavy glass lenses set in a massive iron case, which is set flush with the curbstone. Within the case are a number of incandescent lamps that are switched on at nightfall. The lettering shows distinctly by day and even more conspicuously at night.

Digitized by Google

New Electrical and Mechanical Appliances

Lamp Grips on Bryant Sockets.

Considerable trouble and inconvenience has been experienced in lamps loosening in sockets when installed where subject to vibration. This is particularly true in factories using high-candlepower lamps where heavy machinery is operated, and on steam and electric cars, steamboats, etc. Constant jarring and vibration cause lamps to unscrew or "back off" from the base contact so that the circuit is broken and often the lamp falls.

To overcome this difficulty, the Bryant Electric Company, Bridgeport, Conn., has developed a new and very effective lamp grip. In this new form of socket, the threaded copper portion which receives the lamp is slotted on two diametrically opposite sides in such a manner as to provide two tongues which are flexible. Two flat steel springs are mounted in the porcelain base with the free ends so arranged as to bear on the outside of these copper tongues. This will be clearly understood from the accompanying illustration. Thus, without any external adjustment or any other labor than the insertion of the lamp, sufficient tension is brought to bear upon the lamp base to prevent vibration from causing the contact to break, even under the most severe conditions with violent and continued jarring.

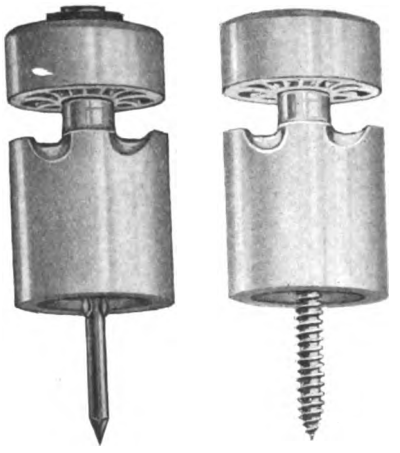
Bryant Socket Provided with Lamp-Grip Feature.

This lamp-grip feature can be supplied at a slight additional charge, in connection with practically all sockets of both the medium and mogul type manufactured by the above-named company.

New Assembled Porcelain Knobs.

In all wiring work involving the use of porcelain knobs, much time is usually lost in gathering the batch of parts needed for the knobs and in assembling the knobs at the job. For instance, say 75 knobs are needed; the stockkeeper will count out 75 caps and 75 bases from one bin, 80 nails from another bin, and 80 leatherheads from a third bin; usually all these parts are then dumped into a box and taken to the job, where the helper, or the wireman himself, must assemble the knobs ready for use. Much breakage and loss of loose parts also results from this common practice.

A new type of knob recently placed on the market eliminates these difficulties by a simple construction which insures that the knobs are always handled as a complete assembled unit ready for instant use. The base, cap, leatherhead, and nail are assembled once for all at the factory and remain in proper relation at all times. The cap is extra strong to minimize the liability to breakage.



"Nail-It" and "Screw-It" Assembled Porcelain Knobs.

Two forms of these new knobs are made, as shown in the accompanying cuts. The screw type possesses the same features as the nail type. The cap is countersunk to exactly fit the screw supplied. Loss of parts of the knob, nails or screws is eliminated and a vast amount of time saved by having the assembled knobs ready for use.

These knobs are known, respectively, as "Nail-It" and "Screw-It." They are manufactured by J. H. Parker & Son, Parkersburg, W. Va., and sold through the leading jobbers throughout the country.

New Telautograph Invented in Sweden.

United States Consul General Ernest L. Harris, of Stockholm, Sweden, states that a new telautograph or telewriter, an instrument for telegraphic transmission of ordinary handwriting, has just been invented by two Swedish engineers. This new apparatus apparently differs entirely from the fundamental principles of other telautographs. The most characteristic feature of the apparatus seems to be that it can be used independently of the electrical resistance of the line. It can be connected alternately to a long or short line without any adjustment of the resistance, and can consequently be used in connection with the public telephone systems. This apparatus has been in practical use for some time for testing purposes, and its manufacture for commercial exploitation has now been started in Sweden.

Turbine Operates 32 Months Without a Stop.

A remarkable record of continuity of service in power-plant operation has just been reported by the Quincy Market, Cold Storage & Warehouse Company, Boston, Mass. Mr. Fairbanks, the chief engineer of this company, reports that it has had in operation a 500-kilowatt Westinghouse-Parsons steam turbine which has been carrying load continuously for two years and eight months without the steam being turned off at the throttle. A short time ago it was decided to shut down the turbine to give it an inspection. This inspection showed that the machine was in perfect condition, and it was immediately started up and put back into service.

In an up-to-date refrigerating plant, such as this one, continuity of service is absolutely essential, as any interruption in service means considerable financial loss, and the record shown above is evidence of the reliability of modern generating apparatus.

In the first half of 1915, 18 electric locomotives, valued at $134,238, were exported from the United States.

Digitized by Google

Improved Disconnecting Switches and Busbar Supports for Large Generating Plants.

Delays and outages due to short-circuits and switching mistakes have ever been serious, but with increasing sizes in generating units, the significance of better equipment in switches and busbar supports is very apparent to anyone. We now have units of 20,000, 25,000, 30,000 and 35,000 kilowatts, and with 50,000-kilowatt units already designed and being called for by some of the big companies, the bus and switch detail to care for these big units has not progressed with the demand. Consequently, certain large plants have suffered serious losses due to failure of bus supports and their attendant structures and compartments; disconnecting switches have also been opened by shorts and other causes. To provide more reliable and safe devices for these conditions, the engineers have first called for heavier and more rugged bus supports with greater factor of safety, and then called for a locking type of disconnecting switch, followed with a demand that the locks must be positive, and then with further demands that the locks must be foolproof and interferenceproof.

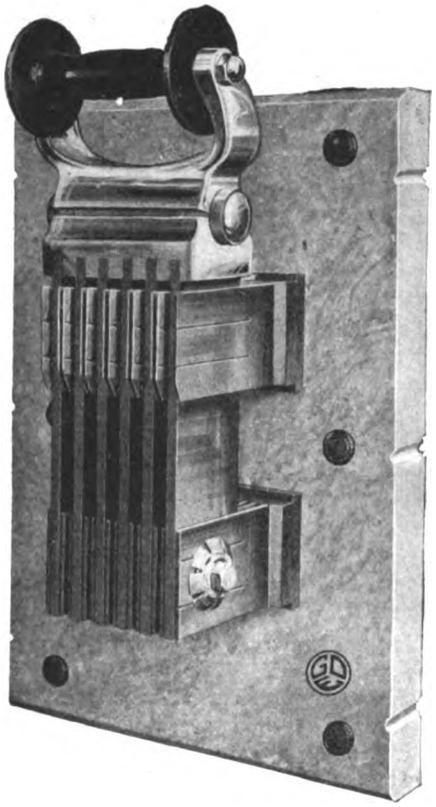


Fig. 1.—6,000-Ampere Switch.

Engineers are today demanding better switches with guaranteed minimum millivolt drop under full load, fixed frequency and temperature; such switches can only be manufactured with special care and materials. The use of solid copper forgings has made possible great savings in energy formerly lost through use of poor design and cast copper parts in switch construction. Another waste in energy is found in the various clamp devices that are used on the buses, supporting cables, etc. The elimination of this waste can be obtained by the use of nonmagnetic materials in the construction of the clamping member or the supporting device of the conductors.

Phosphor-bronze bolts, when machined from the solid rod, have great strength and are superior to brass or other metals. The porcelain factor is one often neglected by the designing engineer, primarily owing to a multitude of other details seemingly of more importance. It is not generally realized that the entire system is dependent upon the insulating properties and strength of the station porcelain, whether this be on switches or on bus supports. Porcelain manufactured by the wet process has greater strength than that of any other process and is, therefore, used exclusively for all classes of important devices and fittings. Such porcelain can be equipped with well-cushioned mechanical clamps for the proper support of its hardware. The use of cement in any form should be avoided. The design should permit a test with combined high frequency

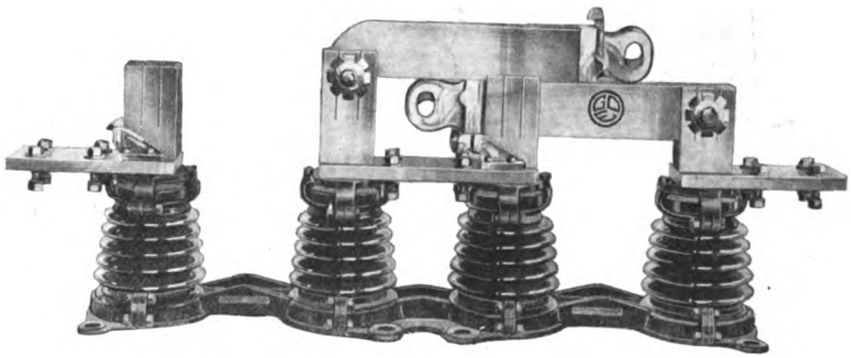


Fig. 3.—Special Switch for 30,000-Kilowatt Generator.

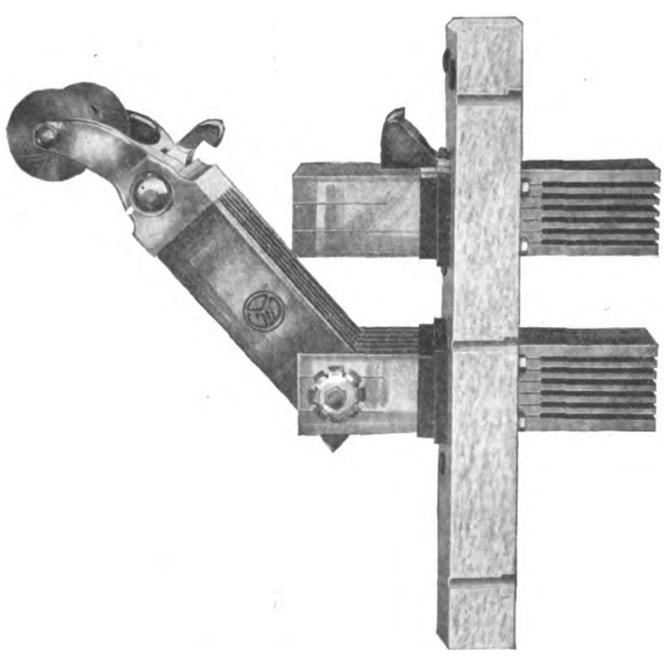


Fig. 2.—Side View of Same 6,000-Ampere Switch.

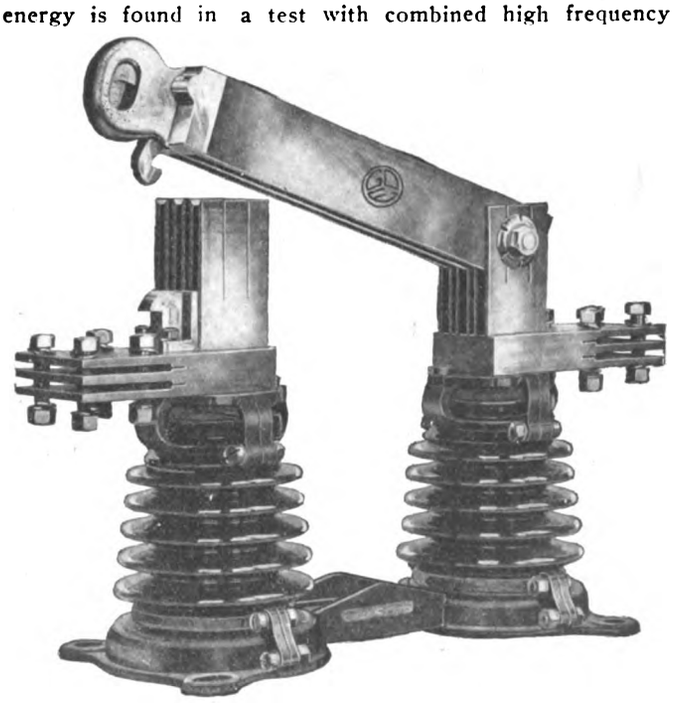


Fig. 4.—2,000-Ampere, 15,000-Volt Bus Switch.

Digitized by Google

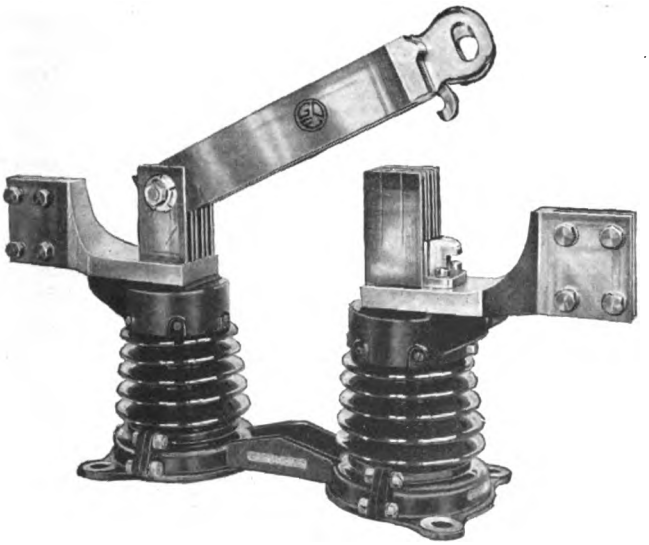


Fig. 5.—Another Type of 2,000-Ampere, 15,000-Volt Switch.

and high potential of, say, four to seven and one-half times greater than the service voltage, and on high-capacity service due allowance must be made for "spill-over" troubles. This usually requires very heavy and rugged porcelain.

The General Devices & Fittings Company, Chicago, Ill., has recently furnished much switch and bus-support equipment for three of the largest power plants in the country, and descriptions and illustrations of a few of these new designs are given here for the first time.

Referring to Figs. 1 and 2, these show a front and side view of a back-connected positive-lock type switch with a rating (on the conservative basis of 680 amperes per square inch of cross-sectional area and of 68 amperes per square inch of contact area) of 6,000 amperes and 600 volts, 60 cycles, and 20 degrees Fahrenheit limit temperature rise. These are the only switches ever provided with a positive lock which is thrown in or out with the switch handle. The studs are milled from solid copper forgings and slotted seven inches deep for bus insertions. The studs can also be slotted for vertical buses. All contacts are ground to reduce the millivolt drop to the lowest possible point. All hardware, bolts, nuts, spring washers, etc., are of phosphor bronze, turned from solid rod. The clips are of Sigamond spring copper; the blades are extra-hard-drawn pure blading copper; the handle fork and entire lock are of Hertz nonmagnetic metal; and the handle itself is of black fiber made from rings turned to size and treated. This switch is made in sizes up to 16,000 amperes; above 10,000 amperes all sizes are equipped with double-cushion locks and interferences.

Fig. 3 shows a special generator switch for a 30,000-kilowatt, 13,200-volt turbogenerator. It is equipped with positive locks and throw-over interference. The patent base is continuous.

In Fig. 4 is shown a special generator bus switch rated at 2,000 amperes and 15,000 volts, and mounted on a patented malleable-iron bridge base. The positive type lock is especially heavy and very rugged. The clip block is a single-piece copper forging, with slots six inches deep.

Fig. 5 shows a special extra-heavy switch for 2,000 amperes and 15,000 volts equipped with positive snap lock and vertical terminals for bus insertion. The patent bridge base is an assurance of continuous alinement. The clip blocks are one-piece solid copper forgings milled and slotted to micrometer size. Any switch can be arranged, if necessary, for mounting upon pipe frames, either single or double pipe, and on the horizontal or vertical plane for front-connected switches and horizontal only, if the switches are back-connected.

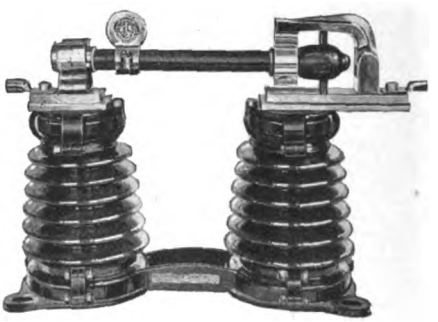


Fig. 7.—Support for 15,000-Volt Fuse.

Fig. 6 shows a triple-pole locking-type switch equipment mounted upon a horizontal pipe frame. These switches are rated at 2,000 amperes and 600 volts, 60 cycles. They are equipped with positive interference locks and are the

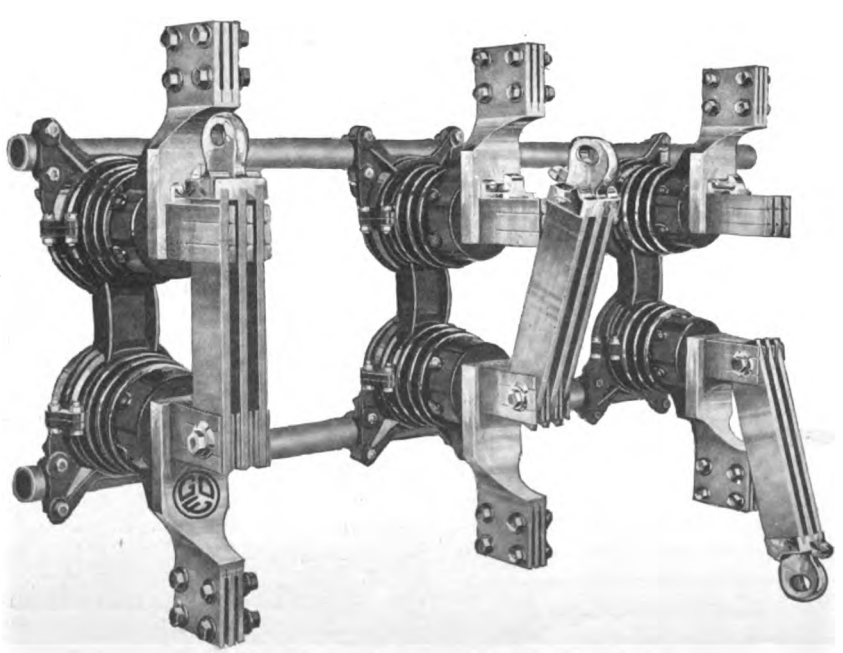


Fig. 6.—Triple-Pole Locking-Type Switch.

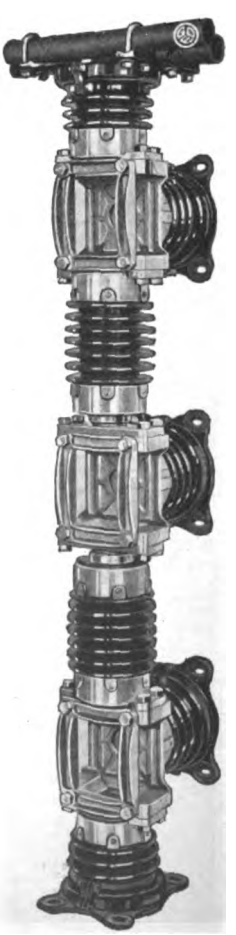


Fig. 8.—Three-Phase Bus Support.

Digitized by Google

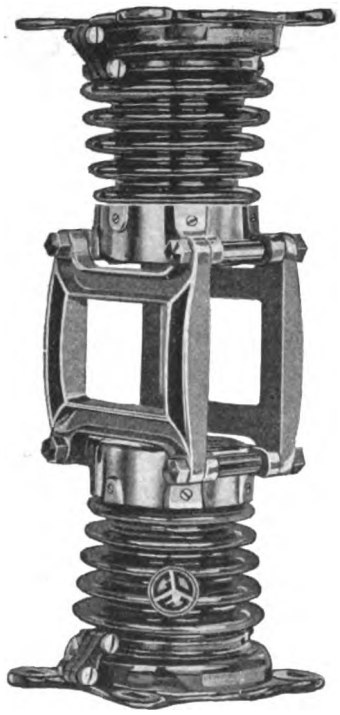


Fig. 9.—15,000-Volt Clamp-Type Bus Support.

first of their kind to be made. The bridge bases permit of vertical adjustment, and barriers are provided between switches, but are not shown on the cut.

In Fig. 7 is shown a disconnect-type support for a 15,000-volt expulsion fuse. These are also built for cartridge-type fuses and are also mounted on bridge bases. They are furnished for both flat and pipe mounting.

A special three-phase bus support for 600-volt service is shown in Fig. 8. All metal, except in the bases, is Hertz nonmagnetic metal; the bolts are phosphor bronze machined from solid rod. These supports are now made in all sizes and voltages and to support up to 19 bars one-fourth inch by ten inches, which, so far as known, is the largest support ever made of this type. Any combination of mounting can be arranged for. This support is also adjustable. Its weight is 320 pounds.

Fig. 10.—Tubular-Bus Support.

Fig. 9 shows a 15,000-volt special extra-heavy clamp-type bus support for holding heavy vertical buses and arranged to be mounted in and between a 36-inch compartment.

Fig. 10 is also special and extra heavy. It is arranged for 3.5-inch copper tubing insulated for 13,200 volts. It is adjustable all around, and can be removed from the bus while power is on bus.

Fig. 11 shows a single support to take one phase leg from the big support shown in Fig. 7. It is arranged for mounting on two parallel pipes and

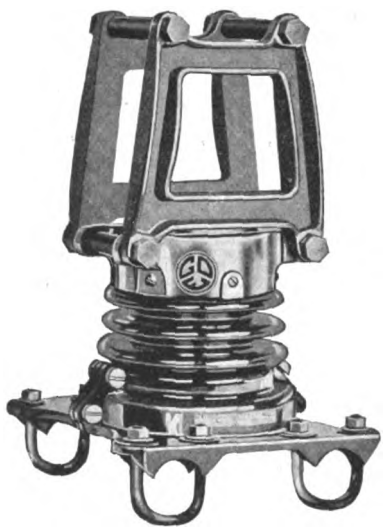


Fig. 11.—Bus Support for Pipe Mounting.

is built to clamp the bus and not for contact or taps.

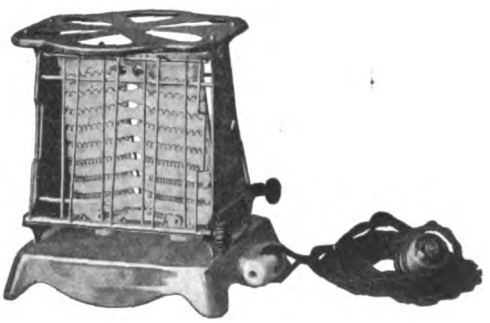
Fig. 12 shows a heavy contact-type bus support for 15,000-volt service. This support is adjustable all around. All porcelain is tested with high frequency at 220 to 280,000 cycles and is also given a combined high-potential, 60-cycle, and high-frequency test of 275,000 cycles before shipping, and this test is with all hardware and equipment in place. All shipments are packed in cartons, each unit being entirely complete.

The General Devices & Fittings Company was the first manufacturer to build switches with a guaranteed millivolt drop, and on both the heavy-capacity and the central-station standards. Copper forgings are used entirely for all switch work and terminals. The porcelain used is said to have no equal for design or strength, and is guaranteed to be wet-process entirely. Corrugated-post types for voltages up to 66,000 volts are stocked. Floor and wall tubes and bushings are also stocked up to 35,000 volts and can be furnished up to 150,000 volts. The company's exhibit of porcelain is the largest in the country outside of an insulator factory. Its trade-mark "G. D. F." means "Good Designs First" and, taken with its slogan of "Quality and Service," is surely exemplified by the illustrations that are shown with this article.

Fig. 12.—Special 15,000-Volt Bus Support.

Toaster That Turns the Toast.

A recent addition to the line of electric ware marketed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is the "turnover" toaster. The appearance of this device is shown in the accompanying illustration. By turning the knob near the bottom the frame is thrown outward, while wire catches at the bottom trip the toast outward so that it slides along the frame with the



Improved Turnover Toaster.

browned side down. On turning the knob back again the toast is raised to a vertical position with the fresh side toward the heater.

The heating element consists of a continuous coil of resistance wire wound on a porcelain plate. The resistance is so distributed as to produce uniform heating, taking into account the variation in heating effect caused by the vertical position of the heater. The entire device is nickel-plated and highly polished, and has a shelf for warming plates or keeping the toast or the coffee hot.

Digitized by Google

Cutler-Hammer Charging Panels.

For garage work it has been a practice in the past in the case of any considerable size equipment, say from six circuits up, to use slate panels mounting at the top an ammeter and voltmeter and below the meter in succession six double-pole double-throw knife switches and fuses, it being the idea to throw the double-pole switch, to the hinges of which is connected the battery, to one side to connect the ammeter into circuit and to reverse the throw to cut the meter out of circuit; voltmeter readings on each battery being taken by some sort of a push button, or in some cases by a six-circuit voltmeter switch mounted at the top of the panel.

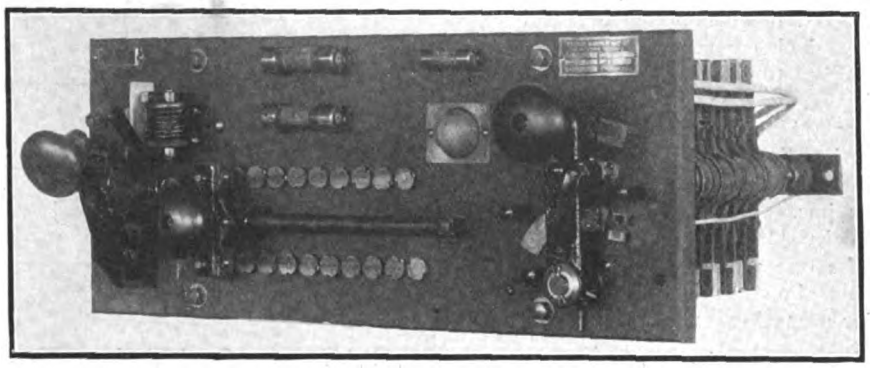


Fig. 1.—Near View of Standard Unit of Book-Case-Type Charging Panels.

The charging rheostats are generally mounted above the slate panels, the levers on the switch heads protruding through the rheostat case, and being manipulated by means of some sort of a rod with a ring on the end of it.

The chief objection to this type of apparatus is that there is quite an arc drawn at the moment of transition from meter reading to non-reading position of the knife switches. In other words, in throwing from the meter circuit to the line circuit there is always an arc drawn, which is, of course, very destructive to the switch blade and contacts, and in the case of Edison batteries charging at extremely high currents there is also the danger of the operator's hands being burned.

Fig. 1 shows a single section of the new Cutler-Hammer book-case type of panel. The slate itself is obtained from the Monson Maine quarries, being the best that can be used for electrical purposes. On each slate section is mounted a low-current circuit-breaker, a slider type of rheostat, one pair of battery fuses, a pilot light, light fuse and a meter-reading switch.

The low-current circuit-breaker is pivoted at the bottom, and cannot be closed unless the slider cross-head is at the extreme left-hand side of the panel. In other words, it is mechanically interlocked with the slider cross-head, thereby preventing the operator from throwing the battery on the line with the resistance all cut out. The circuit-breaker is held closed by means of the pivoted armature engaging the pin clearly shown at the top of the circuit-breaker, the holding magnet itself passing the full or series current. The circuit-breaker in this side has a holding range of approximately eight to one, that is to say, if the series coil is designed for 60 amperes the breaker will hold closed down to approximately 7.5 amperes. The slider cross-head acts simply as a means of bridging from the upper to the lower set of buttons, the resistance being connected from button to button contacts on the upper and lower rows.

It is apparent, therefore, that the carrier arm does not carry current, the current being taken from one copper shoe to the other one by means of double pig tails. There is also some current carried across by means of the heavy bronze flat springs on the under side of the cross-head.

The pilot light is connected directly across the battery terminals, and lights up whenever a battery is connected to that particular section. The meter-reading switch on the extreme right has three positions, one of them the normal, that is the position as shown on the photograph, which allows the current to flow from the bottom track through the laminated copper brush on the under part of the switch lever to the small segment clearly shown at the top. This segment is connected to one side of the line. The meter reading position is obtained by moving the switch lever to the right as far as it will go and against the tension of a spring. This allows the main current to flow from the lower track to the small segment to the right at the top, connecting in the ammeter, and at the same time the two small contact springs under the right-hand stop post are short-circuited by a brass strap carried on an insulating fiber support on the lever, so as to complete the voltmeter circuit to the battery. It is evident, therefore, that ammeter and voltmeter are read simultaneously, and that upon letting go of the handle on the switch lever it will return to its normal position, that is the position with the meters both out of circuit, without drawing an arc, for the simple reason that in the process of transferring from the meter to the non-meter position the meter itself is simply short-circuited and then cut out of circuit.

There is one other position for this meter switch to assume and that is the one obtained by moving it over against the left-hand stop post, in which case the line circuit itself is opened, but there is no burning of the contacts or the brushes, as the arc is drawn on a blow-out roller and copper pencil held by a spring in contact with the roller. This spring is clearly shown on the top of the lever. To prevent burning of the contact roller a powerful magnetic blow out is provided, the magnet itself being mounted on the rear of the panel, the windings being designed to pass full series current.

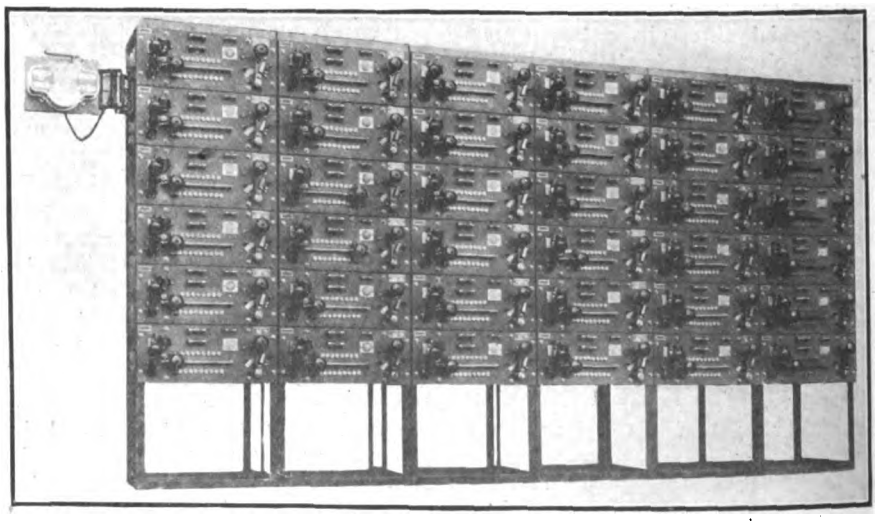


Fig. 2.—Battery-Charging Board with 36 Standard Units.

Digitized by Google

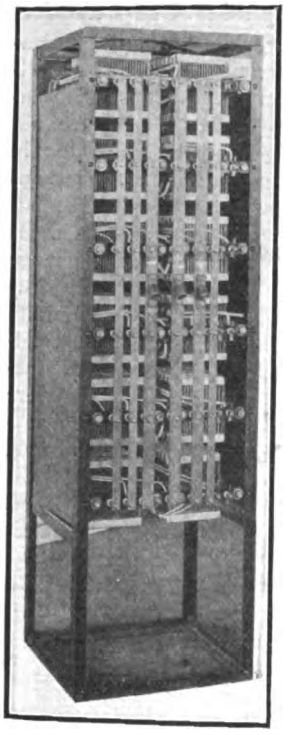


Fig. 3.—Rear View of Six-Section Panel.

of equipment it is only necessary to remove four bolts from the slate and two from the steel strap holding the rear ends of the grids, to entirely remove it from the frame, just the same as one would pull a drawer out of a cabinet.

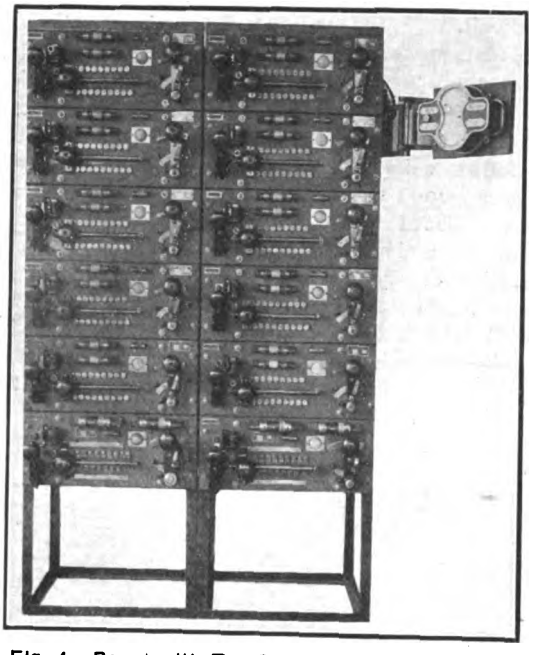


Fig. 4.—Board with Ten Standard and Two Special Sections.

Fig. 2 shows an equipment made up of thirty-six of these standard sections, each section being designed to charge 42 lead cells at 40 to 8 amperes from a line voltage of 115.

From this view it will be noted that whereas in the existing old-style type of equipments each six-circuit panel requires an ammeter and voltmeter, thus introducing an item of considerable expense, with this new sectional type of equipment one duplex meter can be made to suffice for 36 circuits, or in the case of the meter shown on the panel where it is illuminated it probably could handle 42 circuits, it simply being a matter of distance, at which the meter scale is easily read.

Fig. 4 shows a 12-circuit equipment arranged for three-wire service. The two lower sections, however, are of larger capacity, the rating being 180 amperes. From the construction of the two different capacity sections it will be seen that the only difference is in the contacts, the 90-ampere being of the double-button type and the 180-ampere of the double-copper-segment type. The slate panels, however, are both the same size, the grid supports being identical in construction. They therefore fit into the same frame, and the high-capacity section can be interchanged with a lower-capacity section and vice versa.

If this meter switch is moved to this open-circuit position, circuit to the battery, of course, is opened and the low-current circuit-breaker automatically opens, and since the circuit-breaker is connected into one side of the line, the meter switch into the other, double-pole protection is provided without the necessity of a knife switch.

The resistance grids are carried by a strap iron on one end, and on the other end by a steel crab, which is fastened in turn to the rear of the slate panel.

Each section is completely wired and assembled before being mounted in the frame.

With the particular size of front shown in the illustration, 16 steps of adjustment are usually provided, the capacity of the front itself being 90 amperes.

With this sectional or book-case type

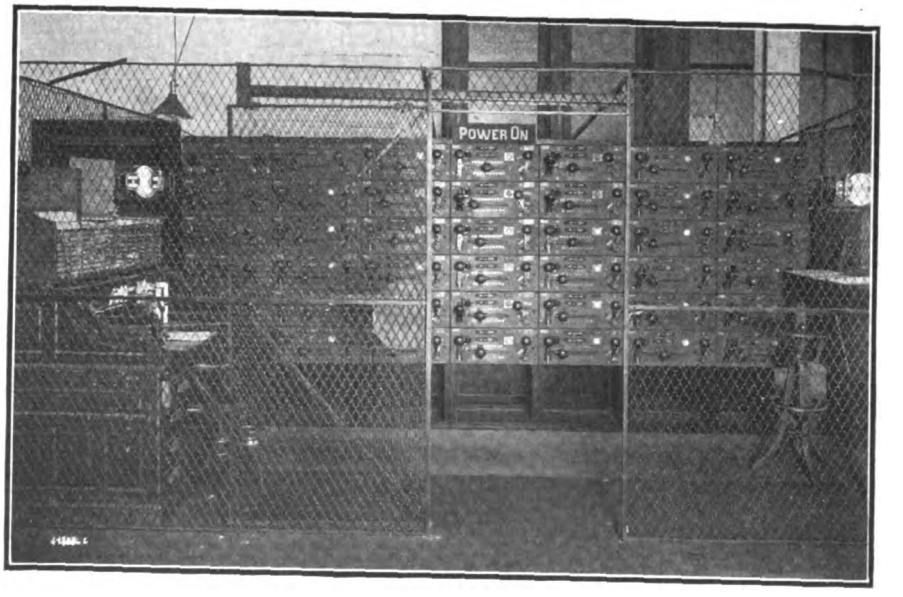


Fig. 5.—41-Section Charging Board in Service.

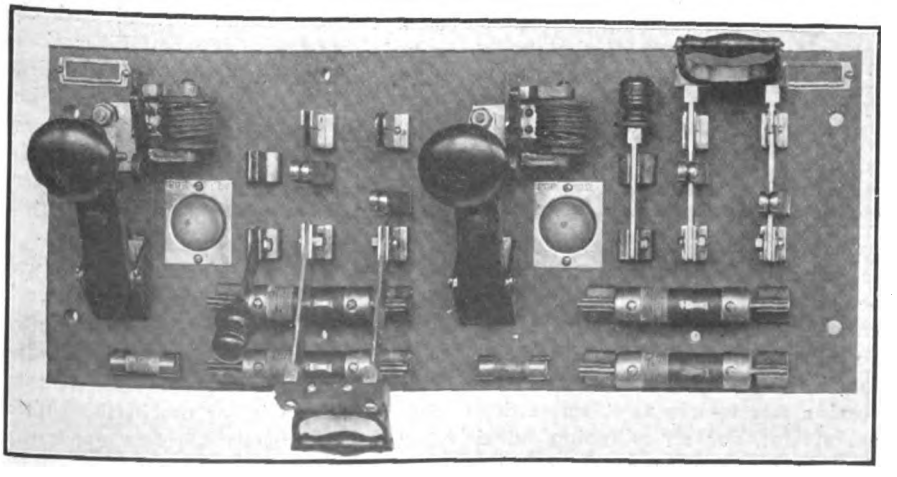


Fig. 6.—Detail of Special Section.

Fig. 5 shows a 41-circuit equipment which is of particular interest.

Each charging section is standard in construction, as shown in Fig. 1, with this exception, that on the tail of the low-current circuit-breaker there is fastened a silver-tipped bronze spring

Digitized by Google

that makes contact with a spring post when the circuit-breaker is open.

By referring to the illustration note should be made that on the upper slate section on the extreme left-hand panel there are mounted two Schwarze high-tension bells designed to operate on 115-volt circuit.

If for any reason when a battery is on charge the line voltage should fail entirely or fall below that of the battery so as to cause the current to reverse in the circuit, the circuit-breaker will drop out and, through the contact springs just mentioned, complete the circuit to the bell, calling the attention of the operator to the fact that the breaker is open. This particular equipment was built for a contractor in New York, engaged in hauling United States mail.

Fig. 6 shows the detail section of a 90-section equipment recently installed. Each slate section mounts two low-current circuit-breakers and pilot lights as used on the standard sections, also two special double-pole single-throw knife switches with patented meter-reading clips. There are also furnished two single-pole single-throw resistance-shorting switches. The operation is as follows: When the battery has been plugged on to the panel, the double-pole switch is closed so that it engages the two meter-reading clips nearest to the switch hinge, the single-pole switch being opened. The open-circuit voltage, therefore, is recorded on the voltmeter; now by closing the circuit-breaker and closing the knife switch in a little further so that it makes contact not only with the two meter-reading clips, but also with one of the switch posts, one of which is higher than the other, the closed-circuit counter voltage of the battery is recorded as well as the charging current flowing through the battery. Closing the switch all the way allows the switch blades to slip pass the meter clips cutting the ammeter and voltmeter out of circuit without causing an arc. In other words, this knife switch functions exactly the same as the standard meter switch previously described.

New Compensator Type Relay.

A new type of circuit-opening, inverse-time-limit, oil-dashpot relay has recently been developed by the General Electric Company for use in conjunction with a low-voltage release for automatic overload and low-voltage protection of alternating-current motors up to 2,500 volts and 300 amperes.

The relay is connected in series with the line, the low-voltage release across one phase in the usual manner with the low-voltage coil in series with the relay contacts.

On overload greater than the current setting of the relay, the relay contacts open-circuit the low-voltage release coil and the motor is cut out of circuit. If the voltage drops to a predetermined per cent of normal, the motor is also disconnected from the power supply.

This relay is mostly employed with motors using self-contained compensator control, but sometimes for switchboard service when both low-voltage and time-delay overload protection are required. Here series relays replace the secondary relays, current transformers and oil-switch tripping coils otherwise required, this simplifying and reducing the cost of the equipment.

Current calibration is from normal to twice normal, and time adjustment from ten seconds to five minutes on 25-per-cent overload. The delay recommended, however, is about 15 seconds at the starting current of the motor. This affords ample protection to the motor against damage from overload or single-phase operation, but prevents the circuit from being opened while the motor is starting.

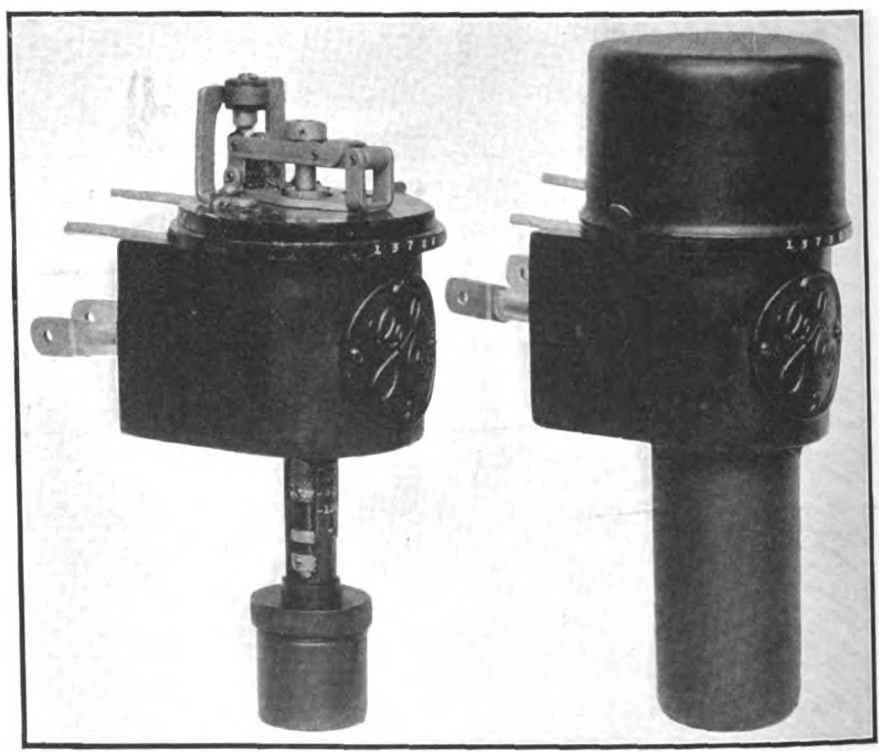
The new relay is a vast improvement over the one previously manufactured. The contact, dashpot and calibrating tube are inclosed by dustproof stamped-steel covers. Current and time adjustment are accomplished outside of the dashpot simply with the aid of a screw-driver. The settings are constant, for an adjusting nut is locked in place after each setting is made.

Wireless Companies Use Bakelite.

For a considerable period, the manufacturers of wireless apparatus experienced difficulty in the matter of insulation. Fiber and hard rubber were not at all satisfactory, for the insulation in addition to having the requisite mechanical and dielectric strength, must be impervious to moisture, oils, and dust. It must be absolutely unaffected by change in temperature. This is especially true in the tropics where the high humidity and extremes of temperature have rendered fibers and hard rubber unsatisfactory. These insulation difficulties were solved by the Wireless Specialty Apparatus Company at the suggestion of P. K. Reynolds.

In discussing this matter with G. W. Pickard, chief engineer of the Wireless Specialty Apparatus Company, Mr. Reynolds suggested Bakelite, knowing that it had the desired characteristics. Acting upon this suggestion Mr. Pickard obtained from the Continental Fiber Company, which is a licensee of the General Bakelite Company, samples of Bakelite Dielecto in sheet form. These samples proved so satisfactory that this substance was adopted for use on all parts of wireless apparatus made by the Wireless Specialty Apparatus Company.

About the time Bakelite Dielecto was adopted by this company, it was at work upon a wirelsss set for the United States Navy Department. After testing it, the Navy Department was so much pleased that it adopted it for use in the United States Government wireless apparatus. Since that time, other wireless companies have come to use Bakelite.



Series Relay, Showing Device Open and with Covers in Place.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

AUTOMATIC PHONOGRAPH. — The Automatic Machine and Tool Company, 210 North Ann Street, Chicago, Ill.

Gabel's Automatic Entertainer, consisting of a special phonograph with automatic mechanism for changing records and needles, all inclosed in a wood and glass case. A coin-switch controls circuit of one-twentieth horsepower, 110 or 220-volt, alternating-current or direct-current motor, which winds phonograph spring. An incandescent lamp illuminates device while operating.

Listed September 3, 1915.

CABINETS.—United Electric Manufacturing Company, 926 Lafayette Street, New Orleans, La.

Cast-iron boxes designed for use especially in concrete walls as inclosures for cutouts, and as junction boxes.

Listed August 2, 1915.

ELECTRICALLY LIGHTED SCALE.—Detroit Scale Company, Detroit, Mich.

A computing scale provided with an attachment plug and cord and six small incandescent lamps which illuminate the dial and display sign when material is placed on scale to be weighed.

Listed September 3, 1915.

FIXTURES. — Holloway Brothers Company, Incorporated, 336 West Sixty-Third Street, Chicago, Ill.

Window transparency consisting of a metal inclosure for four standard flashing receptacles, provided with 20-watt lamps for illumination of a painted celluloid sign held between two panes of glass forming front of device. A length of standard armored cord with standard terminal fittings is supplied.

Standard for indoor use only.

Listed September 3, 1915.

PANELBOARDS.—Detroit Fuse and Manufacturing Company, Detroit, Mich.

Detroit ironclad switchboards in which standard, labeled, inclosed switches made by above named manufacturer are assembled to specifications and are mounted on a metal structure in which all current-carrying parts are entirely inclosed.

Listed September 11, 1915.

PICTURE MACHINES AND APPLIANCES.—American Standard Motion Picture Machine Company, 110 West Fortieth Street, New York, N. Y.

"American Standard" projectors; motor-driven motion-picture machines driven by special motors mentioned below, supplied by American Standard Motion Picture Machine Company, and expressly accepted for the purpose.

Direct-current motor, Colonial Fan & Motor Company, 0.1 horsepower, 115 volts.

Alternating-current motor, Universal Fan Motor Company, 0.1 horsepower, 110 volts.

Listed September 15, 1915.

PICTURE MACHINES AND APPLIANCES.—Optigraph Company, 564 West Randolph Street, Chicago, Ill.

Optigraph portable hand-operated motion-picture and stereopticon machine, Type A. The electrical parts of this device comprise an incandescent lamp of special form with standard socket, snap switch, and portable cord for attachment to supply circuit.

Standard for use only with standard slow-burning film supplied by manufacturers.

Listed September 3, 1915.

RECEPTACLES, for Attachment Plugs.—Detroit Fuse & Manufacturing Company, Detroit, Mich.

Fused receptacle for attachment plug, catalog No. 5001.

Attachment plug, catalog No. 5021.

These devices each consist of special porcelain cutout block in two pieces, provided with spring plate contacts inclosed in metal cabinet, and wooden attachment plug having two sliding-plate contacts to slide between contacts of receptacle.

Two-pole, 30 amperes, 250 volts.

Listed August 18, 1915.

RHEOSTATS. — Hatfield Electric Company, Indianapolis, Ind.

Rheostats and panelboard for charging automobile lighting and ignition storage batteries in service stations. Open wire resistance coils mounted on porcelain insulators secured to an angle-iron framework, to which a slate panel is attached carrying knife switches for controlling voltage and current.

Standard for use in automobile service stations when mounted in accordance with National Electrical Code requirements for rheostats and four feet above the floor, or located in a room or inclosure provided for this purpose.

Listed September 3, 1915.

SIGN MACHINES.—Federal Sign System (Electric), Lake and Desplaines Streets, Chicago, Ill.

Motograph sign machine, consisting of motor-operated rolls and idlers, carrying a perforated sheet of fibrous paper which passes between brush and solid contacts, thus making and breaking circuits of lamps in a sign to flash words, or any desired design. The entire device is inclosed in a standard cabinet.

Motor, one-sixth horsepower, 110 volts, alternating current or direct current.

Rating, one-fifteenth-watt lamp per brush, 110 volts.

Standard when wired and installed in a manner acceptable to Inspection Department having jurisdiction.

Listed September 3, 1915.

SWITCH BOXES. — Geometric Stamping Company, 1509 East Fortieth Street, Cleveland, O.

Pressed-steel switch boxes for mounting flush switches and receptacles, and having removable sides to facilitate assembly for use in gangs. "H 501 Catalog G."

Listed August 20, 1915.

SWITCHES, Automatic.—Bristol Time Clock Company, Aberdeen, S. D.

Automatic time switch, 30 amperes, 250 volts.

This device consists of an asbestos-lined case, inclosing an eight-day, 24-hour clock mechanism, arranged to operate three standard double-pole labeled snap switches.

Listed August 25, 1915.

SWITCHES, Automatic. — G. L. Time Switch Company, 3419-21 Rutger Street, St. Louis, Mo.

Automatic electric-time switch, 10 amperes, 250 volts.

This device consists of a wood case, inclosing an eight-day, 24-hour clock mechanism arranged to operate a standard, labeled surface snap switch.

Listed August 20, 1915.

SWITCHES, Push-Button Flush.—The Arrow Electric Company, 630 Capitol Avenue, Hartford, Conn.

Arrow E switches, standard and labeled.

Single-pole, 5 amperes, 25 volts, 10 amperes, 125 volts, catalog No. 6800.

Double-pole, 10 amperes, 250 volts, catalog No. 6801.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 6802.

Also above types with lock attachment.

Listed August 13, 1915.

SWITCHES, Pendant Snap.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts, catalog Nos. 11015-22, inclusive.

Listed September 14, 1915.

SWITCHES, Surface Snap.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 13000, 13010.

Listed August 28, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

EAST AURORA, N. Y.—The taxpayers will soon be asked to vote upon the subject of a new system of lighting the village streets. Fifty-two lamps of 250-candlepower each will displace the 35 lights of 60 candlepower now in use, if the project is not vetoed by the property owners. The cost will be approximately $6,000. Address Mayor Brotherhood.

PAULSBORO, N. J.—The Board of Education will soon start on the construction of a large modern school building here. Clyde S. Adams is the architect.

WESTVILLE, N. J.—A complete sand-handling plant, consisting of elevators, screens, storage bins, etc., will be constructed here by the West Jersey Sand & Gravel Company. Manwaring & Cummings, Philadelphia, are the engineers in charge.

POTTSTOWN, PA.—A thoroughly modern ice-cream plant is being planned for William S. Markly, in this city. Lachman & Murphy are the architects.

SOUTH BETHLEHEM, PA.—Several million dollars will be spent by the Bethlehem Steel Company to erect on the 65 acres of land recently acquired on the site of the village of Shimersville, a large plate mill, a battery of furnaces and the buildings to house the Bettendorf Car Works to be moved from its present location in Davenport, Iowa. Practically all operations now taking place in the steel mills are made electrically so it is thought that the new plant will be entirely electrified. E. G. Grace is president.

YORK, PA.—By reason of a large bequest, this city will shortly begin the construction of a $500,000 library building.

BALTIMORE, MD.—Henry Hess, formerly of the Hess-Bright Manufacturing Company, of Philadelphia, and a number of Baltimore capitalists will shortly start the construction of a $1,000,000 plant here for the production of high-grade steel products to be manufactured by the electrical process. The Baltimore Trust Company, the United States Fidelity and Guaranty Company and the Consolidated Gas, Electric Light and Power Company are interested.

BALTIMORE, MD.—The Public Service Building Company will erect a 12-story brick, stone and steel office building here. Parker, Thomas & Rice are the architects.

ACWORTH, GA.—Acworth city authorities have voted to install a new system of waterworks and electric lights. The present system will be abandoned entirely. All-day and all-night electric current will be maintained for motive and lighting current. The water for the city will be pumped from artesian wells by electric motors. Address Mayor George L. Lemon.

NORTH CENTRAL STATES.

CINCINNATI, O.—C. E. Schaffner has awarded to Fischer Brothers the contract for the installation of all electrical equipment in his new apartment building, to cost $75,000. L.

BICKNELL, IND.—A stock company, to have $1,000,000 capital stock, has been organized in this city by A. L. Brocksmith, superintendent of the Bicknell Light and Power Company. The company expects to build a power station at Apraw Falls, on White River, two miles south of this city, and provide power for coal mines operating in this field. It also intends to build an electric line connecting the mines.

URBANA, ILL.—Plans have been prepared for a 1,000-light system which the board of local improvements is contemplating for the entire western section of Urbana. Address A. M. Lindley, president.

GRAND MARIAS, MINN.—A petition is being circulated for an electric light plant. Address town clerk.

CORWITH, IOWA.—Bonds have been voted for an electric light plant. Address city clerk.

WEST UNION, IOWA.—The Turkey River Power Company will make extensive improvements, to include a 300-kilowatt generating unit, water wheels and generator. Cost $20,000.

POPLAR BLUFF, MO.—Sealed proposals will be received by H. H. Wilcox, city clerk, Poplar Bluff, Mo., up to 2 p. m. November 3, 1915, for the construction of a municipal electric light and power plant. Fuller-Coult Company, engineers, St. Louis, Mo. Bond issue of $75,000 sold.

COOPERSTOWN, N. D.—The city council is considering plans for improvements to the electric light system. Address city clerk.

BUCKLIN, KANS.—The council will expend $10,000 for an electric lighting system. Address town clerk.

SOUTH CENTRAL STATES.

MAYFIELD, KY.—A bond issue for purchase of the local water and light plants will be voted on at the coming election. The American Appraisal Company recently appraised the properties at $161,000 and the city is having an audit of the books made. As the first step in the direction of a white way the city council has ordered that all wooden awnings built out over the sidewalks shall come down. The one-light unit plan has been adopted as more efficient than any other. The contract for furnishing the posts was let to the Ornamental Foundry Company, Anniston, Ala., at $23.40 a post, less the cost of wiring and the globe. The post is a patented two-piece post. G.

EARL, ARK.—Memphis people are investing $30,000 in the purchase of the Crittenden Power Company, at Earl, Ark. J. F. Freeman, former manager of the Railway Ice Company, Memphis, negotiated the deal. John F. Rhodes and H. A. Morrison, were the former owners. The concern under the new regime will be known as the Earl Light, Power and Ice Company. G.

WOMBLE, ARK.—The city council has granted a franchise to the Black Springs Lumber Company to supply Womble with electric lights. The company already has a plant at the lumber mill, and the lights will be in service as soon as the poles and wires can be erected.

GREENVILLE, TEX.—The City of Greenville has ordered lights and equipment for a "White Way." The lights will extend over a distance of nearly one-half mile and will be suspended by what is known as the Greenville bracket, a special attachment which was first tried out by the company in this city. The lights will be installed at once.

GATESVILLE, TEX.—Governor Ferguson has granted a deficiency of $10,000 for the erection of an up-to-date heat and power plant for the State Training School for boys near Gatesville. The erection of the new plant will be under the personal supervision of Pat Bracken, master mechanic of the state penitentary.

PLAINVIEW, TEX.—The Malone Light and Power Company will extend its high-voltage electric transmission line to Hale Center and Abernathy for the purpose of supplying those towns with electric current for lighting and power. A number of irrigation pumping plants will also be furnished with power. D.

WACO, TEX.—The plan of having a system of ornamental street lighting here, which has been handled by the Young Men's Business League, has been given a new impetus as a result of efforts made by President W. W. Naman, of the league, who is chairman of the white way committee. An active campaign to secure the lights will be made within the next few weeks.

WESTERN STATES.

ESCONDIDO, CAL.—A resolution has been passed by the city council calling for a bond election for $50,000 for the construction of a municipal electric and gas plant.

REDWOOD CITY, CAL.—The citizens of San Bruno have voted for a lighting district.

ALBANY, ORE.—William Hoflich has applied for a franchise to construct a power plant here and furnish the city with electricity for light and power purposes.

BAKER, ORE.—The Baker Mines Company, to add to the efficiency of its plant at Cornucopia, plans the installation of a small hydroelectric power plant for the operation of milling machinery and an air compressor. The company plans generating between 400 and 500 horsepower. The work of construction includes the installation of a 10,000-foot pipe line, to tap the east fork of Pine Creek; two water wheels, etc. Reported work will probably start on the project sometime early in November. O.

SEWARD, ALASKA.—It is reported the city council has granted the Seward Electric Light & Power Company a franchise to operate an electric light plant and to furnish this city and residents with light and power. According to the terms of the franchise, the city of Seward may, if it so desires, purchase the property after 20 years at a price to be fixed by a board of appraisers. O.

Digitized by Google

PROPOSALS.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on October 19, 1915, for the following material: 6,300 feet interior communication cable; 1,500 feet rat tail, rubber-insulated wire; miscellaneous single and twin conductor wire; schedule No. 8869, all for delivery at Navy Yard, Brooklyn, N. Y.; miscellaneous interior communication cable; miscellaneous lighting and power wire; schedule No. 8862, both for delivery at Navy Yard, Philadelphia, Pa.; 6,650 feet single-conductor cable; schedule No. 8857, for delivery at Navy Yard, Washington, D. C.; three 125-horsepower induction motors, schedule No. 8859, for delivery at Navy Yard, Washington, D. C.; 25 one-quarter horsepower portable ventilating sets, schedule No. 8871, for delivery at Navy Yard, Brooklyn, N. Y.

NAVY ELECTRICAL SUPPLIES.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until October 19, for furnishing the following materials. Firms interested should make application to the Bureau, giving the schedule numbers desired. Schedule 8832, single-boat-type electric heater; schedule 8845, storage-battery truck; schedule 8847, electrically illuminated sextants. Bids will be received until October 26 for the following: Schedule 8857, single-conductor cable; schedule 8859, cupro-nickel shell bands, 600-pound crucibles, and 125-horsepower induction motors; schedule 8861, electric blue-printing machine; schedule 8862, interior-communication cable and lighting and power wire; schedule 8869, interior-communication cable, rubber-insulated rat-tail wire, and single and twin-conductor wire. Bids will be received November 2 for the following: Schedule 8854, dry cells; schedule 8877, 75-kilowatt, oil-cooled transformers; schedule 8878, electric welding outfit. Bids will be received until November 9, 1915, for schedule 8865, water-tight annunciators, circuit-breakers, general-alarm boat-hour gongs, contact-makers, etc., alarms, electric whistle outfit, electric docking telegraphs, and thermostats. Bids will be received until November 30 for schedule 8876, portable transmitting and receiving radio sets.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,481. ENGINEERING REPRESENTATIVES.—An American consular officer in Brazil reports that a firm of civil and electrical engineers has just begun business in his district and desires to be placed in communication with American exporters. The firm desires to make a specialty of the sale of American goods. Correspondence may be in English. Quotations should be made c. i. f. Santos, Brazil.

NO. 18,558. ELECTRIC-LIGHT ACCESSORIES.—An American consular officer in the United Kingdom reports that a firm in his district desires catalogs and price lists from manufacturers of brass parts for electric-light accessories. Samples accompany the report and may be examined at the Bureau and its branch offices. (Refer to file No. 66,372.)

NO. 18,625. ARC-LAMP CARBONS, ETC.—An American consul in the United Kingdom reports a good market for arc-lamp carbons, chemical supplies, doorbells, etc. Further information may be obtained from the Bureau or its branch offices.

NO. 18,634. ELECTRIC ELEVATORS, ETC.—An American consular officers in France reports that an agent desires to enter into commercial relations with manufacturers of electric elevators and supplies, and to obtain, as soon as possible, catalogs and price lists. Correspondence may be in English.

NO. 18,652. X-RAY MACHINES.—An American consular officer in Italy reports that a doctor in his district desires to receive catalogs and prices of X-ray machines. Prices, if possible, should be given c. i. f. Palermo. Correspondence should be in Italian.

NO. 18,662. MACHINERY.—A report from an American consular officer in India states that a company desires to receive full information in regard to machinery for an ice plant, an aerated-water factory, and a mill for extracting oil from copra and sim sim (sesame). All the machinery to be driven by electric power generated by means of oil engines, which are also to be purchased. Detailed correspondence is solicited and not catalogs.

NEW INCORPORATIONS.

DEMPSTER, S. D.—The Dempster, Light and Power Company has been incorporated with a capital of $2,500, by John G. DeWahl and others.

VOLIN, S. D.—The Citizens Light and Power Company has been incorporated for the purpose of installing and operating an electric light system in this city.

ORANGE, N. J.—Selah Electric Company; to deal in electric motors; capital stock, $125,000. Incorporators: L. M. Sanders, F. L. Green, W. R. Hinsdale, all of Newark.

TUCKERMAN, ARK.—Articles of incorporation have been filed by the Citizens' Light and Power Company. The company is capitalized at $10,000, and was incorporated by L. D. Smith, L. T. Slayden and William Laner.

NEW YORK, N. Y.—S. & H. Electrical Company, Incorporated. Electrical construction, etc. Captital, $2,000. Incorporators: Reuben Simon, Edward J. Hussman and Edward Nimark.

NEW YORK, N. Y.—Arc Welding Machine Company, Incorporated. Electric welding plants. Capital, $10,000. Incorporators: Cyril G. Ballin, Edward N. Matthews and George L. Robinson.

LOUISVILLE, KY.—The City Sign Company, $250 capital, has been incorporated in Louisville, to make and sell electric and other signs. S. C. Bewley, William T. Johnston, and G. H. Kirn are the incorporators. G.

GLEN HOPE, PA.—The Glen Hope Light, Heat and Power Company has been incorporated with a capital of $5,000, by Warren Partridge, W. O. Hoover and J. P. O'Laughlin. The offices of the company will be located at Clearfield.

CHICAGO, ILL.—The Guaranteed Appliance Company has been incorporated. The company's capital stock is $5,000, and it is to manufacture and deal in electrical appliances. The incorporators are Prescott D. Bennett, Reuben N. Trane and Dudley Taylor. Z.

CISNE, ILL.—The Cisne Electric Light Company has been licensed to incorporate. The company's capital stock is $5,000. It is to supply light and power to the inhabitants of the village of Cisne, Ill. C. B. Clay, Nellie Clay and John H. Brown are the incorporators. Z.

WILMINGTON, DEL.—The Eureka Automatic Signal Company, with a capital of $350,000, has been incorporated to acquire patents of all kinds and to develop same. Dallett H. Wilson, Bethlehem, Pa., Mary Z. Bradshaw, Easton, Pa., and Ellen Z. Breed, Cleveland, O., are the incorporators.

FINANCIAL NOTES.

The Central Trust Company, Kuhn, Loeb & Company and Kidder, Peabody & Company, New York, who privately opened subscriptions for the new issue of $20,000,000 Brooklyn Rapid Transit Company five-per-cent secured notes, announce that the entire amount has already been over-applied for.

Dividends.

	Term	Rate	Payable
Brooklyn City R. R.	Q	2 %	Oct. 15
Edison Co. of Boston	Q	$3.00	Nov. 1
Grand Rapids Ry., pf.	Q	1.25%	Nov. 1
Montreal Tramways	Q	2.25%	Oct. 15
Ottumwa Ry. & Lt., pf.	Q	1.75%	Oct. 15
Pub. Serv. Investment, pf.	Q	$1.50	Nov. 1
West Penn. Rys., pf.	Q	1.25%	Nov. 1
Western States Gas & Elec., pf.	Q	1.75%	Oct. 15

Reports of Earnings.

ILLINOIS TRACTION.

Consolidated earnings of Illinois Traction Company and Western Railways & Light Company for the three months and the twelve months ended June 30, 1915, shows:

	1915	1914
Three months gross	$2,601,804	$2,723,871
Net after taxes	973,292	1,020,441
Surplus after charges	146,995	196,259
Balance after preferred dividends	39,962	89,226
12 months gross	11,141,880	10,994,565
Net after taxes	4,586,748	4,502,638
Surplus after charges	1,261,554	1,415,627
Balance after preferred dividends	833,424	991,949

PHILADELPHIA COMPANY.

Duquesne Light Company:

	1915	1914
August gross	$ 384,086	$ 348,314
Net after taxes	179,267	114,259
Five months gross	1,957,188	1,906,287
Net after taxes	934,060	746,048

Pittsburgh Railways Company:

August gross	$1,008,012	$1,007,037
Net after taxes	358,797	289,180
Five months gross	5,028,593	5,135,477
Net after taxes	1,820,702	1,545,197

LEHIGH VALLEY TRANSIT.

	1915	1914
August gross	$ 198,668	$ 182,931
Net after taxes and depreciation	92,068	78,471
Total income	103,137	88,525
Surplus after charges	47,831	34,580
12 months gross	1,594,922	1,863,030
Net after taxes and depreciation	790,984	714,795
Total income	921,625	845,978
Surplus after charges	260,445	207,142

BRAZILIAN TRACTION, LIGHT & POWER.

(Earnings in Milreis.)

	1915	1914
July gross	6,703,000	6,462,860
Net after taxes	3,900,000	3,723,790
Seven months gross	44,387,110	42,907,048
Net after taxes	25,843,420	24,562,598

CONSOLIDATED GAS, ELECTRIC LIGHT & POWER.

Baltimore—Consolidated Gas, Electric Light & Power Co. reported income account for the fiscal year ended June 30, 1915, as follows:

	1915	1914
Gross earnings	$6,789,402	$6,400,896
Expenses and taxes	3,576,583	3,333,825
Net earnings	3,212 819	3,067,065
Fixed charges	1,640 361	1,567,689
Surplus	1,572,457	1,499,385
Dividends	1,064,629	891,562
Balance	507,829	607,823
Net to profit and loss after special resources	47,828	22,823

Digitized by Google

Operating expenses and taxes do not include new business and extraordinary expenses amounting to $300,000 in 1914 and $125,000 in 1915 and charged to reserve for new business campaign and extraordinary expenses in each year.

VIRGINIA RAILWAY & POWER.

	1915	1914
August gross	$442,699	$446,198
Net after taxes	221,544	236,299
Total income	229,014	242,779
Surplus after charges	85,083	105,257
Balance after depreciation	76,750	96,924
Two months gross	891,556	890,014
Net after taxes	454,571	467,879
Total income	470,700	480,773
Surplus after charges	183,395	206,852
Balance after depreciation	166,728	190,186

GEORGIA RAILWAY & POWER.

	1915	1914
August gross	$ 498,869	$ 527,950
Expenses and taxes	295,061	318,481
Net earnings	203,808	209,468
Eight months gross	4,170,522	4,140,887
Expenses and taxes	2,450,338	2,426,691
Net earnings	1,720,184	1,714,196

DAYTON POWER & LIGHT COMPANY.

	1915	1914
August gross	$ 80,498	$ 71,823
Net	40,429	31,800
Surplus after charges	22,294	14,498
12 months gross	1,011,708	904,192
Net	474,499	405,227
Surplus after charges	259,820	200,059

GREAT WESTERN POWER.

(Western Power Corporation Subsidiary.)

	1915	1914
August gross	$ 244,583	$ 225,515
Net after taxes	169,910	154,915
Total income	187,155	174,155
Surplus after charges	80,400	73,093
Balance after dividends California Electric Generating, pf.	67,900	60,593
Eight months gross	1,887,723	1,752,590
Net after taxes	1,326,931	1,146,387
Total income	1,463,485	1,294,821
Surplus after changes	619,857	499,159
Balance after dividends on California Electric Generating preferred	519,857	399,159

REPUBLIC RAILWAY & LIGHT.

	1915	1914
August gross	$ 260,792	$ 255,488
Net after taxes	102,494	100,431
Total income	162,637	100,519
Interest charges	58,560	57,063
Preferred dividends	25,957	25,957
Surplus	18,121	17,499
Eight months gross	1,968,619	2,003,459
Net after taxes	750,027	771,554
Total income	751,099	772,788
Interest charges	459,648	450,112
Preferred dividends	207,656	207,656
Surplus	83,795	115,021

COMMONWEALTH POWER, RAILWAY & LIGHT.

	1915
August gross	$ 1,181,948
Net earnings	597,055
Surplus after charges	160,262
Balance after preferred dividends	80,262
Eight months' gross	9,202,661
Net earnings	4,763,763
Surplus after charges	1,340,906
Balance after preferred dividends	700,906
Twelve months' gross	14,088,122
Net earnings	7,318,052
Surplus after charges	2,188,966
Balance after preferred dividends	1,228,966

CALIFORNIA TELEPHONE & LIGHT.

California Telephone & Light Company for twelve months ended August 31, 1915, reported earnings as follows:

	1915	1914
Gross earnings	$125,040	$114,261
Net after taxes	55,082	47,048
Surplus after charges	30,851	24,714
Balance after amortization, depreciation and preferred dividends	6,333	2,345

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
August gross	$ 360,055	$ 343,543
Net after taxes	145,496	141,698
Surplus after charges	92,177	90,561
Balance after preferred dividends	75,798	75,456
Eight months' gross	2,488,442	2,416,902
Net after taxes	952,533	949,252
Surplus after charges	538,945	545,432
Balance after preferred dividends	408,263	425,105

PUGET SOUND TRACTION, LIGHT & POWER.

	1915	1914
July gross	$ 664,564	$ 726,373
Net after taxes	262,427	303,217
Surplus after charges	80,886	125,335
Twelve months' gross	7,846,587	8,691,638
Net after taxes	3,041,789	3,626,047
Surplus after charges	886,359	1,524,160

PORTLAND RAILWAY LIGHT & POWER.

	1915	1914
August gross	$ 460,861	$ 487,264
Net after taxes	203,278	211,350
Surplus after charges	16,771	25,164
Twelve months' gross	5,668,404	6,575,622
Net after taxes	2,583,578	3,239,563
Surplus after charges	372,722	1,098,418

PACIFIC LIGHT & POWER CORPORATION.

	1915	1914
August gross	$ 263,833	$ 234,014
Net after taxes	185,129	160,057
Total income	194,249	172,285
Surplus after charges	86,631	63,148
Eight months' gross	1,906,859	1,734,019
Net after taxes	1,277,661	1,022,107
Total income	1,360,977	1,139,048
Surplus after charges	499,462	315,900

COLUMBUS RAILWAY, POWER & LIGHT.

	1915	1914
August gross	$ 242,299	$ 243,564
Net after taxes	88,727	87,447
Surplus after charges	48,495	47,254
Twelve months' gross	3,056,293	3,066,923
Net after taxes	1,242,567	1,113,970
Surplus after charges	771,668	633,893
Balance after preferred dividends	486,545	348,770

CUMBERLAND COUNTY POWER & LIGHT.

	1915	1914
August gross	$ 285,383	$ 272,799
Net after taxes	144,984	144,022
Surplus after charges	79,981	80,558
Twelve months' gross	2,567,923	2,491,684
Net after taxes	1,102,672	1,058,171
Surplus after charges	322,398	295,435
Balance after preferred dividends	184,398	157,435

PERSONAL MENTION.

MR. CHARLES KNAPP CREGIER, assistant chief electrical inspector of Chicago, was married on October 9 to Miss Evelyn Atkins, of Chicago. Mr. Cregier is a son of former Mayor DeWitt C. Cregier of Chicago and has been connected with the Bureau of Electrical Inspection for many years. During recent years he has been developing at odd times a system for synchronizing motion-picture and phonograph machines so as to produce a true talking motion picture.

MR. ALFRED J. HIXON, president-elect of the Massachusetts Electrical Contractors' Association, is a native of San Jose, Cal., where he was born in 1876. Removing to Chicago in 1892 he entered electrical work as a practical electrician. Here he remained until 1899, when he came to Boston, working ten years for an electrical contracting firm, a large part of the time as foreman and superintendent. He then entered business for himself, establishing the contracting firm of the Hixon Electric Company, Summer Street, Boston, he being its president and treasurer. Besides this extensive business, Mr. Hixon has other interests along allied lines. He is a member of the Boston Athletic Association and several other organizations. His home is in Braintree, Mass.

MR. H. W. BRUNELL, for the past four years power engineer for the Pennsylvania Utilities Company, of Easton, Pa., has terminated his services with that company and will hereafter be connected with a large power corporation in New York City. Mr. Brunell went to Easton from Oklahoma, where he was chief engineer for the H. M. Byllesby Company. One of his main achievements while connected with the Pennsylvania Utilities Company was the building of the high-tension line between the hydro-electric station at Stroudsburg and the Delabole substation. This line, erected in January of this year, was completed in 30 days, which is regarded as an especially splendid piece of work. Mr. Brunell was also instrumental in furthering the electrification of many of the quarries in the Slate Belt, to accomplish which he invented several devices which have proved a great saving in the operation of this important industry.

OBITUARY.

MR. ROBERT WAGNER, superintendent of the Laporte City Public Utility Company, died on October 6, at Waterloo, Iowa. Mr. Wagner was prominent in electrical and community interests and held the position of superintendent at Laporte City for many years.

DATES AHEAD.

Electric Vehicle Association of America. Annual convention, Cleveland, O., October 18-19. Executive secretary, A. J. Marshall, 29 West Thirty-ninth Street, New York, N. Y.

Association of Railway Electrical Engineers. Annual convention, Hotel La Salle, Chicago, Ill., October 18-22. Secretary, J. A. Andrucetti, Chicago & Northwestern Railway Company, Chicago, Ill.

American Institute of Electrical Engineers. Planters Hotel, St. Louis, Mo., October 19-20. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York, N. Y.

Kansas Gas, Water, Electric Light and Street Railway Association. Annual convention, Topeka, Kans., October 21-23. Secretary, Ivor Thomas, 237 South Main Street, Wichita, Kans.

American Physical Society. Columbia University, New York City, October 30. Secretary, A. D. Cole, Columbus, O.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 12-13. Secretary, H. F. Wheeler, Hattiesburg, Miss.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 11	Oct. 4
American Tel. & Tel. (New York)	123⅞	123⅜
Commonwealth Edison (Chicago)	136	136½
Edison Electric Illuminating (Boston)	241	240
Electric Storage Battery common (Philadelphia)	73	74
Electric Storage Battery preferred (Philadelphia)	73	74
General Electric (New York)	176	177½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	8	8¾
Massachusetts Electric preferred (Boston)	38	42
National Carbon common (Chicago)	150	158
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	131½	132
Philadelphia Electric (Philadelphia)	25¾	25
Postal Telegraph and Cables common (New York)	76¼	78
Postal Telegraph and Cables preferred (New York)	65⅛	65½
Western Union (New York)	49	76⅞
Westinghouse common (New York)	133¼	137¾
Westinghouse preferred (New York)	149	146

Digitized by Google

With the Electrical Manufacturers

James G. Biddle, 1211 Arch Street, Philadelphia, Pa., is sending out cards calling attention to his line of megger sets for insulation testing. The Jagabi hand tachoscope, or speed indicator, is also illustrated.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has ready for distribution another folder on the Hubbell duplex wall receptacle that provides two outlets, each rated at 6 amperes, 250 volts.

Minerallac Electric Company, Chicago, Ill., has issued bulletin No. 70, which describes and illustrates the new Minerallac balanced disconnect switch, showing its advantages over the older types.

The Trumbull Electric Manufacturing Company, Plainville, Conn., has devoted the October number of its monthly house organ, "Trumbull Cheer," to the Jovian Order and the principle of co-operation for which it stands. A special Jovian marching song has been composed by Trumbull Tem, all in honor of the thirteenth Jovian congress.

Page & Hill Company, Minneapolis, Minn., producer of cedar poles, announces the opening of a Chicago office at 19 South La Salle Street. The office will be under the management of E. C. Stockdale, formerly connected with the Stone & Webster Engineering Corporation, having been identified with the Keokuk hydroelectric development and other of its projects.

The Usona Manufacturing Company, Inc., maker of "Kwik-Lite" products, announces the opening of a new branch office and warehouse, in the Wells-Fargo Building, San Francisco, Cal. A complete stock of "Kwik-Lite" cases, batteries and lamps will be carried at this branch, so that prompt service may be given the Pacific Coast states. The San Francisco office is the fourth to be opened since last February by the company, the other three being in New York City, Toledo, O., and Windsor, Can.

King Foundry Company, St. Joseph, Mo., is sending out folders calling attention to four specially attractive, low-price offers, good in October, applying to ornamental single-light standards complete with globes and various sizes and types of high-efficiency lamps, all ready to set up and connect to the circuit. The advantages of ornamental lighting to mercantile establishments, banks, business blocks, etc., are pointed out. The company also has ready for distribution an 18 by 30-inch wall chart on which are shown 32 of the company's attractive single-light and cluster standards. This should be of value to contractors and central stations.

Wagner Electric Manufacturing Company, St. Louis, Mo., has recently published some new bulletins, of which No. 109 describes single-phase rotary converters for motion-picture projection; the characteristics and advantages of this machine are set forth and views are given of typical sets and of theaters in which they are used. Bulletin No. 110 is similarly devoted to single-phase motors of the types BA and SA. Bulletin No. 111 likewise treats of polyphase motors, and bulletin No. 112 of generators and synchronous motors.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., published a very attractively illustrated folder dealing with its exhibits at the Panama-Pacific International Exposition for the special use of those attending the convention of the American Electric Railway Association last week. The railway exhibits were specially featured and the grand prizes awarded emphasized. Another special publication is No. 1562, entitled "Railway Equipments and Locomotives in the Far West"; this is a 48-page, beautifully illustrated book describing the electric railway systems in the West for which the company furnished electrical equipment.

Record of Electrical Patents

Issued by the United States Patent Office, October 5, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,155,338. Detectometer. A. G. Carlson, North Easton, Mass. For wireless system; indication is amplification of amount of adjustment necessary to restore most favorable operative position of rectifying mineral and member pressing thereon, after disestablishment thereof.

1,155,345. Means for Smoothing and Ironing the Insulating Wrapping of Electric Conductors. A. Finckbein, assignor to Siemens-Schuckertwerke G. M. B. H., Berlin, Germany. Apparatus for compressing and drawing tight the insulation on a conductor by an ironing action.

1,155,346. Tachometer-Magnet and Mount for the Same. T. J. Fischer, assignor to Stewart-Warner Speedometer Corporation, Chicago, Ill. Magnet in form of split ring with temperature compensator.

1,155,350. Attachment of Electrical Fixtures to Outlet Boxes. H. R. Gilson and J. M. G. Fullman, assignors to National Metal Molding Co., Pittsburgh, Pa. Box is provided with lugs and spanner for supporting fixture.

1,155,358. Process of Manufacturing Articles Out of Highly Refractory Material. P. M. Hulbert, Detroit, Mich. Carbon heating resistances are protected by embedding in comminuted, nonoxidizable, refractory material, integration thereof being produced by heating.

1,155,364. Electric Switch. J. F. Monnot, Paris, France. Fluid-pressure-operated snap switch.

1,155,372. Ignition Device for Internal-Combustion Engines. L. T. Rhoades, assignor to New York Coil Co., New York, N. Y. Cam circuit-breaker controlled by centrifugal device.

1,155,373. Track Instrument. J. S. Romig, Altoona, Pa. Rail-operated liquid-immersed contactor.

1,155,384. Electrical Meter. H. Tolle, assignor to Siemens-Schuckertwerke G. M. B. H. Alternating-current meter of the Ferraris type.

1,155,415. Lightning-Arrester. J. T. Greene, assignor to National Electric Specialty Co., Toledo, O. Vacuum tube type.

1,155,423. Electric Flatiron. W. J. Keep, assignor to Michigan Stove Co., Detroit, Mich. Arrangement of heating unit, housings, etc.

1,155,426. Method of Making Contact Bodies of Tungsten. A. J. Liebmann and W. A. Megrath, assignors to Independent Lamp & Wire Co., New York, N. Y. Tungsten plate welded electrically to a support, resistance-increasing material being placed between plate and support.

1,155,427. Contact Bodies of Tungsten. A. J. Liebmann and W. A. Megrath, assignors to Independent Lamp & Wire Co. Face plate of tungsten welded to support of iron or steel.

1,155,443. Process of Manufacture of Impregnated Material. J. Rosen, assignor to Societe Anonyme des Combustibles Industriels, Paris, France. Insulating, impregnating material made from coal tar.

1,155,448. Electric Plate-Condenser. G. Seibt, assignor to General Transmission Co., New York, N. Y. Stationary parallel plates are sandwiched with movable plates integral with their carrier.

1,155,460. Armor for Flexible Articles. C. Barbour, assignor to Standard Underground Cable Co., Pittsburgh, Pa. Double layer of helical wire of different pitches forms armor for cable.

1,155,466. Electric-Display Switching Mechanism. E. H. Bickley, assignor to Motograph Co. of America, Detroit, Mich. Lamp bank of traveling-word sign, controlled by ribbon carrying interchangeable contacts.

1,155,476. Safety Apparatus for Railways. T. M. Freeble, Rochester, Pa. Arrangement of insulated track sections in block system.

1,155,477. Manual Actuator for Railway-Signals. T. M. Freeble, assignor of one-half to R. M. Kaufmann, Pittsburgh, Pa. Device for electrically bridging rails.

1,155,478. Safety Apparatus for Railway Trains. T. M. Freeble. Track trip (operated according to track conditions) operates device on car to indicate permissive speed and distance traveled; also automatic reduction, if speed exceeds permissive.

1,155,480. Range. W. S. Hadaway, Jr., New Rochelle, N. Y. Interchangeable heat units, each comprising radiant electric heater and heat-absorbing slab, arranged for oven and stove top.

1,155,481. Regulator for Laundry Rolls. W. S. Hadaway, Jr. Automatic regulation of heat imparted to roll by stationary electric heater.

1,155,482. Heat-Regulating System. W. S. Hadaway, Jr. For type-setting machine crucibles; comprises immersion and outlet heaters with provision for regulation.

1,155,483. Electric Heater. W. S. Hadaway, Jr. Slab of heat-absorbing material heated by radiation from electric heater.

1,155,484. Motor-Control System. J. H. Hall, assignor to Electric Controller & Mfg. Co., Cleveland, O. Dynamic braking with supply and braking-circuit switches electromagnetically interlocked.

Digitized by Google

1,155,494. Toaster. J. F. Lamb, assignor to Landers, Frary & Clark, New Britain, Conn. Electric heater unit is readily removable.

1,155,496. Automatic Control Device for Illuminating Apparatus. C. G. Lindblom, assignor to Aktiebolaget Lux, Stockholm, Sweden. Electric thermopile operates automaticaly to light and extinguish illuminating apparatus.

1,155,497. Electric Welding Machine. W. C. Lindemann and K. D. Camp, assignor to A. J. Lindemann & Hoverson Co., Milwaukee, Wis. Driving connections for moving the movable electrode in a spot welder.

1,155,500. Co-Ordinating Actuating Means for Magnetos and Igniters of Internal-Combustion Engines. T. C. Menges, assignor to Associated Manufacturers Co., Waterloo, Iowa. Particular structure of gearing for purpose indicated.

1,155,501. Recording Instrument. C. R. Moore, LaFayette, Ind. Electromagnetically operated punch for recording ribbon.

1,156,502. Electromagnet. C. R. Moore. Core in insulated sections, circuit for coil being made through the sections and armature hinged to one section and making and breaking contact with other.

1,155,512. Primary Battery. A. L. Saltzman, assignor to New Jersey Patent Co., West Orange, N. J. Manner of supporting plates.

1,155,514 and 1,155,515. Spark Plug. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. First patent: configuration of sparking point and manner of securing to plug casing. Second patent: relates to securing of insulation in casing.

1,155,521. Magneto-Electric Machine. F. R. Simms, assignor to Simms Magneto Co., Bloomfield, N. J. Has two armatures for generating separate lighting and ignition currents.

1,155,535. Train-Controlled Electric Recording Crossing-Signal. H. Wilkins, assignor to W. H. Redman, W. M. Smith and J. P. Wilson, Vanderburg County, Ind. Clock-operated record and train-controlled marker.

1,155,547. Electric Signaling System. A. H. Bull, Brooklyn, N. Y. Desired one of several receivers on line selected by arrangement of impulses.

1,155,560. Treatment of Seed Grain. H. E. Fry, assignor to C. E. DeWolf, London, England. Grain placed in solution of manure, heated, current passed through it and then sprayed with mineral oil.

1,155,578. False-Alarm-Preventing Device. J. Janik, Plymouth, Pa. Hand of operator is gripped and held fast.

1,155,593. Electrical Heater. A. W. Mansbridge, Winnipeg, Man., Canada. Heating element adjustable to radiate through front to form radiator or to heat top to form stove.

1,155,599. Electric Heater for Use in Connection with Water-Cooled Gasoline Automobiles. G. P. Metcalf, St. Paul, Minn. To prevent freezing of circulation system.

1,155,600. Non-Glare Headlight. W. W. Metzger, J. A. Altendorf and C. M. Verrill, Los Angeles, Cal. Lamp in concave reflector is surrounded by translucent bell open at front, but diffusing light transmitted to reflector.

1,155,610. Underground Conduit. J. W. Orrock, assignor of one-half to H. H. Vaughan, Montreal, Canada. Details of structure for supporting and protecting underground conductors.

1,155,626. Switch. H. A. Steen, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Structure of magnetic blowout.

1,155,640. Impulse-Transmitter for Selective Systems. G. Brown, assignor to Western Electric Co., New York, N. Y. Particular structure of gearing and contacts.

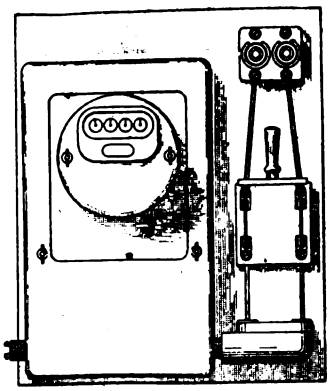
1,155,643. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Automatic regulation of generator in car-lighting system, the regulating effect being increased upon intermittent fluctuations of generator output.

1,155,648. Means for Protecting Contents of Oil-Containing Tanks Against Ignition by Electrical Discharge. W. Dodd, Des Moines, Iowa. Tank inclosed by conducting cage connected to it at intervals.

1,155,649. Rectifier Compound. N. Fallek, assignor to Cook Railway Signal Co., Denver, Colo. Compound for use as rectifier comprises sodium phosphate, asbestos, sodium silicate and water.

1,155,650. Thermostatic Control. G. R. Fassett, Lakewood, O. Thermostat blade forms one terminal in a clock-controlled mechanism for closing electric circuit at predetermined intervals.

1,155,653. Method and Apparatus for Utilizing Hertzian Waves. E. R. Gill, assignor to T. McCampbell, Yonkers, N. Y. Electric circuit has series of breaks controlled by detectors successively subjected to wave train.



No. 1,155,742.—Meter-Protecting Device.

1,155,656. Air-Cooled Tank for Electrical Apparatus. I. Harter, assignor to Babcock & Wilcox Co., Bayonne, N. J. Transformer tank has flattened tubes connecting with top and bottom and extending outwardly from its walls.

1,155,672. Telephone-Exchange System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Automatic, central-energy, intercommunicating, party-line system.

1,155,695. Trolley Guard. J. Zanolli, Pittsburgh, Pa. For preventing wheel from jumping trolley with provision for admitting wire to wheel and permitting passage of stay wires.

1,155,716. Wire Support. A. F. Fest, Audubon, Iowa. Crossarm brace and clamp.

1,155,722. Fire-Alarm System. F. Gottschalk, Stirling, N. J. Fuse link controls telephone receiver hook.

1,155,742. Meter-Protection Device. E. A. Le Fever, Buffalo, N. Y. Meter and connections on base and inclosed by cover sealed to base. (See cut.)

1,155,776. Telegraphone. H. L. Washburn, assignor to American Telegraphone Co., Springfield, Mass. Relates to reeling arrangements for record.

1,155,805. Lighting Fixture. E. F. Guth, assignor to Luminous Unit Co., St. Louis, Mo. Fixture support, etc., combined with junction box. (See cut.)

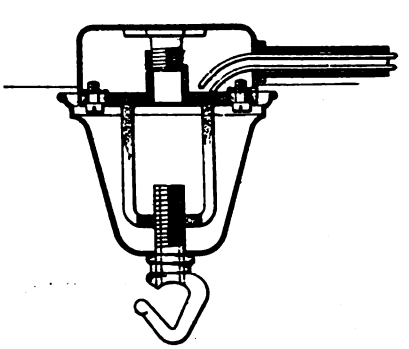
1,155,812 and 1,155,813. Electric Insulation. J. A. Heany, New York, N. Y. First patent: insulating sheath for conductor formed of convolutions of a thread completely and uniformly covered with fibers. Second patent: tape has a foundation cord and an inclosing flattened layer of matted asbestos fibers.

1,155,814. Electric Switch. E. M. Hewlett, assignor to General Electric Co., Schenectady, N. Y. Oil switch adapted to draw arc through aperture into receptacle to cause expulsion of oil and destroy arc.

1,155,817. Car Indicator. H. A. Humphrey, assignor to Safety Elevator Lock & Signal Co., Kansas City, Mo. For elevators; carrier moved synchronously with car controls direction and position-indicating lamps.

1,155,826. Adjustable Resistance. E. C. Larry, assignor to General Railways Signal Co., Gates, N. Y. Simple and compact structure in which resistance is varied by slider contacting with bare convolutions of resistance coil.

1,155,834. Railway and Highway Signaling Device. A. H. Messer, Mankato, Minn. Railway normal-danger and highway normal-clear signals interlocked to operate simultaneously.



No. 1,155,805.—Fixture Outlet and Support.

1,155,835. Electrical Scroll Saw. G. H. Murphy, Balls Ferry, Cal. Particular arrangement of handle, insulation and connections.

1,155,849. Manufacture of Steel. W. R. Walker, New York, N. Y. Molten iron containing manganese is treated in Bessemer or open-hearth furnace, stopping treatment when percentage of manganese is high and treating further in electric furnace.

1,155,870. Locking Mechanism for Elevator Gates. F. Barlow, London, England. Starting and stopping switch controlled by gate catch.

1,155,913. Trolley Wheel. W. S. Griffith, Homer City, Pa. Particular structure of harp and trolley guard released by pull on trolley rope.

1,155,921. Reversible Brush-Holder. G. L. Halvardson, Stockholm, Sweden. Brush ring locked in position by hook controlled by field.

1,155,963. Electric Lamp. O. Schaller, Südende, near Berlin, Germany. Globe of incandescent lamp comprises two parts held together by atmospheric pressure and a liquid seal for the joint, the leading-in wires being disposed in the joint.

1,155,978. Drum Switch with Maximum Cutout. M. Vogelsang, assignor to Voigt & Haeffner Actien-Gesellschaft, Frankfort-on-the-Main, Germany. Has circuit-breaker biased to break held closed by connection with regulating member, the connection being controlled by overload, with provision for locking regulator in position on disconnection.

1,155,985. Centrifugal Switch. H. L. Zabriskie, assignor to Diehl Mfg. Co., Elizabeth, N. J. Structural details of motor switch.

1,156,035. Electrical Transformer System. F. S. Perrin, assignor to Splitdorf Electrical Co., Newark, N. J. Interrupter effect is produced for sparking from direct-current source by feeding the direct current to parallel primaries on a transformer and periodically nullifying its effect by reversing the current in one primary, the secondary feeding the spark gap.

1,156,043. Telegraph System. W. H. Shephard and A. E. McKechnie, London, England. Particular structure of receiving apparatus.

Reissue 13,990. Mechanical Movement and Electric-Light Socket. T. A. C. Both, assignor to Zee Socket & Mfg. Co., Boston, Mass. Original No. 1,040,132, dated Oct. 1, 1912. Details of socket switch.

Patents Expired.

The following United States electrical patents expired on October 11, 1915:

612,009. Process of and Apparatus for Electrolyzing Sea Water. G. B. Baldo, Trieste, Austria-Hungary.

612,015. Lightning Arrester. C. C. Chesney, Pittsfield, Mass.

612,038. Electric Switch. G. W. Hart, Hartford, Conn.

612,049. Arc-Lamp Globe. H. G. Mills, Milwaukee, Wis.

612,062. Trolley Arm. B. R. Shopp, Jr., Jersey City, N. J.

612,063. Switching Mechanism. G. W. Singleton, Syracuse, N. Y.

612,068. Electric Railway. F. D. Sweet, Elyria, O.

612,122. Electrical Converter. F. Schwedtmann, St. Louis, Mo.

612,123. Electrical Connector. F. Schwedtmann.

612,132. Electric Trolley Device. C. L. Jeffrey, Johnstown, Pa.

612,139. Casing for Electric Car-Lighting Apparatus. W. F. Richards, Buffalo, N. Y.

612,146. Electric System of Distribution. J. N. Thomas, Johnstown, Pa.

612,152. Electric-Lamp Socket. F. M. Bell, New York, N. Y.

612,172. Telephone Arm Rest. J. R. McKelvey, Lawrenceville, Ga.

612,192. Hinge Conductor for Electric Currents. F. E. Chandler, Brandon, Vt.

612,203. Controlling Switch for Electric Motors. R. Hutchison, Mobile, Ala.

612,212. Rheostat. E. O. Raster, Chicago, Ill.

612,219. Telephone Central-Station Apparatus. J. H. West, Berlin, Germany.

612,234. Electric Traction Apparatus. R. Demeuse, Brussels, Belgium.

612,236. Circuit-Controller and Receiver Support. L. Duque, Paris, France.

612,250. Process of Electrolytic Separation of Metals. H. von der Linde, Crefeld, Germany.

612,326. Electric Battery. M. E. Euld, Baltimore, Md.

612,330. Telephone Pay Station. W. Gray, Hartford, Conn.

612,344. Underground Electric Railway. C. W. Jenkins, Richmond, Va.

Reissue 11,697. Conduit-Outlet Insulator. F. W. Erickson, Boston, Mass.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII. No. 17. CHICAGO, SATURDAY, OCTOBER 23, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:

The Convention of the Electric Vehicle Association..... 741
Co-Operation with Schools..... 742
Financing with Commercial Paper..... 742
License Laws for Electrical Contractors..... 743
The Greatest Utilization of Hydroelectric Power..... 743

DEPARTMENTS:

Commercial Practice 751
Electrical Construction 755
Public Service Commissions..... 758
Questions and Answers..... 759
New Electrical and Mechanical Appliances..... 772
Current Electrical News..... 779
Record of Electrical Patents..... 783

LEADING ARTICLES:

Electricity in Harvesting Machinery Manufacture..... 745
Business Hints for Dealer and Contractor.—By G. D. Crain, Jr. 755
Thirteenth Annual Jovian Convention..... 761
Electric Vehicle Association Meets..... 764
Progress on the Electrification of the Chicago, Milwaukee & St. Paul Railway..... 769

MISCELLANEOUS:

American Association of Engineers Prepares for Convention 744
February Convention of Illuminating Engineers..... 744
Prosperity Festival in Louisville..... 744
Massachusetts Hydroelectric Companies Under State Supervision 744
An Electric-Range Campaign That Paid..... 751
Valuation of Milford Utility Property..... 751
New Lighting Installation in Waltham Employs Gas-Filled Lamps 752
New Quarters of Haverhill Electric Company..... 752
Simplified Rate Schedule of Springfield..... 753
Results of 30-Day Iron Campaign at Malden..... 753
Original Window Display Attracts Attention..... 754
Prize Window Display of New York Edison Company..... 754
Co-operation Between Contractors and Central Stations.... 756
New Electrical Code for New York..... 756
Portland Code 757
Among the Contractors..... 757
Civil Service Examination for Fire-Prevention Inspector.. 763
Hydroelectric Problems Considered at Philadelphia Meeting of American Institute..... 763
Load Dispatching at Boston Described..... 767

Copyright, 1915, by Electrical Review Publishing Company, Inc.

CONVENTION OF THE ELECTRIC VEHICLE ASSOCIATION

It is seldom that so much of real value is accomplished at an annual convention as was true of the sixth annual meeting of the Electric Vehicle Association of America at Cleveland, O., on October 18 and 19. Many of those prominent in the business who attended the convention expressed the opinion that it marks a new epoch in the electric-vehicle industry. Certainly a degree of co-operation was in evidence that unfortunately has been lacking in the past. It may perhaps be considered as a sign of the times that the representation of central-station men exceeded any other class and on every hand comprehensive offers of co-operation were made.

An admirable report of the committee appointed to suggest means for a closer co-operation between the central stations and other branches of the electric-vehicle industry offered specific suggestions for channels of co-operation. The question was raised by President Lloyd of the National Electric Light Association, who was the guest of the convention, whether those companies, members of the Vehicle Association and represented at the convention, were not already cognizant of the benefits to be derived by co-operation such as outlined. The problem of bringing this report as well as other information presented at the convention, to the attention of central-station companies generally, coupled with an invitation of Mr. Lloyd for the Electric Vehicle Association to co-operate more closely with the National Electric Light Association, suggested the thought in the minds of many of those present whether some sort of working agreement or affiliation with the latter organization could not be effected. While no one who has followed the destinies of the Electric Vehicle Association could question the wonderful accomplishments that have been effected through its influence, still there seems to be a vast field for enlisting the consideration and co-operation of the central stations in the medium-sized and smaller cities. With its remarkable organization, the National Electric Light Association is in an excellent position to assist the vehicle organization in this work, and it is hoped that without sacrificing its identity the Electric Vehicle Association can widen the scope of its activities through a closer co-operation with the former body.

While representing only a comparatively small field in the vehicle industry, the electric taxicab came in for a considerable amount of discussion at the convention.

Digitized by Google

A paper presented by a representative of a taxicab company in Detroit indicated that remarkable results are being attained and that the electrically propelled vehicle is not only more economical, more reliable and more easily controlled, but the public has shown a decided preference for the electric vehicle where the opportunity for a choice has been given. This emphasizes the enormous advertising value to the electric-vehicle industry were such service to be extended to all the principal cities. It seems that the industry could well support the propaganda of electric taxicabs with this feature alone as a reward.

Another most important subject which seemed to rise to the surface in practically all of the discussions was that of battery service. Despite the claims of many in the industry that the electric vehicle is fool-proof, requires little or no attention, and can be operated even by a child, experiences have shown that expert battery attention is necessary if the electric vehicle is to fulfill its duties in a satisfactory manner. Battery-service systems providing either for the outright rental of the battery to the user, or for exchanging charged batteries for discharged batteries at a cost based on mileage or kilowatt-hours, eliminate the possibility of inattention or improper use by the customer, and will undoubtedly do more to increase the serviceability and satisfaction of the electric vehicle than any other one item. Reports from various parts of the country indicate that serious consideration is being given this subject either by central-station companies, battery companies or garages, and that wherever tried the success has been unqualified. From the trend of the discussions on the floor of the convention it is apparent that the development of the industry will largely hinge on the extension of such service systems.

CO-OPERATION WITH SCHOOLS.

It is a byword that the luxuries of one generation become the necessities of the next. We have had ample evidence of the truth of this statement in the use of the conveniences of the home which are supplied by the electric current. The child who grows up in a home equipped with telephone service and electric light regards these as necessities and when he grows up would not think of having a home of his own which was not at least as well equipped with these facilities.

The impressions made in childhood are the most lasting ones. This is so true that the facts noted in the preceding paragraph are sometimes reversed to the extent that the parent insists that what sufficed in his own childhood must be good enough for his children, regardless of the intervening progress in facilities, ideas or pedagogical standards.

Those interested in the greater development of the electrical industry will do well to bear these facts in mind and take every opportunity to co-operate with schools and similar institutions in extending the use of electrical appliances, as it is here that the most lasting results can be accomplished. Every electrical man should interest himself in seeing that local schools are equipped with electrical apparatus in every way possible, and this may even advantageously extend to the point of supplying equipment at cost or of even donating it in cases where school funds are not available for supplying the desired equipment. Furthermore, no opportunity should be lost in co-operating with school authorities in planning instruction in electrical subjects and of suggesting methods of instruction, not only on the scientific side of the subject but in its application for household, commercial and industrial purposes.

Vocational schools and vocational education are being rapidly extended in this country and no vocational school should be without a course in electricity. The planning of such a course can often be benefited by the consultation of those actively engaged in the industry, and every opportunity should be taken to extend this co-operation where school authorities desire it.

FINANCING WITH COMMERCIAL PAPER.

The past 18 months have witnessed considerable difficulty among central stations in securing the necessary capital for making extensions, even when such extensions are fully warranted by prospective business or business actually contracted for. This has applied especially to the issuance of permanent securities to cover such uses of capital. Even in normal times many central stations, like other utilities, have financed extensions by issuing commercial paper until the volume of the latter has warranted its refunding by the issuance of bonds or stock. By choosing a favorable time for such issuance, they can be marketed to the best advantage. Such a practice has been especially advantageous during the period referred to, since lower interest rates have been in vogue for commercial paper than for bond issues even when well secured in the most stable companies. While present conditions continue it would therefore seem advisable to, as far as possible, finance all extensions by temporary notes, and postpone the issuance of the usual securities until such time as a favorable market can be secured.

The same considerations apply to the furnishing of working capital for carrying along the ordinary business transactions of the utilities. Such funds may well be procured from the disposal of short-time notes which can be renewed from time to time. The permanent securities issued can in this way be limited to values more nearly in correspondence with the physical property of the corporation. Under present conditions the securing of funds from this source is the most advantageous method. Where commission regulation is in vogue and the income of utility corporations is based upon an actual valuation, allowances are usually made for working capital as well as for intangible values. The percentage return upon the valuation is seldom limited to values below 7 or 8 per cent. If the funds in question are borrowed upon a basis of 5 or 6 per cent it is evident that an advantage will thereby accrue to the stockholders.

Digitized by Google

LICENSE LAWS FOR ELECTRICAL CONTRACTORS.

The need for license laws covering the work of electrical construction has been apparent for some time in this industry. Progress has already been made to some extent and certain states have passed state laws, while cities in other localities have passed local ordinances with the object of restricting the prosecution of this work to the hands of those who are competent to carry it out, and who have sufficient knowledge of wiring regulations to see that the finished work will comply therewith. These restrictions are very properly placed upon the prosecution of electrical construction in the interest of safety to the public, for it is conservative to say that nearly all of the fires which have been correctly attributed to electrical origin arose from defective wiring; that is to say, the use of defective material or else installation in contravention to the requirements of the National Electrical Code.

License laws, like any other laws, are worse than useless unless they are enforced. For the desired benefits to follow the enactment of such legislation it is essential that rigid enforcement should follow and this will only occur when there is a competent official with both the power and the interest to see that the provisions of the law are properly carried out. Where such interest does not already exist in the proper official it can be stimulated by the activity of local associations. Such bodies should take it upon themselves wherever it appears necessary to discover cases of violation, report them to the proper official, and insist upon the enforcement of the law.

In considering the desirable provisions of a license law, advantage may well be taken of what experience has already been gained in those communities that have already had legislation along this line. To secure the greatest protection an examination as to knowledge and experience in the work should be made one of the necessary prerequisites for securing a license. In addition to this it is sometimes provided that a bond should be filed by the contractor securing a license for the faithful performance of his work in conformity to the regulations. While this may sometimes be desirable, it seems likely that in most communities it will be more effective to provide for a fine and for the revoking of the license in cases of failure to adhere to the regulations, whether this failure be due to ignorance or to wilful attempts to install defective material or to do work which does not comply with the code.

The requirement of prior examination and the power to revoke the license are the two provisions which are most necessary for application to both employing contractors and to journeymen wiremen.

The benefits of a suitable law which is rigidly enforced accrue not only to the public but to responsible and competent contractors and wiremen and to the electrical supply houses. The contractor is protected from the competition of those who have not sufficient knowledge and experience of the business to properly estimate their costs and also from those who wilfully install shoddy material. The supply man is protected from the same type for it is this type that involves him in the largest percentage of his losses.

THE GREATEST UTILIZATION OF HYDROELECTRIC POWER.

Two of the papers at the Philadelphia meeting of the American Institute of Electrical Engineers last week dealt with the use of steam plants in supplementing the output of hydroelectric stations and both pointed out the feasibility of utilizing steam plants in this way, even when the steam equipment is not owned by the hydroelectric company, but by one or more customers. The scheme seems to work out best when the customers of the hydroelectric company are local distributing companies which buy their power in bulk and retail it. In many cases such companies have old steam equipment which is still serviceable, even though incapable of attaining the high efficiency of units of more modern design. As supplementary units to carry the load during peak hours or during seasons of low water, such equipment may be entirely adequate, since the first consideration for such intermittent service is investment and fixed charges rather than fuel cost.

Arrangements for hydroelectric supply can often be made for a large portion of the year if there be possibilities of supplementary steam supply to take care of winter peaks and seasons of drought. Steam stations are often demanded for stand-by purposes anyhow, and can be made to serve their greatest usefulness by provisions for mutual interchange of power between customer and hydroelectric company.

One of the most interesting features involved in these relations is the extent to which hydroelectric development shall be carried. In many cases such development has been limited, where storage facilities are out of the question, by the minimum flow of the stream. Even where there is no steam supplement, however, such conservatism is not always warranted. Low-water periods usually occur in the late summer, while peak loads, at least where lighting predominates, reach their extreme maxima during the winter months. The capacity for supplying such peaks may not be too great for the available supply at such times, even though it could not be utilized at the periods of low water. But at the latter periods it may not be required.

With the auxiliary steam plants this idea may be carried much further, and development carried out to a point representing possible utilization for a substantial part of the year, even though dependence must be put upon the steam equipment for more than emergency service. Only through the most complete co-operation of steam and hydraulic plants, even when under different ownership, can the most complete and most economical utilization of the available water power be made.

Digitized by Google

American Association of Engineers Prepares for Convention.

Plans for the national convention of the American Association of Engineers to be held in Chicago December 10-11 are being rapidly completed. All engineering societies have been invited to send official representatives to the convention to join in the discussion and assist in attempts to solve a few of the welfare problems confronting the engineer.

A National Membership Committee has been selected to push the organization of local chapters in various parts of the United States. Those appointed on the committee are A. H. Krom, assistant engineer, Illinois State Public Utilities Commission; F. H. Newell, professor of civil engineering, University of Illinois; S. Steenerson, engineer, Minnesota Highway Commission; Edwin R. Webster, Marion, Iowa; Daniel B. Luten, Indianapolis; O. L. Dent, Bemidji, Minn.; R. A. West, Tye River, Va.; Israel L. Beerman, engineer, New York State Highway Commission; Harold Almert, Chicago; W. N. Winter, Hood River, Ore.; H. L. Holderman, Lewistown, Mont.; Ernest McCullough, Chicago; George C. Keech, Chicago; A. T. North, Chicago.

Owing to the increase in its activities the Association has taken larger quarters at 29 South La Salle Street, Chicago.

The Service Clearing House is actively engaged in putting the engineer in touch with the employer and the employer in touch with the man without charge. One of the largest electrical manufacturing companies in the United States has given the Association the preference in filling all vacancies which require men of technical training.

McCall Raps Chronic Agitators.

Joseph B. McCall, president of the Philadelphia Electric Company, addressed the members of the Philadelphia Jovian Electrical League at the weekly luncheon at the Hotel Adelphia in Philadelphia recently, and paid his respects to professional agitators in some communities who wage war against public utility companies, actuated either by motives of political gain or private profit.

Mr. McCall paid high tribute to the men engaged in the electrical field. He told of the responsibilities devolving upon them and added, "There is no set of men in any line imbued with such honesty of purpose, endowed with greater intelligence, or more anxious to serve their communities than those directing or employed by electric companies."

"The men in charge," he said, "serve the public, the representatives of the municipalities and the stockholders. On the other hand, they are opposed by professional agitators, who are aligned against the business and wish to destroy or lessen its efficiency. I deplore these attacks made about the country on the industry. These men who criticize do not have to satisfy both the public and the stockholders at the same time. All of these critics are not in public life, but they take the opportunity to "knock" and condemn. But all are inspired either by a desire to gain political ends or for private profit."

February Convention of Illuminating Engineers.

A meeting of the Council of the Illuminating Engineering Society was held October 14 in New York City.

After considering the appointments to various committees for the present year, preliminary plans were discussed for the holding of a semi-annual convention in New York next February to mark the tenth anniversary of the organization of the society.

It was also planned to arrange for the presentation of a course of lectures on illuminating engineering similar to the course which was given in the fall of 1910 at the Johns Hopkins University under the auspices of the society.

The programs of papers and meetings for the various sections of the society were read and discussed briefly by the vice-presidents representing the various sections of the society.

Prosperity Festival in Louisville.

Louisville Jovians, after having thoroughly canvassed the local situation with the heads of the various commercial organizations of the city, have decided to take the lead in promoting Electrical Prosperity Week in Louisville and to bear whatever expense will be incurred. This announcement was made at the regular weekly luncheon at which not only the Jovians but representatives of the newspapers and others interested in the proposition were present. Definite plans will be formed and announced shortly and the work of preparation for a big attention-getting celebration will begin.

At the luncheon Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, spoke on the subject of prosperity, which he said was imminent.

The sooner all people realize that conditions in this country are sound, he said, the sooner prosperity will reach all individuals in it. Toward the conclusion of his address Mr. McDonald stated:

"I believe that Electrical Prosperity Week will do much to hasten this day. To the company which I represent it has already come. Manufacturers are taking larger amounts of electric power; with this they are driving more machines and employing more men to run the machines. The men draw wages and part of these they spend for electricity for light and for gas, with which to make their homes comfortable. Every month that passes gives increased evidence of this tendency. I hope the same condition of affairs prevails in the business of all those to whom I am speaking."

Part of the plans of the Louisville Jovians, of which league Robert Montgomery is president, provide for a "Prosperity Festival" at the Armory, the largest hall in Louisville, where it is proposed to have displays of electrical appliances, etc.

Massachusetts Hydroelectric Companies Under State Supervision.

In addition to the returns rendered to the State Gas and Electric Light Commissioners by the Massachusetts lighting corporations and the municipal plants, the hydroelectric generating and transmission companies this year for the first time rendered their reports of business for the year which ended June 30, 1915. The supervision of the Commission over these corporations was provided for by a law which passed the legislature of 1914, and which became effective August 1, 1914.

Operations for the year 1914-15 indicate a large and successful business, most of which is the development of but a decade or so. The Connecticut River Transmission Company, which operates plants of the New England Power Company on the Deerfield River, had a total output of 125 million kilowatt-hours. It sold about 52 million kilowatt-hours for motor service, 28 millions to street railways and 29 millions to other companies and municipal plants. Earnings were practically one million dollars. The company not only procured energy from the Deerfield River plants but also purchased 6 million kilowatt-hours from the state's generating plant at the Metropolitan reservoir, and 5 million kilowatt-hours from the Berkshire Street Railway Company, besides smaller quantities from the Worcester, Fitchburg and other lighting companies. By the economical interchange of product, low prices are possible to industrial concerns in the state. For large quantities of energy, the price is as low as 4 mills per kilowatt-hour, while the average price ranges around one cent.

One result of the extensive hydroelectric development in Massachusetts has been a marked stimulus to industrial activity.

Digitized by Google

Industrial Power Series—Article No. 142.

ELECTRICITY IN HARVESTING MACHINERY WORKS.

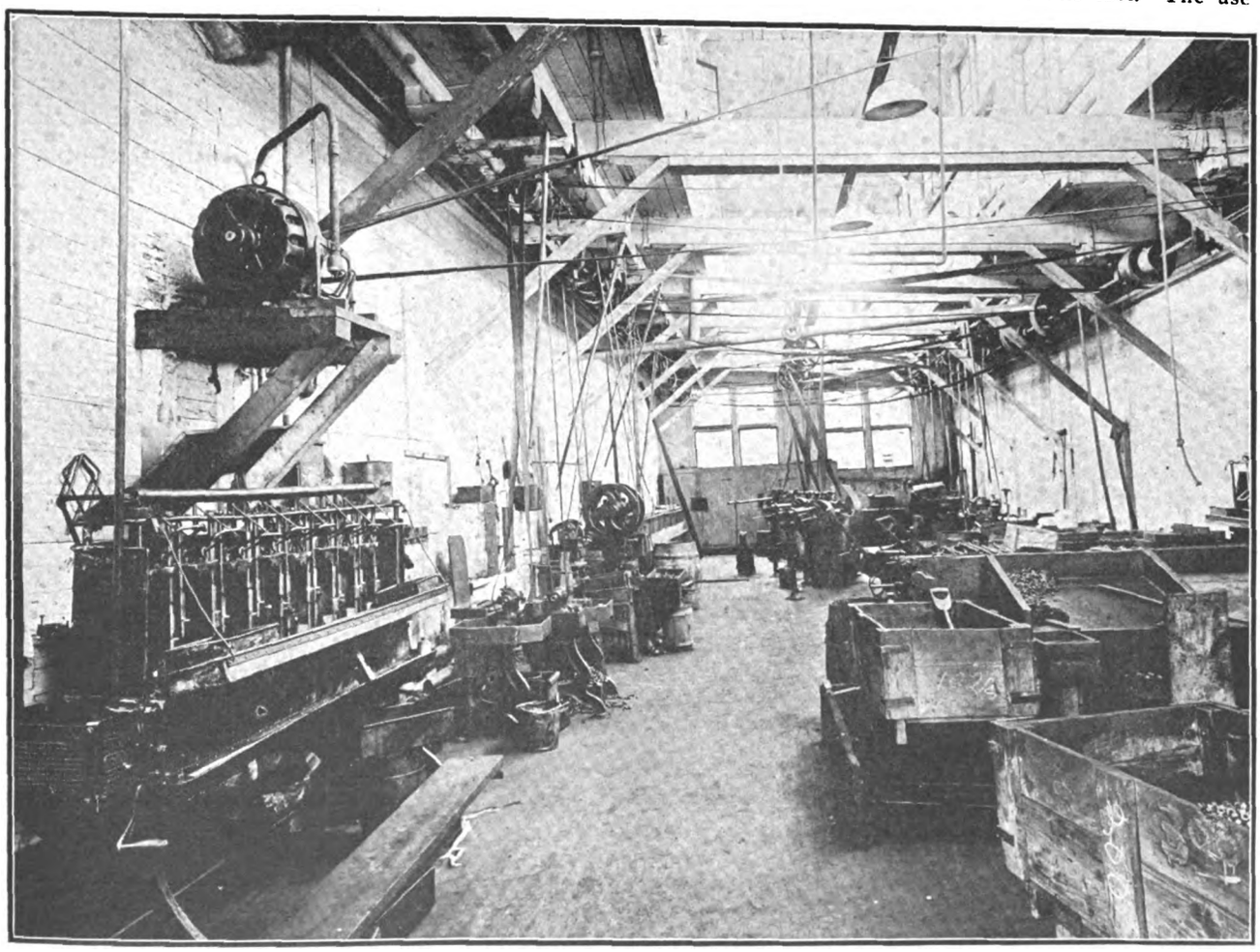
This article describes the processes involved in manufacturing harvesting machinery and points out the advantages of electric motor drive. The plant of the International Harvester Company at Auburn, N. Y., is described in detail with reference to the motor equipment, power consumption, etc.

The International Harvester Company is so well known that it needs no introduction, but a few facts regarding the Osborne works of this company at Auburn, N. Y., may not be amiss. In that city there are three mills designated at Nos. 1, 2 and 3, which are located in various parts of the city and connected by the Owasco River Railroad, the latter connecting with the New York Central and the Lehigh Valley Railroads. All three mills cover several acres of ground, and consist of groups of buildings of from one to five stories in height.

In the No. 1 mill, grain, grass and corn machines are manufactured, which consists of binders, mowers, hay tedders, hay rakes and corn binders. The No. 2 mill is devoted to the manufacture of tillage machinery, and the No. 3 mill manufactures binder twine, and was described in the September 15, 1915, issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

No. 1 mill, the subject of this article, is located in the central part of the city, on the banks of the Owasco River, with the main office building fronting on one of the principal business streets. Formerly mechanical drive was used entirely, part water power and part steam power. The water power is utilized to some extent at the present time, but steam power has been replaced by 27 electric motors, ranging from one-half to 75-horsepower, with an aggregate horsepower rating of 902.5. All the motors are alternating-current induction motors of the squirrel-cage, slip-ring, and internal-resistance types. Service is furnished by the Empire Gas & Electric Company from its three-phase, 60-cycle, 2,200-volt mains, and with the exception of some of the smaller motors all are operated at a potential of 2,080 volts.

All electrical construction work in the buildings is of the most approved type, and safety devices are used wherever possible. It is well known that the International Company was one of the pioneers in the "safety first" campaign, and a visit to any of its mills bears out this fact. The use of



Nut-Tapping Department Driven by 15-Horsepower Motor.

Digitized by Google

central-station service and electric drive have resulted in a large power saving, increased production, and better control of the power in the various buildings and departments.

To gain a comprehensive idea of what electric power has to do with the manufacture of agricultural implements it will be necessary to describe briefly the output of the company, and to outline the various processes and manufacturing conditions. One of the interesting features of the No. 1 mill is the high load-factor maintained, which is no doubt partially due to the diversified character of the machinery, the fact that the parts made are small, so that machines are not necessarily kept idle for long periods while placing the work to be machined in position, but may be principally attributed to the various heads of departments, who maintain a high state of working efficiency and a high ratio of production. These department heads are directly under the supervision of Walter H. Beck, superintendent.

While on a recent inspection trip of the No. 1 mill the writer stopped a busy expert long enough to ask him what gave manufactured products their supremacy. The reply was: "Men, equipment and keeping ahead of the times." The building of farming machinery is not a simple engineering proposition, like constructing a bridge, or a locomotive, where all factors are constant. The farming machine has to meet every known condition of soil, water and vegetation, and the only way to meet these conditions is by long experience. One department head stated that every effort is made to keep the working conditions as favorable as possible, such as freedom from dust, abundance of light, plenty of fresh air, and the provision for safety, all of which are necessary to bring the product up to a standard which will meet the requirements outlined.

The use of electricity for light and power materially aids in maintaining ideal working conditions, and this leads to a discussion of the real advantages of electric power in manufacturing establishments, especially where central-station service is used. One striking fact is that since the introduction of the present power equipment in the No. 1 mill there has been a saving of between four and five hundred horsepower. There are several reasons for this saving: Formerly the power was transmitted mechanically from central points, necessitating the use of heavy shafting and belting, some of the belts reaching five feet in width. This, of course, was the cause of large friction losses, which have been greatly reduced by the elimination of the heavy transmission, and dividing the smaller shafting and driving the machinery in groups. Four hundred horsepower for a 10-hour working day is equivalent to 2,980 kilowatt-hours and at as low a rate for service as two cents a kilowatt-hour there is a net saving for power of $59.60 daily.

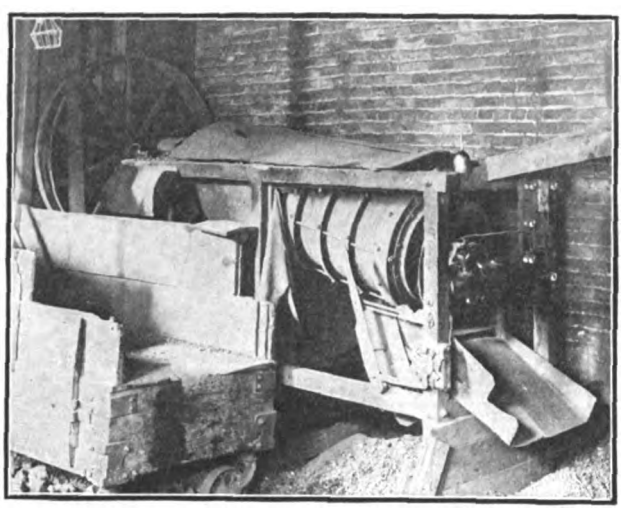
Another feature to be considered is that the elimination of heavy mechanical transmission from a central point is the means of doing away with belt shafts from floor to floor, which are always a menace in case of fire, as the flames quickly spread from floor to floor through such shafts. In such locations as that of the No. 1 mill the value of real estate is high and the space formerly occupied by the steam plant can be utilized for manufacturing purposes. By doing away with the steam plant the salaries of engineers and helpers are eliminated, as well as depreciation of the machinery and power plant repairs, and other incidentals are no longer factors to be considered.

If any one department shuts down the expense for power in that department ceases, and in case of overtime work in any department long lines of shafting and heavy belting do not have to be kept in operation, as the electric motor is ready to start or stop at any time, and as soon as stopped the power expense stops. The general efficiency of electric power is greater than that of mechanical power and it is reasonable to say that a large public utility with extensive power stations can sell energy cheaper than power can be developed in a smaller plant for private use.

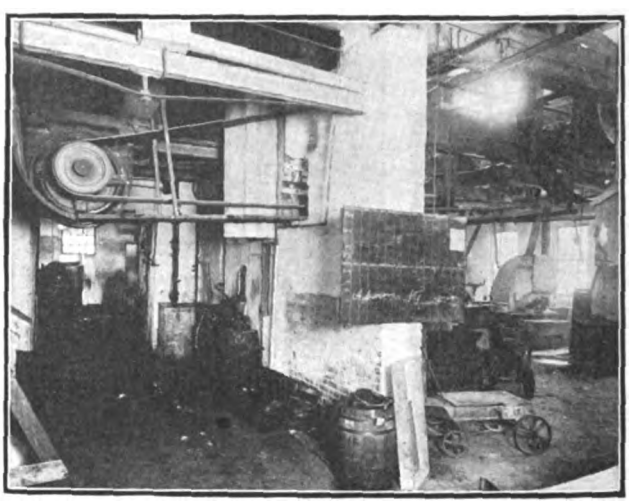
In reference to the motors, they are quickly and cheaply installed, and can be changed from one location to another in a short time. They require no stone or brick foundations and can be mounted in a position that does not occupy working space. The flexibility of electric drive is an important factor to be considered, and together with other advantages make this form of power ideal for all manufacturing establishments.

A brief description of the harvesting machines made at this plant may be in order. The New Osborne binder cuts and binds the grain and deposits the bundles at intervals on the fields. The cutter may be roughly compared to hair clippers on a huge scale, and consists of a series of triangular knives, mounted in a horizontal row, which have an oscillating motion imparted to them by the mechanism as the binder is drawn along by horses. The knives move between guards. A revolving reel turns the grain toward the machine, and as the grain is cut it falls on a platform consisting of an endless traveling belt, which bundles the grain with the aid of other mechanism, and when a sufficient quantity is bundled it is automatically tied with binder twine.

Many machine processes are required to finish the various parts and put them through the preliminary state. The principal parts include gears, roll-

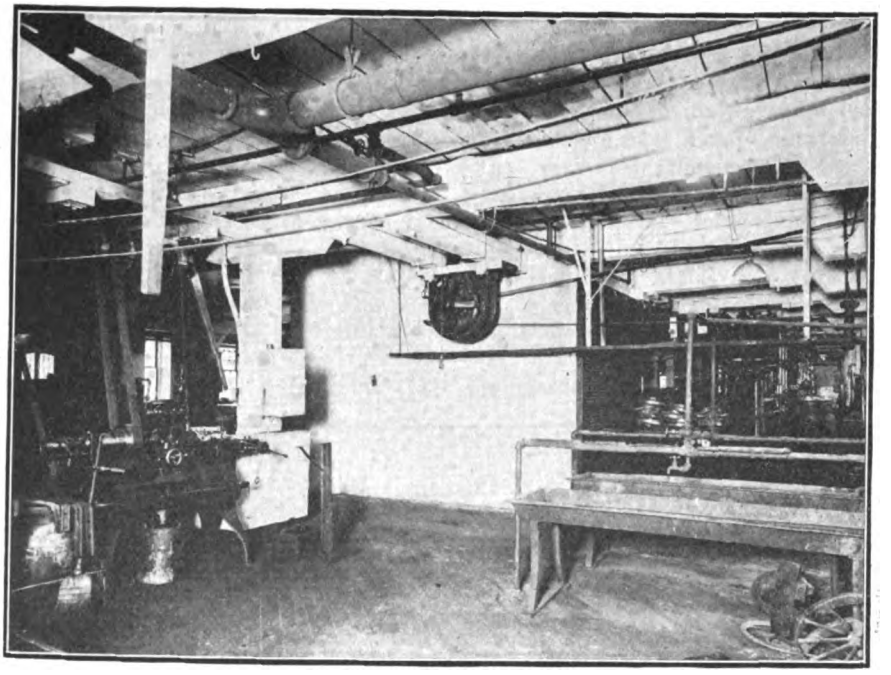


Magnetic Separator in Cupola Room.



Six Facing Wheels Driven by 40-Horsepower Motor.

Digitized by Google

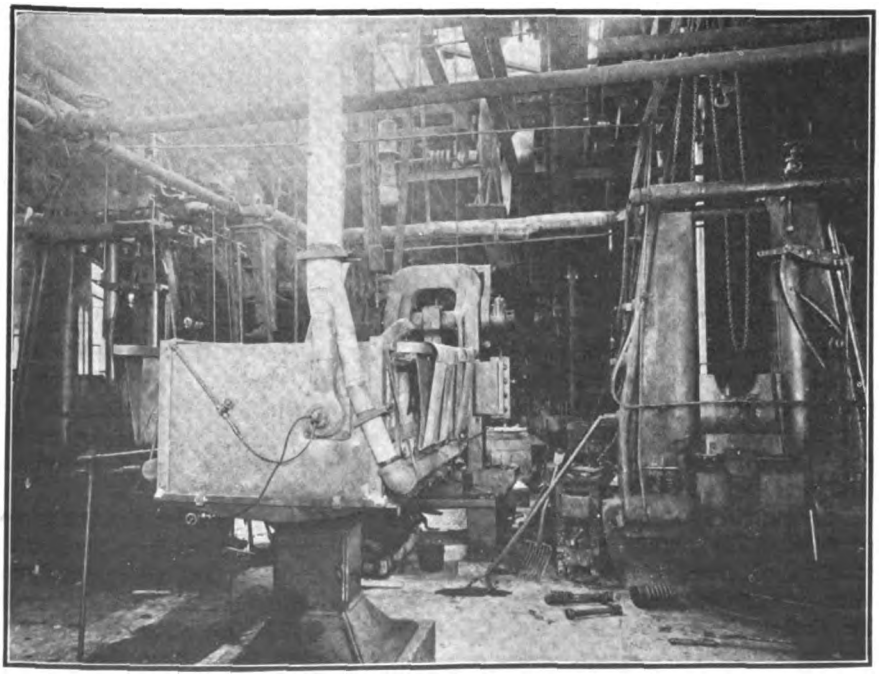


Fifty-Horsepower Motor in Drill Department.

er bearings, sprocket wheels, sprocket chains, nuts, bolts and many forged and cast parts. One of the principal features of the binder is the knotter, which ties the binder cord around the bundles of grain or corn. The work on this piece of mechanism requires the highest skill, and the use of jigs and special machinery so that thousands of duplicate parts can be turned out without any variation in quality or dimensions.

Reapers, in so far as the cutting mechanism is concerned, do not differ materially from the binder. This machine does not bind the grain, and is intended for small farms.

In the mower the cutting mechanism is similar to the last two machines. The hay tedder made by this company is for the purpose of turning over the hay as it lays on the ground, and is said to be especially valuable in a rainy season, for with it one can go into the hay field and toss the hay into light windrows where the air will circulate through it and dry it. It consists essentially of a number of oscillating forks which are mounted on wheels similar to a mower. As the horses draw the tedder the forks oscillate by means of mechanism, to which motion is imparted by the travel of the tedder. The hay rake is horse-drawn and is so arranged that by actuating a hand lever the rake can be lifted from the ground and the accumulation of hay dropped into piles. The corn binder performs the same function as the grain binder, with the exception that the bundles are tied and deposited in a vertical position. There are special departments for most of the machines, but there are many parts of the machines of all classes which are made in a single department, such as the bolt and nut departments.



Oil Burners and Drop Hammers.

The Empire Gas & Electric Company's service enters through conduit from the street subway, and the three strands of the lead-covered cable connect to the lower terminals of three disconnecting switches the upper contacts of which connect to the service switchboard. Connection is also made from the service feeders to three disconnecting switches arranged in a row below the first set, the latter set of switches serving to disconnect three high-tension lightning arresters. The service switchboard consists of five enameled-slate panels with the necessary controlling and recording instruments, one panel of which is for controlling an auxiliary generator used for emergency service. Panel No. 1 controls the incoming service line, and is equipped with an oil switch, no-voltage relay, three ammeters, one for each phase, and an indicating wattmeter. Panel No. 2 is for controlling the auxiliary generator. Panel No. 3 is a totalizing panel, and is provided with two graphic recording watt meters and two watt-hour meters. One graphic recording meter and one watt-hour meter is for the central-station records and the duplicate instruments for the International Company's records. Panels 4 and 5 are power feeder panels. The records for the daily consumption of current from the graphic instruments are kept on file for determining the peak loads, which will be explained later.

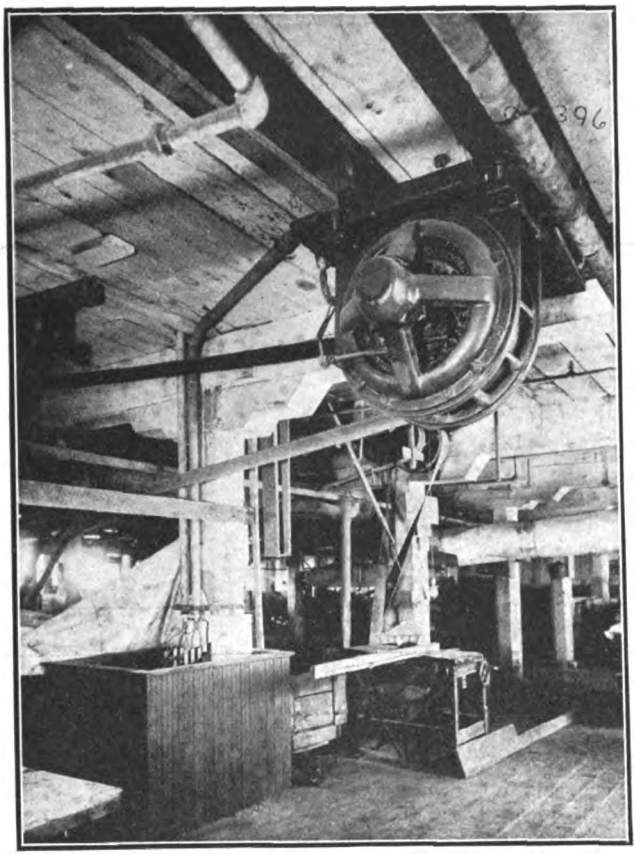
Rates for energy are based on three factors: Flat rate for the connected motor load in horsepower, daily peak load, and sunset peak load. The day peak load obtains for the entire year and the daily peaks are averaged monthly for the basis of charges on this account. The working day is from 7 a. m. to 6 p. m., with a 50-minute recess at noon. There is also a Saturday half holiday. The daily peak-load charges are added to the flat-rate charges. From September 15 until March 15, inclusive, the sunset peak is figured, and is also added to the flat-rate charges. The sunset peak is the maximum demand during the time between sunset and closing time, which is 6 p. m., as previously stated.

Construction work throughout the mills is conduit work for power feeders, with some open work for lighting circuits. Conduit is also used between the motors and starting compensators.

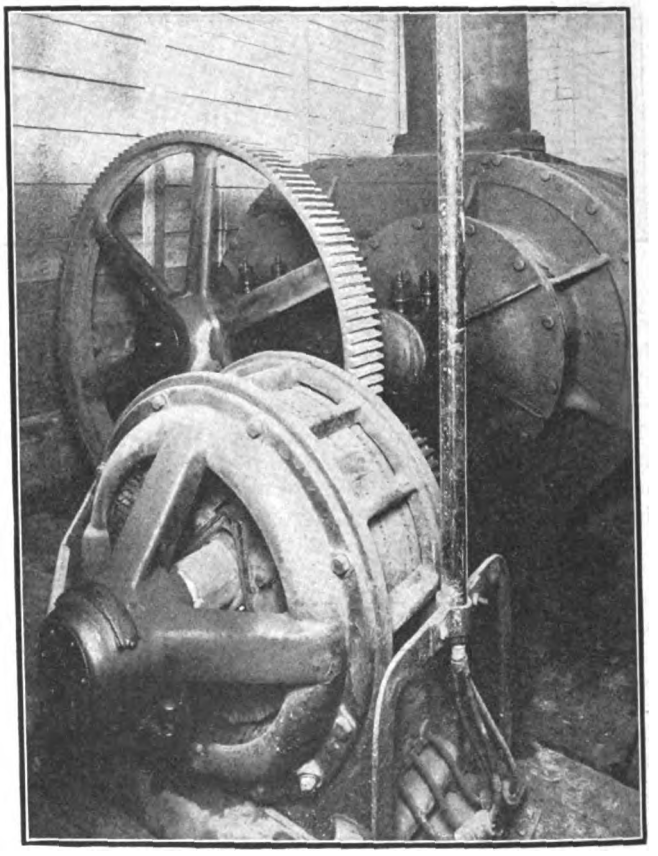
Digitized by Google

Motors are supported on heavy timber platforms or by I-beams laid across the roof girders. Particular attention has been paid to the motor pulley sizes and the speeds in an effort to standardize them as far as possible. In some cases a motor is not confined to driving the machines of one department, but may drive parts of two or more departments. This is for the purpose of dividing the grouping and shaft divisions in the most logical manner.

In every department there are several safety push-button switches for stopping the motor in case of accident; pressing the button operates the no-voltage release of the starting compensators. The chief electrician has devised an arrangement controlled by a solenoid on the starting compensator which automatically locks the latter when the safety button is pushed, and the starting lever cannot be operated until the button pushed is released. There are other arrangements for manually locking the starting compensator when the millwright is working about shafting or pulleys.



Motor Driving Machines in Box-Making Department.



Blower Driven by 50-Horsepower Motor.

Motor and Machinery Equipment.

Logically the experimental department is the keynote of the manufacturing plant, as here all machines are developed and new designs created. Not only this, but machinery and devices for improving the product and facilitating manufacturing are developed. When a new harvesting machine is designed or a new part of a machine developed samples are shipped to all parts of the country, and the machines are tried under all conditions—rank grain, down grain, rough land and wet land. Then the redesigning comes and a new lot of samples. This process is sometimes kept up for three, four, or even five years.

There is, of course, a drafting room, also a photographic department in connection with the experimental department. The machine equipment consists of a power hack saw, engine lathe, three small drill presses, one small engine lathe, forge, tool grinder, etc. The machines are group driven by a 10-horsepower, 220-volt induction motor of the squirrel-cage type. The motor operates at 1,200 revolutions per minute, and is equipped with an eight-inch pulley.

Next in order comes the pattern shop, where the patterns for all of the cast parts are made. The first patterns are wood, from which metal reproductions are made. It can be realized that for the many thousands of castings required for the machinery manufactured wood patterns would become so worn that the original dimensions would be destroyed. The machine enquipment consists of two eight-inch engine lathes, one 12-inch and one 14-inch engine lathe, three medium-sized drill presses, one surface planer, one band saw, one grind stone, one rip saw, and two wood lathes. The machines are group driven by a 10-horsepower, 220-volt, squirrel-cage motor with an eight-inch pulley. The motor operates at 1,200 revolutions per minute.

The cupola room, where the cupolas, three in number, are charged, contains some interesting applications. Draft for the cupolas is furnished by a high-pressure, 18-ounce, positive blower, driven by a 2,080-volt, internal-resistance induction motor operating at 900 revolutions per minute. This motor is geared to the fan with single reduction gears, having a ratio of 9.5 inches to 4 feet. A second motor of 35-horsepower, of the squirrel-cage type, drives a group of machines consisting of two tumblers for slag, two freight elevators, one 36-inch fan and one magnetic separator for separating the iron from the residue in slag. This latter machine consists of a cylindrical horizontal barrel slightly raised at one end, with collector rings mounted on an insulated collar at one end for conveying the energy to the electromagnets. The whole mechanism is revolved and the sand and residue passes through the machine and the iron retained.

In the foundry proper the flasks are handled by pneumatic lifts traveling on overhead trolleys. Adjoining the foundry there is a blast furnace for melting brass. The air is supplied by a blower driven by a three-horsepower slip-ring induction motor operating at 220 volts. The motor has a speed of

Digitized by Google

Motor Data—International Harvester Company (Osborne Works)

Total connected horsepower, 901.5. Total number of motors installed, 27.
Average kilowatt-hours per month per horsepower connected, 125.9.
The following is the monthly kilowatt-hour consumption for the 12 months.

Month	Kilowatt-Hours	Month	Kilowatt-Hours	Month	Kilowatt-Hours
March	144,100	July	127,590	November	142,125
April	135,200	August	84,835	December	161,225
May	164,800	September	146,350	January	82,560
June	139,075	October	158,975	February	84,700

Below are given the day and sunset peak loads for six days beginning January 4, 1915.

Date	Day peak-Kw.-hr.	Sunset peak-Kw.-hr.	Date	Day-peak-Kw.-hr.	Sunset peak-Kw.-hr.	Date	Day-peak-Kw.-hr.	Sunset peak-Kw.-hr.
Jan. 4	500	420	Jan. 6	505	475	Jan. 8	525	350
Jan. 5	490	480	Jan. 7	500	450	Jan. 9	175	Half Holiday

No.	H. P.	Kind of Drive.	Voltage	Type	Speed	Pulley Dimensions. Inches	Application.
1	10	Group	220	Squirrel-Cage	1200	8	Two drill presses, one grind stone, one wood lathe, one small wood planer, one small drill.
1	3	Belt	220	Slip-ring	1200	6	Blower for brass furnace.
1	50	Gears	2080	Internal-resistance	900	Gear	Positive blower 18-ounce, higher pressure type supplying three gray-iron cupolas.
1	35	Group	2080	Squirrel-Cage	900	13	Two tumblers for slag, two freight elevators, one 36-inch fan, one magnetic separator for separating iron from refuse in crushed slag.
1	15	Group	220	Squirrel-Cage	1200	8	One 8-spindle nut-tapping machine, one 12-spindle nut-tapping machine, seven automatic nut-tapping machines, one 8-spindle hand-tapping machine, three Pratt & Whitney automatic screw machines, two National-Acme automatic screw machines, one hand screw machine.
1	50	Group	2080	Internal-resistance	900	13	One annealing furnace, four cold-heading bolt machines, five cold-pressed nut machines, two cold rivet machines, one automatic trip bending machine, one automatic thread roller.
1	50	Group	2080	Internal-resistance	900	13	One cut-off machine, one small cut-off machine, one shears, three punch presses, two power hack saws, one freight elevator, six roll-thread threading machines, six old-style threading machines, two heavy threading machines, one 6-inch lathe, one drill press, one milling machine, one small milling machine, two bolt pointers, six small drill presses, eight 2-wheel emery grinders.
1	40	Group	2080	Internal-resistance	900	13	Eleven large tumblers, four small tumblers, one drill press.
1	25	Direct-Coupled	2080	Internal-resistance	720	..	Sixty-inch exhaust fan for removing dust from tumbling room.
1	75	Group	2080	Internal-resistance	720	18	Three bulldozers, one small bulldozer, one baby bulldozer, one bolt header, one Welderham No. 8 positive blower, one bolt machine, one tire welder, two eye benders, one power hammer.
2	30	Group	2080	Internal-resistance	900	12	One 60-inch fan for oil burners; three drop hammers; one power shears.
1	40	Group	2080	Internal-resistance	900	13	One 14-inch slotter; one 24-inch planer; two vertical milling machines; five grinders; six small twist drills; two 3-spindle drills; one 2-spindle drill; one small 2-spindle drill; six small engine lathes; one freight elevator.
1	10	Group	220	Squirrel-Cage	1200	..	Two 8-inch engine lathes; one 12-inch engine lathe; one 14-inch engine lathe; three medium size drill presses; one 22-inch surface planer; one band saw; one grind stone; one rip saw; two wood lathes.
1	40	Group	2080	Internal-resistance	900	8	Three 8-inch swing engine lathes; seven 10-inch swing engine lathes; one 12-inch swing engine lathe; one 18-inch swing engine lathe; one small horizontal boring mill; one 5½-inch slotter; four 24-inch shapers; one B. & S. 4A milling machine; one small milling machine; three turret lathes; one 5-foot planer; one 4-foot planer; two punch presses; one latch rod bender; one cotter machine; two wire straighteners.

Digitized by Google

No.	H. P.	Kind of Drive	Voltage	Type	Speed	Pulley Dimensions. Inches	Application.
1	10	Group	220	Squirrel-Cage	1200	8	One power hack saw; one 10-inch engine lathe; three small drill presses; one 8-inch engine lathe; one 12-inch shaper; one small forge blower; one tool grinder; three drills.
1	30	Group	2080	Internal-resistance	900	13	Three freight elevators; one punch press; miscellaneous drills and special rivet machines.
1	75	Belt	2080	Squirrel-Cage	..	..	Motor-generator set.
1	30	Group	2080	Internal-resistance	900	13	Miscellaneous drills.
1	50	Group	2080	Internal-resistance	900	13	Miscellaneous machines including gang drills, turret lathes, key slotters, lathes, emery wheels, punches.
1	30	Belt	2080	Internal-resistance	900	..	No. 50 Sturtevant slow-speed exhaust fan for removing shavings and saw dust from box-making department.
1	30	..	2080	Internal-resistance	900	..	Twenty-four-inch wood planer in box-making department.
1	40	Group	2080	Internal-resistance	900	13	Six cut-off saws; two rip saws; one small wood planer.
1	75	Group	2080	Internal-resistance	720	16	Six facing wheels; twelve section grinders.
1	20	Group	2080	Squirrel-Cage	900	13	Two tempering machines; seven punch presses; one draw-temper fire; one freight elevator; three serrating machines; one multiple drill.
1	0.5	Belt	220	Squirrel-Cage	..	..	Ventilating fan, tempering room.
1	3	..	220	Squirrel-Cage	..	..	Hoist.
1	35	Belt	220	Slip-ring	..	..	Elevator.

1,200 revolutions per minute and is equipped with a six-inch pulley. For the repairing of flasks there is a flask room near the foundry equipped with two drill presses, one grind stone, one wood lathe, one small wood planer and a small drill. These machines are group driven by a 10-horsepower squirrel-cage induction motor with a voltage of 220. It operates at 1,200 revolutions per minute, has an eight-inch pulley.

From the foundry the castings are taken to the tumbling room where they are placed in tumblers and cleaned of the sand which adheres to them. The tumbler equipment consists of eleven large tumblers and four small tumblers. These are group driven by a 40-horsepower 2,080-volt internal-resistance induction motor equipped with a 13-inch pulley and operating at 900 revolutions per minute.

Work for all departments is performed in the blacksmith shop which has quite an extensive equipment of machinery. Here forgings are made and numerous parts are bent and shaped, tires are welded, large bolts are headed, large eye-bolts are made, etc. Three motors are used in this department, two of which are each rated at 30-horsepower and both are started with one starting compensator. The voltage of the motors is 2,080 and the speed 900 revolutions per minute. Each motor is equipped with a 12-inch pulley. These latter motors each drive one 60-inch fan for oil burners, three drop hammers and one power shear. The third motor is rated at 75-horsepower, is of the internal-resistance type operating at 720 revolutions per minute, and is provided with an 18-inch pulley. It group drives three bulldozers, one bolt header, one Welderham No. 8 positive blower for forges, one bolt machine, one tire welder, two eye benders and one power hammer.

The wire room has an equipment of one latch-rod bender, one cotter machine and two wire straighteners and is driven from a motor which also drives the machine shop and some miscellaneous machines. The wire for the cotters is first run through the wire straighteners and then through the cotter machine which is automatic in action. The latch-rod machine forms the hook in the end of the latch rod.

For the manufacture of bolts there are numbered among the machines, roll-threading machines, old-style threading machines and heavy threading machines. The roll-threading machines do not utilize a regular die as in the old-style machines but thread the bolt by a rolling process. The nut-tapping department is operated by a 15-horsepower, 220-volt squirrel-cage motor with an 18-inch pulley, operating at a speed of 1,200 revolutions per minute. It group drives multiple-spindle nut-tapping machines, automatic screw machines and hand screw machines.

In the bolt forge department the process is of more than ordinary interest. To see coils of the raw material passing rapidly through the machines and come out headed bolt blanks and to see cold metal pressed into nuts at a high rate of production makes a person realize what necessity for economical operation has been the means of developing. This department is driven by a 50-horsepower 2,080-volt internal-resistance motor with a 13-inch pulley and operates at 900 revolutions per minute. The group of machines driven by this motor comprise an annealing furnace, cold-heading bolt machines, five cold pressed nut machines, two cold rivet machines, one trip bending machine and one automatic thread roller.

In the grinding room there is an equipment of twelve section grinders which are wet machines and have a stone approximately eight feet in diameter when new. These machines are used principally for the triangular sections which make up the cutter on binders, mowers, etc. In addition there are six facing wheels used for miscellaneous grinding. These machines are group driven by a 75-horsepower internal-resistance motor with a 16-inch pulley and operating at a speed of 720 revolutions per minute.

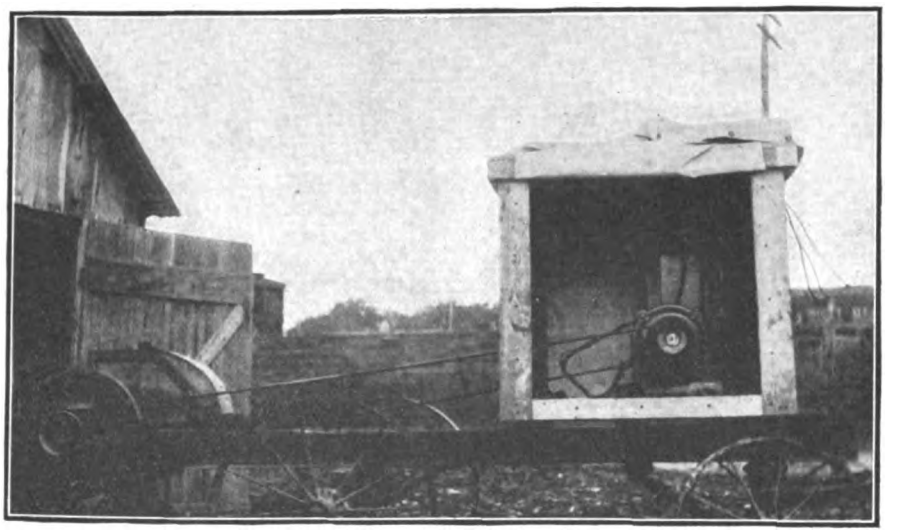
There are other departments having a miscellaneous equipment of machines which are devoted to various processes that are involved in nearly all of the machinery manufactured by the company. The miscellaneous motors with their applications are given on the accompanying data sheet.

Digitized by Google

Commercial Practice Management, Rates, New Business

Uses Motor on Portable Wood Saw.

The accompanying illustration shows an interesting application of electricity. The two-horsepower, three-phase motor shown in the small shed drives a portable wood saw at the wood and coal yard of the Lacey Coal Company, Waco, Texas. The motor and saw are mounted on a wagon which can be pulled around over the large wood yard to any place desired. There are three poles set in the yard and by means of long service wires the motor can be connected where desired. Service is furnished by the Texas Power & Light Company.



Portable Motor-Driven Saw.

An Electric-Range Campaign That Paid.

An interesting as well as profitable electric-range campaign has recently been conducted by the Iowa Railway & Light Company of Toledo, Iowa. This company, with power lines extending through several of the smaller Iowa cities, decided to put more heating devices on its lines to maintain a day load. The Western Electric range was used as a means to this end.

A campaign was mapped out with three days at Tame, three days at Toledo and two days at Gladbrook—all in Iowa. Previous to the campaign a systematic series of ads, serving to stimulate an interest in electric ranges, were run in the daily papers of the above towns. A few days prior to the actual opening of the campaign, slides pertaining to it were run in the motion-picture houses, and a special personal letter was sent out.

The actual campaign was the culmination of the preparatory advertising; the people were given an opportunity to see in operation the electric stove they heard so much of in print. Practical demonstrations were held in each town in which the electric stove was made to bake bread and cakes, broil steak and chops and prepare entire meals. These demonstrations were almost continuous and were held where everybody could see them. Not only did the people see that the stoves were practical but they were shown the amount of current used for each operation, proving their economy under existing rates. The school boards of the towns received special invitations to visit these demonstrations and as a result, two complete domestic-science equipments were sold.

The campaign was a success not only from the standpoint of stoves actually sold but from an educational angle. Those people who did not buy electrical devices during the campaign have an idea as a result of it that electrical devices are worth while, and people with that idea are decidedly good sales prospects. When the Iowa Railway & Light Company conducts its next campaign, it will undoubtedly find that the actual sales will show an increase because of this effort.

Rural Extension at Madison.

Extension of electrical service to the farms surrounding Madison, Ind., has begun by the Madison Light & Railway Company. The first installation of the kind was represented by an extension of the line of the company a mile out from town to the farm of Joseph M. Cravens. He installed a 25-horsepower motor for threshing and heavier work, and a two-horsepower motor to operate house and dairy appliances. A similar equipment has been installed on the farm of A. R. Holcroft. Interest is general among the farmers of the section and it is predicted that two years will see electricity in general use.

Valuation of Milford Utility Property.

The town of Milford, Mass., several months ago selected a committee of seven leading citizens to investigate and report on the advisability of the town's acquiring the property and franchise of the Milford Electric Light & Power Company.

William Plattner, engineering expert, has made an exhaustive inspection of the plant and recently reported to the committee. The property values as scheduled by the company, and those found by Mr. Plattner are compared, as follows:

	Company Valuation	Engineer's Valuation
Electric plant	$16,691.66	$ 9,313.72
Overhead lines	58,851.64	23,798.37
Transformers	4,649.90	4,685.21
Meters	9,941.71	6,814.43
Office equipment, furniture	717.05	619.51
Electric fixtures, tools	437.02	217.09
Stock material	3,767.63	5,203.74
Stock in office	.....	1,078.94
Arc lamps	5,865.45	Incl. above
Totals	$100,920.06	$51,731.01

The estimated annual cost to the town of operating the present plant is $26,325. Mr. Plattner estimates the income as $37,996, of which $25,611 would be from commercial lighting service, $1,783 from public arcs, $7,420 from street incandescents and $2,909 from power.

The income as reported to the Electric Light Commission of Massachusetts for the year ended June 30, 1915, was: Commercial arcs and incandescents, $26,776; public arcs, $1,720; street incandescents, $7,198; power, $4,534.

According to the last published re-

Digitized by Google

port of the Commission, the company had capital stock outstanding of $40,000, bonds of $40,000, notes aggregating $30,800 and other minor items of liability. Operating expenses were: At station, $134; energy bought, $14,503; distribution, $3,167; management, $5,696; taxes, $2,121; incidentals, $556; total, $26,179. Its income from sale of electricity was $37,996, leaving a balance of $11,817. Dividends declared were $4,800; interest paid, $3,898; and balance in hand, $3,803.

The lighting company purchases energy from the Milford & Uxbridge Street Railway Company, in volume averaging about 425,000 kilowatt-hours a year. There are about 550 lighting and 60 power customers on the lines, with about 14,000 incandescent lamps and 65 motors connected. The total lighting load was 654 kilowatts, and the power load 146 kilowatts.

The population of territory served is 15,243.

New Lighting Installation in Waltham Employs Gas-Filled Lamps.

Improved street lighting at Waltham, Mass., was inaugurated on the evening of October 1. The installation consists of 84 600-candlepower Type C Mazda lamps in Novalux tops, mounted on Boulevard magnetite posts 18 feet high, of the same type as are installed by the Boston Edison Company on Huntington Avenue, Boston, and in Brookline.

The Waltham white-way lighting is on Main and Moody Streets, the two principal streets of the Watch City. Units are opposite one another, on about 125-foot centers. In addition, 51 600-candlepower lamps of the same type are installed on other streets, in various locations. These are contained in connected arc casings, suspended on mastarms.

There are also 75 100-candlepower Type C lamps on mastarms, under 20-inch reflectors. One hundred and sixty-two arcs are replaced by the above installation.

The remainder of the lighting equipment of Waltham consists of 623 tungsten units, of 40, 80 and 100 candlepower.

Several months ago the city government decided on an improved lighting installation for its streets, and Professor W. E. Wickenden was engaged to make a study and report on lighting conditions. An abstract of Professor Wickenden's report was published in THE ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for December 12, 1914.

The Edison Electric Illuminating Company furnishes street lighting to Waltham under a ten-year contract.

New Quarters of Haverhill Electric Company.

The Haverhill (Mass.) Electric Company, one of the several lighting properties under the management of Charles N. Tenney & Company, Boston, recently opened new offices on Merrimack Street. The building is a thoroughly renovated and remodeled Colonial structure, and the furnishings were chosen with a view to harmonious effect.

The first floor is given to a show room, and on the second floor are the bookkeeping headquarters, and the offices of the office and appliance managers. An elevator connects the two floors, and the lighting is semi-indirect, with bronze fixtures. The basement contains a stationary vacuum cleaner and an envelope-addressing machine, both motor driven. Here are also lockers for each employee, while on the third floor is a rest room for the women workers. The roof of the building is outlined with 200 incandescent lamps.

The two weeks, September 13-25, were devoted to an exhibition of domestic appliances. Among the devices shown were irons, electric ranges, washers, chafing dishes, toasters, percolators, etc., of various makes. Electrically prepared refreshments were served to all visitors, and music was discoursed by an electrically played piano.

A lady demonstrator was in attendance, and in conjunction with the exhibition canvassers from the Pettengill-Andrews Company, Boston, conducted a house to house campaign for the sale of appliances, with success.

New Office Building of Haverhill Electric Company.

Cambridge Company Offers to Sell Its Property.

The Cambridge (Mass.) Electric Light Company has signified to the Cambridge Board of Trade its willingness to sell its plant to the city providing a satisfactory determination of price be made before the question is submitted to the voters for action. The company says it is impossible to reduce present rates.

Digitized by Google

Simplified Rate Schedule of Springfield Company.

The practice of the United Electric Light Company, Springfield, Mass., in issuing a rate schedule that is based on the rated capacity of motors installed, at least lends itself to the clearer understanding of a central-station's power rates than if the price were measured by actual kilowatt-hours used according to a sliding scale. The plan is of some disadvantage to the central station, in that idle motors are reckoned in the count which enables the consumer to get as low a rate as the total rating of his motors calls for, but this consideration is not important according to the company. The rate card issued by the United Company is of a size to fit inside a No. 10 commercial envelope without folding, and being long and narrow and printed on one side only, the card is readily tacked up in office or shop for ready reference on occasion. This feature is valuable, in that the inducement of lower rates for increased motor installation is ever before the factory manager.

UNITED ELECTRIC LIGHT COMPANY

Rates for Electricity to be used for Power

1 to 5 H. P. 5 cents per kilowatt hour.
If more than 50 K. W hours per H P per month are used, the rate will be 4¢ per kilowatt hour

6 to 20 H. P. 4 cents per kilowatt hour.
If more than 50 K. W. hours per H. P per month are used, the rate will be 3½¢ per kilowatt hour.

21 to 35 H. P. 3½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 3¢ per kilowatt hour.

36 to 50 H. P. 3 cents per kilowatt hour.
If more than 50 K. W. hour per H. P. per month are used, the rate will be 2¾¢ per kilowatt hour.

51 to 75 H. P. 2¾ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 2½¢ per kilowatt hour.

76 to 100 H. P. 2½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 2¼¢ per kilowatt hour.

101 to 250 H. P. 2¼ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 2¢ per kilowatt hour.

251 to 400 H. P. 2 cents per kilowatt hour.
If more than 50 K W. hours per H. P. per month are used, the rate will be 1¾¢ per kilowatt hour

401 to 550 H. P. 1¾ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 1½¢ per kilowatt hour.

551 to 700 H. P. 1½ cents per kilowatt hour.
If more than 50 K. W. hours per H. P. per month are used, the rate will be 1¼¢ per kilowatt hour.

Above 700 horse power the rate is 1 cent per kilowatt hour

The above rates are based on rated capacity of motors installed and there is a minimum charge of fifteen (15) dollars per horse power per year.

Springfield Rate Card.

Electric Sign on Furniture Store.

A flashing electric sign recently installed on the front of a furniture store in a New England city, is remarkable for its construction and effectiveness. On the two faces of a metal drum, about 10 feet in diameter, bracketed to the front of the third story of the building, are installed, in each face, 72 10-watt lamps, those on one face being red and on the other green. The lamps are arranged on each face, in two outlines of a rocking chair, the axis of the rockers being coincident, but the upper part of one outlined pattern being at an angle of about 30 degrees from the other pattern, i. e., one tilting forward and the other backward from the normal upright position.

Each of the two groups of lights flashes alternately at about 10-second intervals, the effect being to produce the illusion of rocking backward and forward.

The daylight aspect of the sign is of a handsome mahogany rocking chair, the design being painted on the drum with upright portion midway between the lamp patterns.

Results of 30-Day Iron Campaign at Malden.

The Malden (Mass.) Electric Company, one of the lighting properties operated by Charles H. Tenney & Company, Boston, has recently closed a flat-iron campaign of one month's duration, with gratifying results. Twelve canvassers were provided with a specimen six-pound iron, with instructions on how to connect the apparatus and how to demonstrate its advantages.

A report each night specified number of irons sold, customers away, and irons already purchased. The returns showed that 2,481 of the number of housekeepers called on had already provided themselves with electric irons, and 1,146 were not at home when the solicitors called.

The proposition was, $2.50 cash, or $3 on time, with payments of 50 cents a month. A return postcard was sent in advance of the campaign to give opportunity to the recipient to evince interest. The company's autos and teams were placarded with attractive signs, and one electric truck carrying an illuminated sign paraded for a week. One evening an outdoor stereopticon show was given in Malden Square, consisting of the latest war pictures, and slides showing the process of manufacture of the iron.

The following were the net results of the campaign:

	Deferred payments	Cash
The salesmen sold	210	72
Collection agents sold	...	71
Other agents sold	55	10
Appliance department sold	19	59
By telephone and mail	88	9
Total placed in service	372	221
Number of cancellations		10
Receipts from 372 irons at $3		$1,116.00
Receipts from 221 irons at $2.50		552 50
Total		$1,668.50

Total kilowatts connected: 593 irons at 550 watts, 326.15.

Estimated yearly consumption, 60 kilowatt-hours per iron, 35,580.

Annual gross revenue at 10 cents a kilowatt-hour, $3,558.

New-Business Circular Brings Results.

Mention has been made in previous issues of the canvass which the Edison Electric Illuminating Company of Boston has been making in its territory to determine the extent of the use of electrical appliances and, more particularly, to compile records for an intensive comprehensive new-business campaign. During the canvass representatives have visited every customer, not only in Boston, but also in the 15 adjacent suburbs served by the company. Preceding the visit of the canvasser, the circular shown in the accompanying illustration, was sent to each customer and many inquiries were received and sales consumated simply on the strength of this advertisement.

THIS WILL INTEREST YOU

"ELECTRICITY For Everybody"

This is the Electric Age; Are You keeping up with it?

ELECTRICITY WILL DO YOUR HOUSEKEEPING

Have you an Electric Washing Machine, Electric Flat-Iron, Electric Vacuum Cleaner or Sweeper, Coffee Percolator, Toaster, Grill, Heating Pad, etc.? You should know all about these things.

MAKE YOUR STORE PAY MORE

Electricity is the Brightest Clerk you can have. It attracts business, welcomes customers, shows them your goods in the best light, runs the coffee mill, meat cutter, soda fountain shakers, fans, ventilators, cash carrier systems, cash registers, etc.

BOOM YOUR FACTORY

Electricity is a busy worker for you if you give it a chance—Clear, Steady Electric Light on the work and not in the worker's eyes, steady running motors close to each machine. Above all, Edison Service that takes no space, no up-keep, no coal worries, no dirt and ashes, and works only when you need it

RUN YOUR FARM AND DAIRY

Electricity takes the place of many hands. Does the work quicker, better and cheaper—Chops and Grinds the Fodder, Milks the Cows, Cools the Milk, Separates the Cream, Hatches the Chickens and Runs the Tool Shop

EVERYWHERE ELECTRICITY IS THE SAVING WORKER

On the Farm, in Hamlet, Town or City—Electricity—Edison Service—will do your work Cheaper and Better than any other way

Watch for the Edison Representative—He is coming to see you

Our lines cover 1442 miles of streets. An Edison Representative is coming to see you and will advise if we cannot reach you.

The Edison Electric Illuminating Company of Boston

General Offices, 39 Boylston Street Local Stores and Offices in 15 Towns

New-Business Circular.

Water Company to Discard Steam in Favor of Electric Pumping.

The Millbury (Mass.) Water Company is about to discard its steam pumping equipment and install an electric power system which will drive its new two-stage Goulds centrifugal pump having a capacity of 900 gallons a minute. A 100-horsepower Westinghouse motor operating at 1,800 revolutions per minute is to drive the pump.

Relative economies of electric drive have been demonstrated by water plants at Canton, Mass., East Providence, R. I., Wellesley, Mass., and other towns and cities in New England, where purchased power is used.

Digitized by Google

Original Window Display Attracts Attention.

An ingenious and effective window exhibit was recently installed in the show window of the Lowell Electric Light Corporation, Lowell, Mass., being made up principally of articles appropriate to the electric lighting business.

Ranged around the back of the window space was a semi-circular row of Mazda lamp boxes in the form of a fort. On top of this structure were placed three large cartridge fuses, each flanked on either side by a plug fuse, giving the effect of cannon in their embrasures.

The window ledge in front of the "fort" was overlaid with a billowy mass of cheesecloth to represent the ocean, and in the midst of it were placed several toy battleships.

Suspended by a cord from the ceiling, and hanging over the edge of the fort and "seacoast," was a toy aeroplane which was kept swinging, with revolving propeller, by the impulse of an oscillating electric fan located directly back of the fort.

On the front of the fan frame was attached a 300-watt type C lamp in a steel reflector. The lamp, turning with the fan, gave the effect of a searchlight sweeping the ocean, and lighting up the model battleships in turn.

The display was arranged by Whiting Geer, of the company's commercial department.

Electric Power in South Wales Collieries.

In the coal mines of the South Wales district of Great Britain, electricity is employed in 291 mines, on the surface to a total of 93,833 horsepower, and underground 100,444 horsepower. These figures are made up thus:

Surface.

Hoisting	16,373	horsepower
Ventilation	17,924	horsepower
Haulage	14,694	horsepower
Coal washing or screening	9,529	horsepower
Miscellaneous	35,314	horsepower

Underground.

Haulage	42,783	horsepower
Pumping	55,096	horsepower
Portable machinery	800	horsepower
Miscellaneous	1,765	horsepower

In these collieries there are 23,066 electric safety lamps in use. Of these, 16,057 are of the C. E. A. G. type (15,426 with magnetic locking and 631 with lead-rivet locking); 5,753 are of the Oldham type (5,369 with magnetic locking). The balance of the total are of Bristol, Float, Gray-Sussmann, Wolf and Varta types. In regard to shot-firing, out of 4,174,106 shots fired, 2,918,872 were fired electrically, 985,759 by fuse, and 269,475 by squibs. The miss-fires worked out as follows for these three classes: With electricity, 3,241; with fuse, 1,341; otherwise, 195.

Increased Power Needs of Youngstown District.

Ground has been broken for the erection of an addition by the Mahoning & Shenango Railway & Light Company, the operating subsidiary of Republic Railway & Light Company, to its central generating station at Lowellville, O.

The installation of the new equipment, which, with the power house, cost about $750,000, will add 20,000 horsepower to its capacity. The increase in generating capacity was rendered necessary by the growth of traffic on the various interurban lines served with power from this station, as well as by the heavy demand for current for power by the iron and steel and allied industries in the Youngstown and Sharon districts.

Special Sales in Boston.

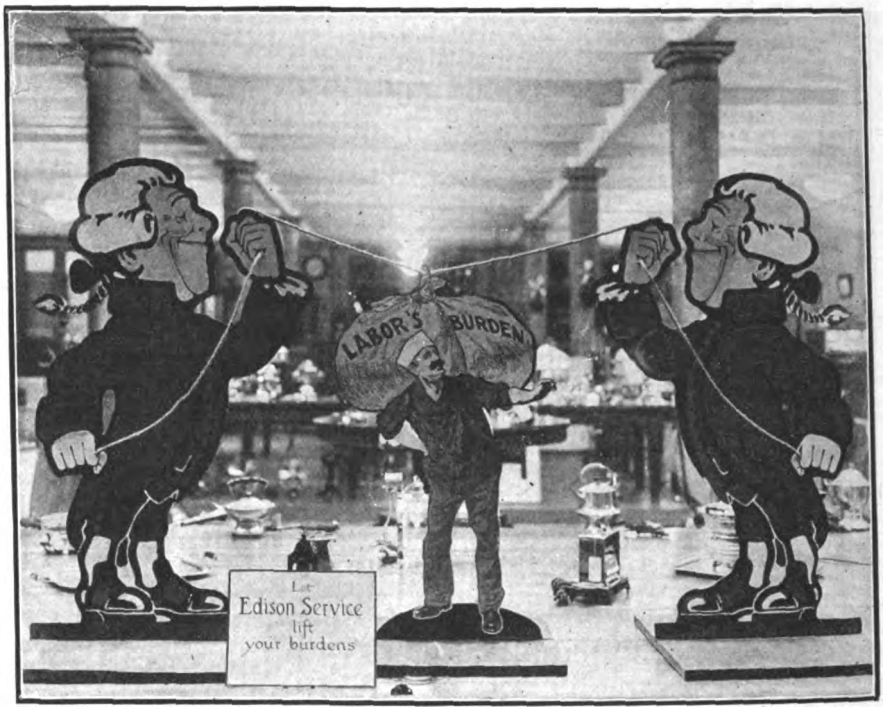
The Boston Edison Company is conducting a sale of attractive table lamps at prices ranging from $5 to $27. The Duntley pneumatic cleaner and the "Brilliant" vacuum cleaner are also being featured. The latter is being sold at $19.00. One unit is offered to be sold at a discount of $1, each day after being offered.

New Street Lighting in Jeffersonville.

Change from the old system of arc lighting in Jeffersonville, Ind., to Mazda nitrogen series lamps, has been effected. Sunday, October 10, was selected for the change and gangs of men spent the day removing the old arc lamps and replacing them with the incandescent lamps, and that evening members of the city council threw the switches to illuminate the new system with a good deal of ceremony. About three hundred lamps are required under the new system. They are of three sizes, 400 candlepower, 250 candlepower and 80 candlepower. The contract for the new service was made last May. Some of the old lamps had been in continual use for over fifteen years.

Prize Window Display of New York Edison Company.

The accompanying illustration will give some idea of the results of the window display contest conducted by the New York Edison Company for an appropriate Labor Day design. The first prize was won by A. F. Westervelt of the lighting inspection bureau and the second prize went to Charles Langford of the distribution department.



Prize Window Display of New York Edison Company.

It is the custom of the company to conduct contests for special window displays several times each year offering an award in gold for each accepted design.

Electrification Again Advocated at Boston.

Electrification of all railroad lines within the metropolitan area of Boston, Mass., and the construction of a subway to connect the north with the south terminal, were advocated at a hearing held October 15 by the Terminal Commission now considering improvements in railroad freight and passenger handling in Boston.

Digitized by Google

Electrical Construction

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Handling the Architect.

Soliciting the architects may be a very expensive and futile proposition; or it may be a profitable and worthwhile expenditure of effort. The result, from the standpoint of the electrical contractor will be determined almost entirely by the character of the solicitation.

Calling on architects is not a job for a "cheap man." It is not the sort of work for a boy or any untrained employee to attempt. If a contractor sends out the wrong sort of representative to solicit the architects, he is simply throwing his money at the little birds. On the other hand, if he has as a solicitor someone who can not only ask business of the architects, but can actually tell them the things they want to know, he is sure to get a lot of business out of it. In fact, business will be created.

Lots of the so-called solicitors enter an architect's office, stand around on one foot until they can get an audience with the head of the office, and then ask hopefully, "Anything doing today?" The architect, ninety-nine times out of a hundred, will reply in the negative. That sort of work is absolutely n. g. and is productive only to the extent that it provides a job for the solicitor.

But when an electrical contractor or his representative, fully up-to-the-minute on electrical wiring, fixture and installation problems, goes into an architect's office, he doesn't go there merely to get, but to give. He can give the architect information that he may be in need of, and the chances are that he is "talking" something that he wants the architect to specify in his next job.

For instance, suppose in addition to being a contractor, he is a dealer, and has the exclusive agency for a new type of indirect lighting fixture. Then he will want to explain to the architect the special advantage of using that particular fixture, and will incidentally learn, if he is a wise solicitor, the jobs which the architect has in view in which it may possibly be used. This sort of solicitation kills two birds with one stone, since it develops information about new building work, and at the same time gives the specialty a boost in connection with it.

Some architects of the lofty, I-know-it-all type, are difficult to approach, and hard to do anything with. Others, realizing their own limitations, and appreciating the fact that electrical installations are a field in themselves, and require expert treatment, are glad to have intelligent advice on the subject. The solicitor can soon determine where his efforts can best be expended, and direct himself accordingly.

The Window-Trim Problem.

"Oh, I don't know anything about trimming a window," objected a hustling, successful, dealer-contractor, who has been carrying a very fair stock of electrical merchandise of late. "My work has been on the outside."

This was said in response to the suggestion that he give more attention to the display of goods in the window. He seemed to think that because he did not understand the intricacies of display to the extent shown by the window men of the big department stores, drawing down as much as $100 a week for their services along this line, it was absolutely useless for him to attempt to display goods in his window.

It was pointed out to him, however, that triming a window effectively does not necessarily involve sleight of hand, and that, considering the large amount of splendid material which the manufacturers of electrical goods now furnish, the veriest tyro can make a creditable display. He finally decided to push his window displays a little more, and turned this proposition over to a youngster in the store, who was familiar with the stock, and who was informed as to the sort of goods which were selling most readily.

This lad then began to take charge of the advertising literature, much of which came with shipments of goods, and much of which had been thrown away with hardly a glance. He put cards and cut-outs in the window, stacked "dummy" cartons bearing the name of advertised goods on the counters, and wherever he saw a chance to use the stuff he did so.

In a few weeks, by dint of serious effort in the direction of displaying the goods attractively in the window, coupled with suggestions from salesmen of the manufacturers who happened to come into the store, this youngster was putting on displays which made people stop and look, and then come in and buy. And, quite naturally the more effective the displays came, the harder he worked on them.

The dealer who is busy with something else, and hasn't the time to give to showing goods in the window, ought to put this end of the business in the hands of some bright young man connected with the store. It will give the latter an outlet for some of his superfluous energy, and it will make sales for the store, as sure as you are a foot high.

They Don't Sell Themselves.

Electrical merchandise is just about as attractive and salable as any sort of goods in any kind of store in the field.

But they don't sell themselves.

Being novelties to a large extent, demonstration is required and clever salesmanship on the floor is needed, even after the customer has been brought inside from the street.

Merely having a store where electrical goods are carried in stock does not insure getting enough volume to support the store and its necessary expenses and leave a profit for the dealer.

Therefore, if you are thinking of establishing a retail store apart from your principal place of business, be sure that you have organized this feature of the business correctly, and that you have arranged for the right kind of supervision and management.

A big contractor-dealer, who has always given the merchandising end of his business careful thought, and who has appreciated its possibilities, established a store in the downtown district, some distance away from his headquarters, several years ago. The store was opened during the holiday season, and partly on this account and partly because special advertising was undertaken to call attention to the opening, sales during that season were excellent. After that, however, things began to drag, and the head of the enterprise realized for the first time that retail sales are not made auto-

Digitized by Google

matically, but as the result of well directed efforts along a number of lines.

Seeing that he could not be in two places at once, and that an efficient man to supervise the store and take general charge of it was needed, he began to look around for such a man, but had difficulty in getting the right sort of manager at the figure he felt he could afford to pay. So the store got rather indifferent handling for some time, and only during special seasons of the year, when the goods were especially suitable for gifts, did the business prove satisfactory. At last the electrical man, thoroughly disgusted with his experiment, closed up the retail store, put the stock back at the main establishment, which was out of the retail district, and gave up his effort to develop that end of the business in the ambitious way he had planned.

The only moral, of course, is to figure that selling the goods is going to be a sufficiently hard job to require the services of a high-grade manager; to select him accordingly, and to pay him enough to make it worth his while to work to the limit to sell the goods speedily.

Sales of electrical goods will support a retail store; but the store must be properly managed, just like any other retail establishment. The goods won't sell themselves.

Deal with One Bonding Company.

On practically all official work, no matter how small, the contractor is required to give bond. The expense of this bond, by the way, should be figured in advance as part of the cost of the job. It is a good plan to deal with one good bonding company exclusively, as this will save a lot of trouble. The surety companies require complete and elaborate information about the business of the contractor, as this class of bonds is considered more hazardous, from an underwriting standpoint, than others, and it is a big convenience to have this statement on record with the company which has been selected, so that it will have to be given again only at rare intervals. The contractor who uses a number of companies is compelled to make out statements to each one, and multiplies the work which is involved in that connection, as the list of questions which must be answered is very long. Besides, it will strengthen his credit to have his bond invariably presented by the same company, which is obviously most familiar with his financial condition.

T. L. Dixon opened an electric store several months ago at 622 East Michigan Avenue, Lansing, Mich. Mr. Dixon carries a line of electrical supplies and also conducts a contracting business at the above address.

Co-operation Between Contractors and Central Stations.

The October meeting of the Lehigh Valley Light & Power Company Section of the National Electric Light Association was held at Allentown, Pa., with Chairman Taylor T. Fogel presiding. After the customary business meeting, Abbot S. Weibel, president of the Lehigh Electric Company, one of the largest contracting firms in eastern Pennsylvania, and also president of the Allentown Rotary Club, gave an exceedingly interesting talk covering the problems encountered by the electrical contractor.

He said in part: "The first thing to be considered is the pleasing of the customer both in a personal way and with a satisfactory installation, for a satisfied customer is the best advertisement for both the contractor and the central-station company. The co-operation of the two parties is absolutely necessary. A correct understanding by the contractors of the rules and regulations of the electric service company is imperative in order to render correct lighting and power service to the public, while boosting and advertising electric service and appliances is advantageous to both the contractor and the lighting company."

Mr. Weibel concluded his talk by giving a few examples where the electrical contractor and his employees get in more personal touch with the customer than the solicitors of the central-station company and consequently can do much to further the use of electric service.

It was suggested that the contractors and the representatives of the light and power company arrange to have an occasional "get-together" meeting to promote a better spirit of co-operation, to the mutual advantage of both, for a greater development of the electrical business. The suggestion was very well received by all concerned and active steps will soon be taken to carry out this plan in Allentown.

Examinations in Massachusetts.

Examinations of electrical journeymen and masters in Massachusetts are being held from time to time at Boston. The fourth examination occurred September 29, when 112 journeymen and 15 masters were in attendance. Of these 12 failed to pass.

Questions were based on the National Electrical Code, and simple diagrams were required to indicate the applicants' knowledge of wiring rules. Men who failed to pass at the first and second examinations, held in August, reappeared at the later tests, and in most cases succeeded in passing this time.

New Electrical Code for New York.

This Code is Chapter 9 of the Code of Ordinances of the City of New York. It was enacted by the Board of Aldermen and became effective July 16, 1915. The following are some of the essential provisions of the Code:

(1) No electric work may be done except by holders of (*a*) a license, (*b*) a special license, or (*c*) a special permit.

(*a*) A license is an authorization to engage generally in the business of installing, altering or repairing electric work.

(*b*) A special license is an authorization to install, alter or repair electric work in a certain specified building.

(*c*) A special permit is an authorization to install, alter or repair electric work constituting a single job.

(2) To secure a license or a special license the applicant must first obtain the favorable recommendation of the License Board. Blank forms of application will be furnished upon request. Holders of licenses or special licenses must file an application for a certificate of inspection before beginning work. A person desiring a special permit must apply for and obtain the same before commencing the work contemplated; at the same time he must file an application for a certificate of inspection on such work.

(3) Fees. "There shall be charged and collected by the commissioner a fee of $10 for each license issued under the provisions of this chapter and thereafter an annual fee of $5 for each renewal of such license and a fee of $1 for each special license or special permit so issued."

(4) Modification, suspension or revocation of special permits and licenses. "The commissioner may at any time by an order in writing, for good cause shown, modify, suspend or revoke any special permit issued pursuant to this chapter, and in like manner, but upon recommendation of the License Board, he may modify, suspend or revoke any license similarly issued."

(5) Electric current may not be supplied to any installation in advance of a certificate of inspection either temporary or final.

(6) The commissioner has power to modify, suspend or revoke at any time a certificate of inspection.

(7) The commissioner has power to order the correction of electrical defects and to disconnect and seal the supply wires and apparatus if his orders are not complied with.

(8) Articles 2, 3, 4, 5 and 6 of the Code contain the technical requirements. These are substantially those under which the Department has been conducting inspections for the past two years, except that Article 3—outside

Digitized by Google

work—has been greatly abbreviated by omitting all reference to pole lines. They correspond to the rules of the National Electrical Code, edition of 1913.

(9) The penalty for violation of the ordinance is as follows:

"Any person who shall violate any of the provisions of this chapter, or fail to comply with any requirement thereof, or who shall violate or fail to comply with any order or regulation of the commissioner made thereunder, or who, being the holder of a special permit, shall install, alter or repair any electric wiring or appliance for light, heat or power, in violation of this chapter, shall, for each and every such violation or non-compliance forfeit and pay a penalty in the sum of $50."

(10) The ordinance contemplates that only authorized persons shall alter or repair electric wiring or appliances for light, heat or power, with the exception of fuse renewals, lamp renewals "and portable devices which together with their cables and attachments have been approved for connection to appropriate parts of the permanent electrical equipment."

(11) Since one of the purposes of the ordinance is to fix responsibility for electric work, the journeyman electrician, or any person working under the supervision of the holder of an authorization (license, special license or special permit) is not required to be the holder of an authorization of his own.

(12) The License Board, from which will emanate the recommendations for the issuance of licenses and special licenses, meets weekly. This Board has established the following rules:

(*a*) An applicant for a license or a special license shall be required to submit with his application a sworn statement which shall give the age of the applicant, if an individual, shall inform the Board of the period of time such applicant shall have been in business as a master or employing electrician, and shall give a list of at least twelve complete equipments for electric light or power which he has installed.

The Board reserves the right further to examine such applicant, either orally or in writing, as to his fitness and qualifications.

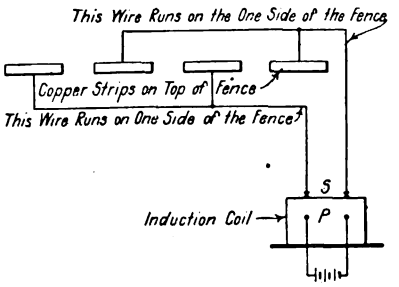
(*b*) Applicants unable to comply with the above conditions shall be required by the Board to submit to a written examination.

(*c*) Applications may be made in the name of an individual, a corporation or a co-partnership. In the case of a corporation or a co-partnership, the applicant shall state the name, age and official position (with such corporation or such co-partnership) of its representative who will submit to examination.

(*d*) Where two or more buildings are under one ownership or one management, the person employed by such owner or by such management to supervise the installation, alteration or repair of electric wiring or appliances in such buildings shall be licensed; or else, the electrician in each building must hold a special license.

Cat Silencer.

Until the present time, I have been pestered by cats howling at nights on the back fence and keeping me awake. To avoid this, take a number of strips of thin copper as wide as the top of the fence, about one inch, and six inches long. Tack these on the top of the fence about three inches apart, then tap wires from every one, 1, 3, 5, etc., going on one side, and 2, 4, 6, etc., going on the other side; connecting all to two wires, as shown in illustration, running to spark coil. When a cat steps from one to the other it


This Wire Runs on the One Side of the Fence
Copper Strips on Top of Fence
This Wire Runs on One Side of the Fence
S
Induction Coil
P

Connections of Cat Silencer.

closes the spark gap and gets a shock. I now sleep in peace.

The coil is working all night but is ready at any time. The coil can be placed in the cellar so that in case of rain it will not be damaged.

R. R. Lautenschlager.

Portland Code.

The city of Portland, Ore., has recently passed a new electrical code which is novel in a number of particulars. The code has been published in loose-leaf form so that when it is amended the old edition can be brought up to date by simply inserting a few new leaves. It also permits of certain sections of the code, which may be in more constant use than others, being segregated and carried in the pocket, as the size of page chosen is such as to permit this.

The code provides for a Board of Appeal, a method which has already been tried in connection with the general building code and found very satisfactory.

The code follows in the main the requirements of the National Electrical Code, but there are a few items in which changes have been made. The direct regulation of heating appliances, such as irons, toasters and percolators, to prevent overloading of circuits, is not attempted, but this is done indirectly by requiring wiring to have a capacity which is based on the floor area and varies with the occupancy of the building.

Among the Contractors.

The manager of the West Coast Engineering Company, Portland, Ore., R. G. Littler, reports several nice electrical construction contracts on hand at this time. He is just completing the 1,500-horsepower installation at the new plant of the Western Cooperage Company, St. John, Ore., which plant was also completely wired for lighting as well as for power. The company has also completed the re-wiring of the Columbia Flour Mills for both lighting and power, and installed the wiring systems for lighting and power in the Stettler Paper Box Company's new factory, which included the installation of a 50-kilowatt three-phase generator, switchboard and engine. Contracts are on hand for a store building for the Lewis Investment Company and for the $30,000 residence for Captain Voorhies, of Golf Park. The re-wiring of the six-story building of the Hughes Investment Company was also completed recently. The company has the contract for the complete electrical installation in the new First National Bank Building, now in course of construction, which Mr. Littler states will be one of the most completely equipped banks, electrically, in the country.

The Erner & Hopkins Company, Columbus, O., has closed contracts for electrical work for the following improvements in that city: Wiring for the new Marietta Paint & Color Company factory and building; wiring for the Budd Dairy Company plant, which among other features will have 140 lamps about the outside coping; wiring for the Peters seven-story office building; wiring for the Columbus Packing Company's new six-story addition; wiring and other work for the new Scioto Country Club; wiring for St. Leo's Church; the electrical equipment for the new lighting plant of the Ohio Masonic Home at Springfield, including motors, generators, etc.

Contract has been secured by the McKeever Electric Company for what is considered about the last word in modern electrical equipment for a country school house. It is located near West Alexandria, O., and the electrical work will run to $4,000, including generators, vacuum-cleaning installation and wiring. A $2,500 contract for the State Hospital at Athens, O., provides for a new lighting system, with 55 outlaying stations.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

The Southside Gas & Electric Company. The Commission has issued an order reducing the electric rates of the Southside Gas & Electric Company for lighting and power service in Mesa, Tempe and Chandler. The new rates are effective as of November 15. The rates prescribed by the Commission are: 14 cents per kilowatt-hour for the first 10 kilowatt-hours consumed per month, 13 cents for from 11 to 100 kilowatt-hours, and 3 cents for all excess. The minimum charge for lighting is $1.00 per month per meter. The minimum charge for power for installations of one horsepower or less is $1.00 per month, and for installations of more than one horsepower, $1.00 per month per horsepower.

CALIFORNIA.

Report on Development of Public Utilities. The Railroad Commission has rendered a report outlining the public utility development work carried on in the state of California since the Commission assumed its jurisdiction over stocks and bonds in March, 1912. The report covers a period from that date to September, 1915, and states that during this period stocks, bonds, notes and certificates have been authorized by the Commission for the public utilities of the state amounting to $466,000,000. Of this amount $175,000,000 has been used to pay maturing debts, and $248,000,000 for new construction, developments of existing utilities, and new ventures.

The Pacific Gas & Electric Company was authorized to acquire, and the trustees in liquidation of the West Sacramento Electric Company to transfer, all the property formerly owned by the West Sacramento Company.

IDAHO.

Special Power Rates. As the result of informal conference between the Idaho power companies and the consumers, held before the Public Utilities Commission, an agreement has been reached fixing new and reduced rates for power for irrigation purposes.

Some objection was made at the hearing to the manner in which it was conducted, in that an attempt was being made to determine what the farmer was able to pay, rather than what would afford a fair return to the company. Commissioner Ramstedt explained that the manner in which they were proceeding was the only way of reaching a satisfactory agreement, and that the Commission did not have sufficient funds to make a valuation and complete investigation of the properties involved.

The new schedule, which will apply to the service for 1915 and two years thereafter, provides a demand charge of $12 a year per horsepower, payable in equal installments during the months the service is used, plus one-half cent per kilowatt-hour for all energy consumed per month. A guaranteed minimum payment is required of $15 per horsepower per month. In addition to these terms, the following quantity discounts are applicable to the new schedule: The first $100 of the monthly bill is net; the second calls for a five-per-cent discount; the third for a 10-per-cent discount; the fourth a 15-per-cent discount, and all over $400 a 20-per-cent discount.

On installations of 100 horsepower or over, the quantity discounts applicable are 10 per cent on the first $1,000 of the monthly bill, 20 per cent on the second thousand, and a discount of 40 per cent on all payments over $2,000.

NEW YORK—First District.

New York Edison Company. The First District Commission has issued an order addressed to the New York Edison Company and the United Electric Light & Power Company, which provides that after January 1 these companies shall make free renewals of lamps to their customers, supplying tungsten lamps of 50 watts and above. The smaller-size tungstens are to be paid for by the customers at a price not exceeding the actual renewal cost of such lamps. It was a former practice of the companies in making renewals to furnish Gem, or carbon-filament lamps. After May 1, 1915, by order of the Commission, the companies reduced their price for current from 10 cents to 8 cents per kilowatt-hour, and allowed the renewal of tungsten lamps when the customer paid an additional half cent per kilowatt-hour for current. The present order cuts out this extra half cent per kilowatt-hour.

The order also provides that the companies shall not refuse to supply current to any applicant on the ground that the applicant is either the owner or operator of a private plant or customer thereof, provided he is not selling current to others outside of his own premises.

After January 1, 1916, the companies shall determine the amount of current supplied by means of a master meter or meters installed on the premises of the customer.

The majority opinion was written by Commissioner Williams. Commissioner Hayward also submitted an opinion in the case, holding that the companies should be required to furnish tungsten lamps of 25 watts without charge.

WISCONSIN.

Standards of Electrical Construction and Operation. Tentative rules have been prepared and submitted to all interested parties throughout the state applying to methods of construction and operation to meet the requirements of public safety and to prevent service interference between public utilities. These rules will be the basis of a joint hearing before the Railroad Commission and Industrial Commission of Wisconsin, to be held at Madison on October 22 and 23.

Annual Edition of List of Radio Stations.

The United States Bureau of Navigation has in the hands of the Public Printer its annual edition of the "List of Radio Stations of the United States," containing a list of 5,073 stations. The table here given shows the number of land, ship, special land, and amateur stations in this publication, as compared with that of 1914:

Classes of stations.	1914.	1915.	Increase.
Government and commercial land stations	189	224	35
Government and commercial ship stations	895	895	0
Special land stations.	54	118	64
General and restricted amateur stations.....	2,796	3,836	1,040
Total	3,934	5,073	1,130

The appendix to this list contains several articles of interest to radio operators. The books, which will be available by November 1, may be procured from the Superintendent of Documents, Washington, D. C., at 15 cents per copy.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 311.—Simple Rate System.—Has any system of rates for residence customers of a central station ever been devised which, though based on actual or assumed maximum demand and including primary and secondary rates for, say, 30 hours' use of this demand, can be fully explained to any customer without using the words "30 hours' use," "demand," "maximum demand," or even "kilowatt-hours"? If such a simple system is as yet too ideal, what is the nearest approach thereto that has been attained?—W. H. T., Ann Arbor, Mich.

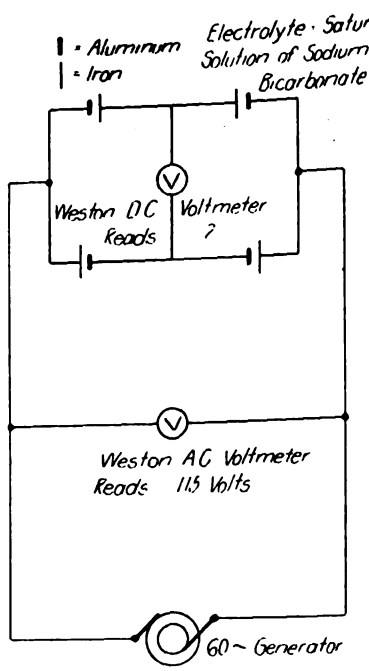
No. 313.—Trouble Near Wireless Stations.—Why is it that in residences in close proximity to wireless stations watt-hour meters frequently burn out and lamps and lamp sockets become short-circuited? Is there any danger to life or from fire? How do central-station companies overcome the difficulty?—C. F., Chicago, Ill.

No. 314.—Talking Signs.—What means are used in electric "talking" or word-spelling signs to prevent injurious arcing at the contacts where the current is continually changed from lamp to lamp?—A. F. B., New York, N. Y.

No. 315.—Motor-Driven Motion-Picture Machines.—About what percentage of our large cities having over 100,000 population permit the use of motor-driven motion-picture machines?—S. P. L., Topeka, Kans.

Answers.

No. 304.—Voltages With Electrolytic Rectifier.—In the diagram given of a Nodon valve (electrolytic rectifier) I find by actual test that the direct-current voltmeter reads higher than the alternating-current voltmeter. Theoretically, as I reason it, the alternating-current voltmeter should read approximately 0.7 of the maximum ordinate of the sine curve of E. M. F. and the direct-current voltmeter should read approximately 0.6 of the maximum ordinate of the same sine curve of E. M. F. Please explain why the direct-current voltmeter reads higher than the alternating-current voltmeter. To give a concrete example, suppose the alternating-current voltage applied to a Nodon valve, as shown in the diagram, be 115 volts, what will the rectifier direct-current voltage be?—A. G., Fort Monroe, Va.



No. 304.—Nodon-Valve Voltages.

Although it may seem peculiar, the fact is that on open circuit, that is, with no direct-current load, the direct-current voltage of an electrolytic rectifier of the Nodon-valve type is higher than the alternating-current voltage applied. Undoubtedly this is due to the direct-current meter registering practically the maximum voltage value of the alternating-current sine wave (which equals 1.414×110 volts). Data obtained on a test of an electrolytic rectifier made by one of the leading testing laboratories of the country bear this out. It was of the four-cell type as indicated in the diagram and used sodium phosphate. With the electrolyte at room temperature and 110 volts, 60 cycles applied, the direct-current voltmeter read 141 volts when there was no load on the direct-current side. With the electrolyte heated to about 190 degrees Fahrenheit, repetition of the test showed 125 volts direct current corresponding to 110 volts alternating current. On applying load, the direct-current voltage dropped to between 90 and 80 volts, depending on the amount of direct-current load; this was true both cold and hot. The efficiency of the loaded cell was about 40 to 45 per cent when cold and 23 to 26 per cent when hot.

The excess of the open-circuit direct-current voltage is probably helped by the inertia of the direct-current voltmeter, as well as the condenser effect of the rectifier. This capacity effect tends to cause the voltage to pile up, so to speak, and this causes the direct-current voltmeter to read much higher than the effective alternating-current voltage value of the circuit.—H. W. S., New York, N. Y.

No. 309.—Automatic Cutout.—It is desired to keep an electric water heater taking 550 watts in circuit as continuously as possible. A few other devices and lamps are also on this circuit, but are turned on for short intervals only. Is it possible to devise some automatic means for temporarily cutting out the heater while the other load exceeds one ampere? The device must reconnect the heater as soon as the other load is cut off or reduced to less than one ampere.—V. B., Milwaukee, Wis.

The arrangement proposed is quite feasible by simply connecting a current relay in the circuit which acts on a circuit-breaker in the circuit of the water heater. Such relay can very likely be bought from stock of one of the supply companies. It is to be connected to the switch which opens or closes the current for the water heater corresponding to the current needed in the other circuit. In the case in question the relay should be set for one ampere when it opens the switch and breaks the current. As soon as the current falls below one ampere, the relay causes the switch to be closed again. It would be sufficient to use a single-pole switch only, as there is probably a main switch for the whole installation. One way of working would be that the switch is kept closed permanently by a spring, the force of which is overcome by the relay as soon as the current in the other circuit exceeds one ampere.—H. A., Pittsburgh, Pa.

Since the supply voltage is not mentioned it is presumed to be 110 volts.

The simplest way to accomplish the desired result would be to design a coil or solenoid which is placed in series with the smaller load, namely, the one-ampere load. This solenoid controls a plunger, to the bottom of the shaft of which is affixed a copper or brass disc. Two stationary contacts are fastened to the slab or base to which the solenoid is fastened; one of these contacts is connected to the heater and the other to one side of the supply feed. The plunger is held down, so that the circuit to the heater is closed through the disk being pressed down against the two stationary contacts, by a small spring. When the one-ampere load comes on the solenoid raises the plunger, opening the contacts and interrupting the current supply to the heater. When the small load drops off sufficiently the plunger falls back to its normal position, partly by gravity and partly by the pressure exerted by the spring; the contacts are again closed and current continues to flow to the heater.

This relay is simple and is readily made. Various little niceties will suggest themselves as the work progresses—using a spring on the plunger shaft to maintain the disk on the level and in intimate contact at all times, the form of contact to use, etc. Such

Digitized by Google

a relay permits of easy adjustment, by the spring, by weighting the plunger shaft or movement of the contacts upward or downward, and by the addition of a dashpot using air or oil. This relay, for material, will cost about $4. There are other forms of relays using differential coils, etc., but they are only more complicated ways of obtaining the same result. They are also more costly, more troublesome to maintain, and more liable to get out of working order.—K. R., Chicago, Ill.

No. 310.—Cleaning Commutators.—I would like to know of something which may be safely used around motors and dynamos for cleaning gummy commutators, etc. We have been using gasoline, but have had trouble from sparks from the brushes igniting the gasoline.—A. S. N., Plymouth, Mass.

Gumming may be due entirely to the brush or in part to the brush and in part due to the surrounding air. In some quarters it is rather common practice to use hard carbon brushes which have been boiled for about 12 hours in light lubricating oil and then allowed to drain for 24 hours. Brushes thus treated frequently cause trouble from gumming, especially when operating temperatures are high. Not only do these brushes gum between brush and commutator, but also between brush and brush-holder, with the result that sparking occurs, frequently chattering, and sometimes glowing of the brush tips. With a good grade of graphite brush gumming is absent; and compared with the carbon brush the graphite brush has lower contact resistance, better lubricating qualities, permits of higher current densities and better commutation with less chattering. Graphite brushes are not as a rule very satisfactory for high-voltage machines, that is for machines of 500 volts and above, because of sparking. The substance best suited for the treatment of commutators depends upon the brush used, the terminal voltage of the machine, whether the commutator is slotted or not, and the atmospheric conditions. A little vaseline sparsely applied to a piece of cloth is often efficacious when used on a commutator, but it should be wiped off the commutator by another dry cloth, especially where the machine operates in air charged with foreign matter. For carbon brushes used in a clean station, wiping the commutator with light engine oil and immediately wiping it off again often gives very good results, but it must be remembered that oil tends to cause gumming, the collection of carbon dust (which may result in flash-over if not remedied) and will ruin mica if used too liberally. Kerosene oil gives very satisfactory results and will remove the grease and gumminess from brushes that are causing trouble from excessive oiliness, and it is safe to use even on high-voltage machines. Its function is to clean rather than to lubricate of course, although it is quite satisfactory for this purpose. Paraffin wax is often used, alone or in combination with other substances, of which there are a number on the market. For cleaning a machine after it has been shut down, but still rotates slowly prior to its coming to a stop. gasoline is very effective; it removes grease and gum and leaves the machine in good condition in this respect ready for starting up again.—K. R., Chicago, Ill.

In cleaning commutators great care is necessary to thoroughly clean and then dry out the commutator in order to prevent short-circuits, etc. Gasoline is very inflammable and for that reason should not be used in cleaning commutators, especially when the machine is sparking. To clean greasy and gummy commutators, carbon tetrachloride is the best thing obtainable. It readily cuts or dissolves all grease, mineral or vegetable oils, and is as good, if not better, than any other solvent. It will not attack copper, mica, or any other part of the machine; also it will not burn even in the presence of numerous sparks, but on the contrary, will act as an extinguisher. It is very volatile and will dry quickly. It is equally efficient as gasoline, if not more so, and has the added advantage of being far safer to handle, thus helping to bring about "Safety First."—W. T. E. Ansonia, Conn.

The cleaning of greasy commutators with gasoline or benzine is an extremely dangerous practice, the vapors becoming very easily ignited by slight sparks; the rag containing the benzine easily catches fire and endangers the operator. An equally effective and absolutely harmless method to be used during service is to moisten a piece of waste or rag with petroleum (lamp oil) and wipe the surface of the commutator. If the surface of the latter, however, is very dirty, it will be better to apply sandpaper at first. From the question it can be inferred that the commutator gets very quickly "gummy" and requires constant attention and nursing. This is not a very satisfactory state of affairs. One should try to remove the reason for the commutator getting greasy or gummy. It seems that the commutation is not sparkless, and probably the quality of the brushes is not the best suitable for the service; very likely they are too soft and lubricate by their content of graphite too liberally. A harder quality of brushes will probably improve matters considerably. The position of the brushes may also not be the right one, that is, they may not be in that position where there is the least or no sparking. To secure the best suitable grade of brushes for the present case an expert of a firm supplying carbons will best be consulted. If the cause of the commutator becoming dirty is once removed a wiping once each 24 hours is quite sufficient to take off the dust and to maintain good operation.

Should the greasy deposit on the commutator, however, be due to the surrounding atmosphere in which the motor has to work, it would be necessary to protect it againse the detrimental effect of the surroundings. The most convenient and cheapest way would be to provide a nousing of sheet iron with pipes leading into the fresh air, to prevent the motor from being unduly heated in the housing. One pipe serves as inlet for the clean, cold air, the other as outlet. If the distances are not too long the natural draft or a small fan fitted to the shaft of the motor will suffice, otherwise forced ventilation must be resorted to.—H. A., Pittsburgh, Pa.

Gasoline should not be used to clean a commutator while the machine is operating. The method used in a large railroad shop, where I was employed, was to use a piece of canvas made into a roll and the end, being soft and smooth, was applied to the commutator while the motor was running. Where a commutator was gummy, we used a few drops of light machine oil, applied with a piece of cheese cloth, same being wiped dry immediately after application. Gasoline was used only when the machine was idle, to clean the brushes and brush rigging in order to insure their not sticking in the brush holders.—J. H. L., North Cambridge, Mass.

No. 312.—Connection of Bell-Ringing Transformer.—Recently I was called to correct some trouble in a door bell rung from a bell-ringing transformer. I found that the push button was arranged to close the primary circuit of the transformer, the secondary being connected directly to the bell. The contacts of the push were burned from arcing, which did no further damage because it was in a noncombustible case. It was explained that this connection had been insisted on to save the small current that the transformer would take continuously. Is there any provision in electrical construction rules to prohibit this connection?—E. S., Atlanta, Ga.

By referring to Rule 81*d* on page 171 of the 1913 edition of the National Electrical Code, it will be seen that all primary wiring for bell-ringing transformers must be installed under the rules for Class C, that is, inside construction. These rules do not permit the use of bell push buttons on voltages that are under Class C. The bell push must therefore be installed on the low-voltage side of the transformer, unless a push-button switch is used which is approved for the higher voltage.—B. W. C., Detroit, Mich.

Digitized by Google

THIRTEENTH ANNUAL JOVIAN CONVENTION

The administration of Homer E. Niesz, Reigning Jupiter of the Jovian Order, was brought to a fitting close by the Thirteenth Annual Convention of the Order, which was held at the Hotel Sherman, Chicago, October 13 to 15. Previous high attendance records were equaled by the registration at this meeting, and in point of importance of business sessions and entertainment new records were established.

The convention opened on Wednesday afternoon, following a complimentary luncheon given by the Chicago Association of Commerce. A report of the first day's proceedings was given in our last issue. Some idea of the growing importance of the Jovian Order may be gained from the report of Mercury Ell. C. Bennett, presented at the first session, which stated that the membership now totaled over 16,000. When it is considered that a large percentage of this membership has been secured during the past five years the importance of the Order and its position as a stimulating influence in the electrical industry may be realized.

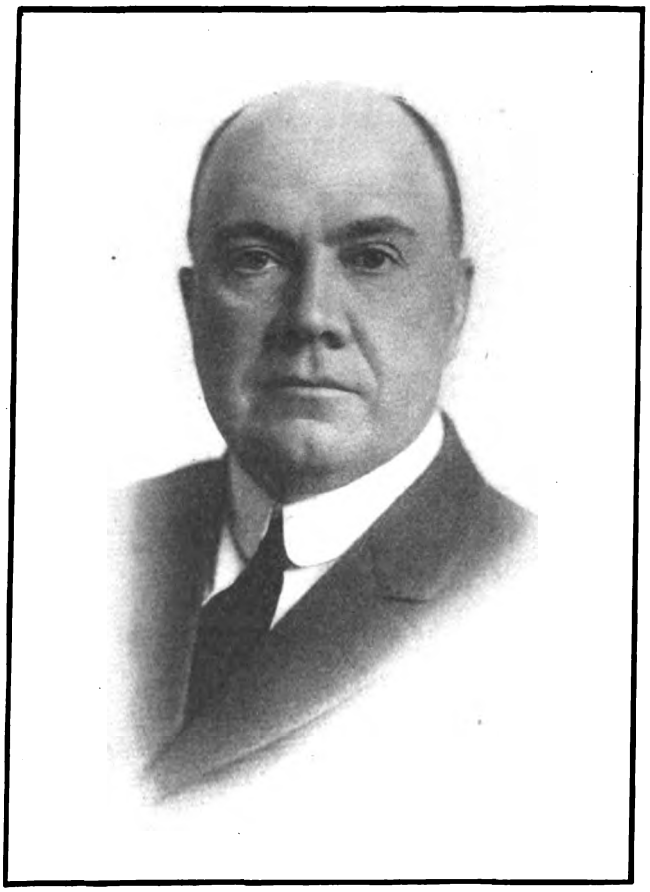
The greatest field of activity, of course, lies in communities where local Jovian Leagues or luncheon clubs have been established. There are at present 72 such organizations, and their records of accomplishment are sufficient evidence of the value of co-operative work.

At the session on Thursday morning E. W. Lloyd, president of the National Electric Light Association, delivered a very interesting address on the subject of "Extending the Utilization of Electrical Energy." Mr. Lloyd made reference to the many fields for a wider use of electricity, laid emphasis on the impetus that could be given this growth by active co-operation of the individuals comprising the Jovian membership. The small-customer business is one of the important fields which will have to be cultivated by the central-station companies, and to make this business profitable from every standpoint it is necessary to have inexpensive, efficient wiring devices, fittings, etc. It is not outside of the realm of possibilities for all cooking, heating and lighting of residences in progressive communities to be done electrically. The fulfillment of this condition necessitates, however, the active co-operation of all engaged in the electrical industry.

Mr. Lloyd referred briefly to the possibilities in electric cooking in the Pacific states, and called attention to a report recently presented before the Northwest Electric Light and Power Association in which it was stated that 80,000 electric ranges would be used in that territory within the next five years. Mention was also made of the successful applications of industrial electric heating and the enormous possibilities in this direction, particularly in the automobile field.

He thought that the greatest field for future development lies in serving rural communities, and much can be gained from the experiences of western companies, where the business has been developed to a much greater extent than in this section. The fact that transformers of as small a capacity as two kilowatts are being used to step down from 11,000 volts directly to 110 volts means that investment in transformers can be greatly reduced. Mr. Lloyd stated that the farmer has a political influence that cannot be longer ignored by central-station companies, and that every effort should be made to supply him at rates that are reasonable and at the same time return a fair profit to the utility.

In connection with conservation of natural resources, Mr. Lloyd thought that the electrical industry has more to do with this than any other business. By the development of hydro-electric plants, the tying together of large centralized power stations many thousands of tons of coal and many thousand barrels of oil can be saved annually. Also, the concentration of manufacturing will be predicated on the centralization of power generation, and this will bring about more economic manufacturing conditions and lower prices of commodities.



Thomas A. Wynne,
Reigning Jupiter of the Jovian Order.

Fred M. Feiker, editor of the *Electrical World*, then presented a paper entitled "The Progress of the Electrical Industry." He said the electrical industry differs from every other in that it is primarily founded on science and later developed commercially. In other words, it has grown backwards. He presented statistics comparing the importance of the electrical industry with others, and commented briefly on the rapid developments that have taken place in lighting units, motors, etc.

A. A. Gray, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, represented the Society for Electrical Development in the absence of Henry L. Doherty, and spoke briefly on the subject of "Electrical Prosperity Week." He called attention to the immense possibilities for developing the use of electricity and electrical appliances if every member of the Jovian Order would consider himself a self-appointed booster and spread the gospel of electricity. Such co-operative work would not only benefit the individual and the industry as a whole, but at the same time would confer a distinct benefit to the community at large.

On Thursday noon those attending the convention were invited to the regular meeting of the Electric Club-Jovian League of Chicago, which was made a Jovian event in honor of the

Digitized by Google

visitors. Thomas A. Wynne, of Indianapolis, was the first speaker called upon, and he referred briefly to electrical conditions in his city. In spite of the fact that there are two utility companies supplying electricity, the Indianapolis Light & Heat Company, which Mr. Wynne represents, has 40,000 meters in service, or one to every 7 inhabitants. He stated that the capitalization of the two companies was approximately $14,000,000, whereas the capitalization necessary for a company of sufficient size to supply the wants of the city need not exceed $8,000,000. This duplication of investment, of course, places a burden on the citizens as well as on the two companies. Fortunately the rate of return allowed to each company in Indianapolis is based on an actual valuation of the plant, plus a going value. In concluding Mr. Wynne stated that in his opinion the greatest field for the Jovian Order was to educate the public to a proper appreciation of their public utilities.

Following Mr. Wynne brief remarks were made by S. A. Hobson, Frank Dostal, Ell. C. Bennett, F. E. Watts, W. N. Matthews, Harry Pieper and Homer E. Niesz.

On Thursday afternoon the annual degree team competition was held at Powers' Theater. Teams representing St. Louis and Chicago competed. Very creditable exhibitions were given by each team, and the Past Jupiters present, who acted as judges, explained in their verdict that it was extremely difficult to decide upon the winner, because of the closeness of competition. The prize, which is a silver loving cup, was presented to the St. Louis team, also the winners last year, and the individual prize, comprising a jewel valued at $100, was awarded to A. L. Le Masters, of the St. Louis team, who took the part of Pluto.

John F. Gilchrist, president of the Electric Vehicle Association of America, was the first speaker of the session on Friday morning. He spoke on the subject of "Contingent Benefits from Electric Vehicle Sales," pointing out how the exploitation of electric vehicles benefits every branch of the electrical industry. To emphasize this point he referred to the great difference in cost of the wagons and carriages used in the days before the advent of motor cars and the present costs of electrics, both of the passenger and commercial type. While, of course, some of the increased cost has been devoted to strengthening the vehicle itself, a large share of the great difference represents investment in accessories and equipment which the electrical industry supplies.

The importance of the electric vehicle from the standpoint of the central station was emphasized by the statement that the annual revenue of the Commonwealth Edison Company from battery charging amounts to $400,0000 per year. The field in this direction can be realized when it is known that were all vehicles used in Chicago of the electric type the total revenue of the company would be doubled. Mr. Gilchrist referred to the discouragements which the pioneers in the central-station industry had to countenance in the early days, and how these were overcome by the resources and ability of the men who maintained their confidence in the future of the industry. Somewhat the same situation has confronted the electric vehicle business, but with the co-operation of all interested in the development of the industry he believes it is destined to be one of the greatest industries of the country.

W. R. Herstein, president of the Electrical Supply Company, Memphis, Tenn., then presented a paper entitled "The Relation of the Jobber to the Electrical Industry," in which he pointed out the important position which the jobber occupies. Manufacturers who sell their products through jobbers can accurately determine what their total cost of distribution will be by establishing fixed discounts, and, further, they are enabled to have a stock of goods kept in various localities throughout the country. The jobber acts virtually as a warehouse for the retailer, and permits him to carry only such stock as he can quickly dispose of, knowing that additional stock can be obtained in the shortest possible time. The jobber also makes possible the establishment of a larger number of retail establishments than would be possible if the manufacturers had to cover the field. The important function of the jobber is to establish credit relations, and this can be done better in a comparatively small field than by a distant manufacturer who attempts to cover the entire country. Mr. Herstein spoke of the importance of the traveling salesman to the jobber, the friendship which these salesmen cultivate with the retailer being a distinct asset.

At the afternoon session Henry M. Byllesby, president of H. M. Byllesby & Company, Chicago, delivered a very interesting address entitled "The Public Utility as a Factor in the Development of a City." He pointed out that the manager of the utility is in most cases one of the two or three leading men in that community, and if this is not true it is usually the fault of the manager himself. To illustrate the influence of progressive public-utility development on a community, Mr. Byllesby referred to the situation in San Diego, Cal. About 10 years ago the combined gas and electric property was purchased by the Byllesby organization, and new rates, methods and policies were put into effect. The price of gas was reduced from $1.75 per 1,000 cubic feet to $1.00, and the rates for electricity were reduced from over 20 cents per kilowatt-hour to 10 cents. Plants were rehabilitated, service in every direction greatly improved and the employees of the company took an active part in civic affairs. Coincident with this rehabilitation of the utilities a renewed activity was shown in the commercial and industrial affairs, new industries were encouraged on the basis of adequate and reasonable gas and electric service, and coincidently the population of the city increased from about 60,000 to over 100,000.

Mr Byllesby spoke of the regulation of public utilities, and how in many states, because of the inactivity of the men directly interested, laws are being enacted which will eventually work to the detriment of the electrical business. In California, for instance, the company in San Diego, which was referred to previously, is not protected from competition by a municipal plant, although the state public service commission has full jurisdiction over rates, accounting, etc. In the states of Washington and Oregon also the commissions have absolutely no powers to prevent competition of any kind, although they are given the power to valuate the properties and otherwise regulate the utilities. Mr. Byllesby made an earnest plea to the members of the Jovian Order to take an active interest in the civic and political affairs of their cities and states, and see to it that legislation enacted would not curb the development of the industry.

At the conclusion of this address the election of officers for the ensuing year took place with the following result:

Jupiter, Thomas A. Wynne, Indianapolis.

Mercury, Ell. C. Bennett, St. Louis.

For congressmen: Dan G. Fisher, Dallas, Tex.; John F. Killeen, Pittsfield, Mass.; J. H. Betts, New York City; Henry Harris, Pittsburgh; M. H. Moffett, Cleveland, O.; J. F. Ramier, Memphis, Tenn.; C. S. Barnes, New Orleans, La.; H. R. Palmer, Richmond, Va.; Frank D. Beardslee, St. Louis, Mo.; W. R. Patton, Milwaukee, Wis.; H. J. Gille, Seattle, Wash.; J. J. Cooper, Denver, Col.; J. H. Pieper, Los Angeles, Cal.; John F. Ward,

Digitized by Google

Toronto, Can.; and F. E. Filer, Winnipeg, Montreal.

Entertainments.

The entertainment features of the thirteenth convention surpassed those of any previous convention. On Wednesday evening an informal reception and dance was held at the Hotel Sherman, at which exhibitions in dancing were given by professionals and other entertainment features provided. During the evening a concert was given by the Commonwealth Edison orchestra, led by Morgan L. Eastman, director.

The annual rejuvenation and special entertainment was held at Powers' Theater on Thursday evening, at which a record-breaking class of 323 candidates was initiated. The initiation was conducted by the Chicago degree team, which had competed in the prize contest in the afternoon. An entertainment comprising six very enjoyable acts concluded the evening's program.

On Friday evening one of the most brilliant and remarkable programs ever witnessed as a private entertainment was presented as the culminating event of the convention. This was known as the Feast of Jupiter, and was under the direction of Oscar Dane, of St. Louis. The entire first and second floors of the Hotel Sherman were reserved, and over 200 costumed performers, assisted by a number of orchestras, provided the entertainment. Attending Jovians progressed from one scene to another, partaking of the festivities typical of each scene. During the progress of the entertainment a supper was served, following which there was dancing.

The ladies' entertainment included an automobile ride through the South Side parks and boulevards, with luncheon at the South Shore Country Club on Thursday afternoon; a theater party on Thursday evening, and a luncheon at Marshall Field's and a shopping expedition on Friday.

Civil Service Examination for Fire-Prevention Inspector.

The Municipal Civil Service Commission of New York City is receiving applications until October 27, for an examination to be held in the near future for the position of inspector of fire prevention. The duties of this position include the inspection of buildings with a view to location of deficiencies in construction, number or arrangement of exits, fire appliances, etc. Candidates must be American citizens and residents of New York State, and be between the ages of 21 and 50. The salary ranges from $1,200 to $1,800 a year. The examination will be based largely on experience and knowledge of duties; a physical examination will also be given.

Hydroelectric Problems Considered at Philadelphia Meeting of American Institute.

A largely attended meeting of the American Institute of Electrical Engineers was held at the University of Pennsylvania, Philadelphia, on October 11. Two sessions were held, one in the afternoon and one in the evening; both were confined to the presentation of papers on hydroelectric matters. President J. J. Carty, who presided, opened the meeting by referring to several meetings of national engineering societies held at San Francisco about the time of the recent International Engineering Congress. He noted with pleasure the marked recognition given to engineers on the Coast. The electrical engineer has succeeded, through his improvements in communication and transportation, in obliterating the distances between the various parts of our great country and in enhancing the interests of civilization. Mr. Carty referred briefly to the proposed celebration next year to commemorate the work of the electrical engineer.

John F. Vaughan of Boston, Mass., presented the first paper, entitled "Supplemental Power for Hydroelectric Systems." The first part of the paper outlined the functions of the steam plant furnishing relay and supplemental power for any system whose normal source of power is water and illustrated graphically and otherwise the relative importance of the various functions and characteristics of the supplemental plant. Mr. Vaughan further illustrated by diagrams in a hypothetical case the division of load between the hydraulic and supplemental sources of power. The second part of the paper discussed some general data obtained from a number of New England water-power systems, indicating the extent to which the water power is supplemented by steam and the methods of utilizing the supplemental capacity. The principal uses for the auxiliary steam plants are for low-water conditions and breakdown service, and to a less extent to help on peak load. With few exceptions, plants, either taken over in consolidation of properties, or rebuilt or extended, utilize existing installations or second-hand apparatus, keeping down their idle investment, and those few exceptions are largely continuously operating high-class plants belonging to customers or built for the purpose of high-grade relay of relatively high annual output.

John Abbet Walls wrote the second paper, which was read by A. S. Loiseaux. This paper was entitled "The Combined Operation of Steam and Hydraulic Power in the Pennsylvania Water & Power Company System." This company has built a hydroelectric plant at Holtwood, Pa., on the Susquehanna River only 25 miles from its mouth. This station has, at present, a capacity of 83,000 kilowatts. The river flow fluctuates in erratic fashion, being subject to sudden and unseasonable variations from one-eighth of that required for full power-house output to a maximum flood of 250 times the low flow. Rather than incur investment charges on equipment installed in advance of the time of there being load sufficient to justify its use, the hydraulic plant was so laid out as to permit of extensions being added on the unit plan as they were required. The problem has been to determine, from estimated load growths and from the hydraulic and power contract conditions, the proper division of load between steam plants and hydraulic station, and the resulting advisability of additions respectively either to hydraulic or steam equipment in the endeavor to accomplish most effective combined hydroelectric and steam operation. The results have been very successful, indicating that a river may be developed to an extent many times its low-water flow where there is extended co-operation between customer and power company in determining, by experimenting, the economy of further supply of hydroelectric power.

At the close of the afternoon session, an inspection was made of the new Christian Street Station of the Philadelphia Electric Company, with its 30,000 and 35,000-kilowatt turbo-generators. Directly after dinner at the Hotel Normandy, the members returned to the Engineering Building at the University where the evening session was held.

The paper presented at the evening session was prepared by Charles G. Adsit and W. P. Hammond, and was entitled "Construction Elements of the Tallulah Falls Development." This large hydroelectric system was described in considerable detail, particularly from the construction standpoint. The plant has one of the highest heads in the world. Its equipment comprises five 12,000-kilovolt-ampere vertical generators from which the energy is transmitted at 110,000 volts to Atlanta, Ga., and Greenville, S. C. Outdoor substations are extensively used. The plant was designed to supply power to the greater part of the state of Georgia. To facilitate construction a small water-power plant for driving air compressors and electric light and power generators was constructed. The paper gives complete unit costs of the various items of construction. The cost of the power production plant, including all of the hydraulic works and power-plant equipment, amounted to $66.67 per kilowatt.

Digitized by Google

ELECTRIC VEHICLE ASSOCIATION MEETS.

That the electric taxicab is a commercial success, is here to stay, and will replace gasoline cars as rapidly as its merits for this service become known, were points that were brought out forcibly at the convention of the Electric Vehicle Association of America, held at the Hotel Statler, Cleveland, Ohio, October 18 and 19.

Aside from the greater economy of the electric taxicab to the operators, its advertising value to the electric-vehicle industry will be of inestimable value, and for this reason alone should be encouraged by all interested in the advancement of the business.

Experiences of a company operating a fleet of electric taxicabs in Detroit, indicating remarkable performances as to efficiency and economy were presented before the convention and received an unusual amount of attention.

Sharing the importance of the electric taxicab discussion was the question of the co-operation of the various allied interests, particularly a better co-operation between central stations companies and manufacturers of the electric vehicle. Walter H. Johnson, vice-president Philadelphia Electric Company, and also of the Electric Vehicle Association, presented a very comprehensive report on this subject, indicating specific channels of co-operation. Coming from an executive of a prominent central station, the recommendations were of particular weight and it was the consensus of opinion that the report should be given a wide distribution among the central-station industry, perhaps through the assistance of the National Electric Light Association.

The question of co-operation and assistance from utilities companies was closely allied with that of battery service to the user and throughout the entire convention the discussions indicated that the development of the industry in the future depends to a very large degree on the establishment of comprehensive battery exchange systems by means of which users can be relieved of the many difficulties attending the proper care and maintenance of the storage battery. A paper presented at the last session dealing with this subject received considerable attention and indicated the trend of the times.

The slogan of the Convention Committee that the sixth annual convention was to be primarily a business meeting for busy men, with many of the usual social features omitted, was borne out by the strenuous program providing for three sessions on Monday, and two on Tuesday, with a dinner-meeting on Tuesday evening as the concluding feature.

The convention was formally opened with an address of welcome by Bascomb Little, president of the Cleveland Chamber of Commerce. President John F. Gilchrist of the Association reviewed the accomplishments during the past year in his address which followed. He reported that it is proposed to again resume the national advertising campaign, somewhat similar to that so successfully conducted two years ago, and a substantial fund for this purpose has already been subscribed. Mention was made of the decision of the Association to publish its own Bulletin hereafter, and statistics were presented relative to membership conditions and finances.

Mr. Gilchrist referred to the growing tendency to establish battery exchange or battery rental systems, and stated that in his opinion some plan of this sort must be worked out to a successful conclusion before the electric delivery wagon or truck can be regarded as an entire success for the use of the small merchant.

Secretary A. J. Marshall in his report dwelt at greater length on membership and financial condition of the Association, and particularly on the stimulating work which is done by the central office. The report further contains a review of the activities of the various sections of the Association, with detailed accounts of some of the advertising and sales campaigns that have been carried on in numerous localities.

The work of the sections was further described by the chairman, or secretary of each individual section, in the report on Section activities which followed.

Monday afternoon session was given over largely to reports of committees and to two papers, one entitled "Industrial Trucks in the Service of the Pennsylvania Railroad Company," by T. V. Buckwalter, and "The Electric Taxicab," by I. S. Scrimger.

The report of the Standardization Committee presented by E. R. Whitney, included several recommendations for standardization which are of particular interest to the electric-vehicle industry at this time. The adoption of two classes of motors for use on electric vehicles was recommended, one class designed for 80 to 85-volt operation; the second class to be designed for 60 to 66-volt operation. Perhaps, with a view to the ultimate adoption of battery-exchange systems the Committee has recommended that the number of cells in lead-acid type batteries, be 42, and the number of the nickel-iron alkaline type 60.

The report of the Traffic Committee outlining its activities in co-operating with various Sections to insure equitable legislation was presented by D. C. Fenner.

In a discussion of the report of the Committee on Standardization the economic advantages of standardizing practice were pointed out, and attention called to the harm resulting from the practice of using batteries that cannot be economically charged at the usual central-station voltages. Those taking part in the discussion were W. P. Kennedy, J. W. Brennan, D. C. Arlington and C. D. Marsh.

The paper by Mr. Buckwalter which was then presented relates the experiences of the Pennsylvania Railroad in using industrial trucks, giving the specifications that have been found most satisfactory. After several years' operation it has been found by this company that industrial trucks should be classified into four distinct divisions, namely, baggage and mail trucks for use in passenger stations; warehouse trucks for freight stations and warehouses; shop trucks for railroad shops and general industrial purposes; and electric tractors for propelling freight cars over street railway tracks.

The paper contains considerable valuable operating data, giving detailed costs and contains a description of a large electric tractor which has been in service for 31 months, and is giving excellent satisfaction. Operating data relative to the performance of this machine indicates that a saving of $32.25 daily is being effected over the cost of horses which previously did the work.

The paper by Mr. Scrimger, entitled the "Electric Taxicab" comments on the heavy expense and unsatisfactory operation of gasoline taxicabs, and the reasons which lead to the manufacture by the Detroit Taxicab & Transfer Company of electric machines, which are now in service.

The average cost of operating the gasoline cab was stated as 30 cents per mile, while the average cost per mile of 12 electric machines now in service is 15.9 cents.

The cab used in Detroit has a 121-inch wheel base, and resembles the high-grade gasoline car in appearance. The public of Detroit has taken very kindly to the electric and the company is replacing its remaining gasoline cabs as rapidly as the electric machines can be manufactured.

W. J. Behn, engineer of the company,

Digitized by Google

supplemented the paper by giving additional data on the construction and operation of the taxicab. As to its ability to climb hills, Mr. Behn stated that the only tests made had been on a 9.2 per cent grade 210 feet long. From a standing start at the bottom of this hill, the electric reaches a speed of 9.4 miles per hour before reaching the top. The battery equipment used comprises 59 cells, of Edison, A-6 battery. The weight of the car complete is 3,950 pounds. The speed of the car is from 22 to 24 miles per hour, and on a level the amperage draw at the higher speed is 61 amperes. The cars are in operation 24 hours per day, and average mileage is from 75 to 100 per day. Charging plugs are installed along the curbing, at the parking stations in front of various hotels, and whenever a vehicle returns from a trip a boosting charge is given so that the vehicles are always available for immediate service. The motor of the vehicle is of special design and a helical worm drive is employed.

The report of the Legislation Committee, which reviewed briefly the legislation enacted during the past year in the various states, which in any way affects the electric vehicle from either the standpoint of the manufacturer or users was presented by P. D. Wagoner, chairman.

At the session on Monday night the report of the Committee on Central-Station Co-operation was presented by W. H. Johnson. As a result of a canvass made among a large number of central-station companies, several specific recommendations for definite co-operation were made as follows:

(1) The central-station should maintain an electric-vehicle department heated by a competent storage-battery engineer.

(2) Central stations should use electric vehicles—both trucks and passenger cars in every line of work, wherever possible.

(3) Central stations should furnish the communities in which they are located with conveniently situated garage facilities, including facilities for the furnishing of boosting charges in proper localities.

(4) Central stations should make adequate appropriations for electric-vehicle publicity in their particular locality.

(5) Central stations should determine upon the capability of a battery service; or a garage and service station plan, which ever seems to be the most practicable and resultful method of obtaining and retaining the electric-vehicle battery charging load.

The report was discussed by Frank W. Smith, E. S. Mansfield and R. L. Lloyd, it being agreed that the report was of sufficient importance to warrant distribution among central stations generally.

In connection with the use of electric vehicles by central stations, Mr. Mansfield thought that it was an unwise policy to urge utility companies to use electric vehicles for all service simply because of the advertising value to the electric. He held they should be encouraged to use electric vehicles only where the conditions of service would justify such use. He further thought the providing of boosting facilities by the central station an important feature in the wider use of electric vehicles even though such stations are used only a few times in the year.

A very interesting address entitled "Problems We are Facing and How They May be Met" was then presented by George H. Kelly of Cleveland. One of the marked developments during the past year has been in the closer co-operation of the allied interests. The central stations are more than ever doing their part in assisting in introducing the electric vehicle and in lowering rates for energy. The battery manufacturers are giving more attention to greater capacities and standarization so that the problem of care and maintenance is becoming less difficult. The manufacturers of electric vehicles particularly during the past year have brought out new inexpensive cars, and reduced prices on standard cars as much as 15 or 20 per cent without sacrificing in quality or appearance. In fact, Mr. Kelly stated, the manufacturers have reduced prices to a point where their future profits depend entirely on increased sales.

The two main problems in the vehicle industry Mr. Kelly thought were first, creating a demand for electric vehicles and secondly caring for the vehicles after they have been sold.

In connection with stimulating demands the two features which are advanced by prospective users, as objections to the electric vehicle, are low speed and limited mileage. To refute these statements Mr. Kelly pointed out that the modern passenger cars of the electric type can attain speeds in excess of those permitted by any city ordinances, and the radius of mileage on one charge is in a very large majority of the cases greater than the user demands. The electric is primarily a utility car, and as this fact becomes more appreciated through the co-operative boosting of all elements in the electric industry sales will rapidly increase.

In regard to commercial vehicles, Mr. Kelly stated that the prevailing prices of the electric are comparable to high-grade gasoline cars, and operating costs are considerably lower.

A crying need in the commercial-car field is for more garages, or service stations where vehicles and batteries can be given expert attention. The greatest field for co-operation by central stations lies in the establishment or in the encouragement of the establishment of such garages and in this connection the battery-exchange system would be a big asset to the industry.

Mr. Kelly referred to the use of electric taxicabs and thought it only a question of time before the gasoline car for this service is entirely superseded.

The discussion which was entered into by W. H. Johnson, Samuel Scoville, Gail Reed, E. P. Chalfant and E. M. Jackson, emphasized the desire of both central stations and of manufacturers to co-operate in placing the facts regarding electric-vehicle performance before the public, and refuting the arguments of slow speeds and limited mileage which are now obsolete.

The concluding paper of the session entitled "The Field for the Small Electric Delivery Vehicle," by Charles A. Ward, was in the absence of the author presented by Mr. Boyer. This paper deals with the demand which has long existed for a low cost, light weight, electric delivery wagon, suitable for the small user, which could be operated at a low cost. The new 750-pound Ward delivery wagon developed to meet this need is described, and the vast field for its use pointed out. The author believes that the final solution of the question of how city delivery service is to be electrified, depends primarily upon standardizing the electric vehicle and manufacturing it in sufficiently large quantities to justify a relatively low price. This paper was supplemented by motion pictures showing the progress of a trip made by a standard Ward car, from New York to Cleveland. The start was made from New York on October 6, the car arriving at the Hotel Statler, Cleveland, on Sunday, October 17. During the entire trip no trouble was encountered and the total energy used amounted to only 165 kilowatt-hours.

At the session on Tuesday morning the report of the Official Organ and Transactions Committee, was presented by P. D. Wagoner, this was followed by the report of the Parcel Post Delivery Committee by W. P. Kennedy.

A paper entitled "Comparative Development of the Commercial Power and Electric Vehicle Road," by H. H. Holding, and S. G. Thompson, was presented by the latter. This paper presents some original data, showing that the prevailing impression that the progress of the electric commercial vehicle propaganda is slow is justified only as it relates to those cities where endeavor in this direction has been dis-

Digitized by Google

couraged, or where no attempt to introduce these machines has been made at all. Comparative curves show that where electric vehicles have been encouraged the progress has been relatively as rapid as have similar gains in other fields of electrical merchandise. Using the history of the popularity of the electric motor in the factory as reference the rate of adoption of the same motive power for the transportation of the products of the factory is, in comparison, highly complimentary to the latter, because the electric motor vehicle is now where the electric drive in the factory was in 1899.

The paper by W. G. Miller and S. G. Thompson on "The Comparative Operation of the Electric and Gasoline Machines in the Same Service," was then presented by Mr. Miller. This paper deals principally with tests conducted to compare the speed of acceleration and deceleration of both gas and electric machines, the probable frequency of stops, expressed in stops per mile, and the total time available for running the vehicle. Resolving these factors to a comparative basis, it is shown that for equal work performance dispite the common belief the gasoline will but slightly excel the electric, which difference is of little consequence when the time saving effected is properly segregated into the different time elements of a nine-hour day.

At this point E. W. Lloyd, president of the National Electric Light Association, addressed the convention on the problems which are confronting the electrical industry, with particular reference to the trend of regulatory legislation. Mr. Lloyd stated that the National Electric Light Association is considering the advisability of engaging experts to handle the various problems that arise rather than have these problems taken up by individual companies.

He thought there was a field for greater co-operation between the Electric Light Association and the Electric Vehicle Association, and suggested that a Committee could perhaps be formed to work out some concrete plan for further co-operation.

As a result of this address H. M. Edwards of New York presented a motion which was unanimously carried that the incoming officers of the Electric Vehicle Association consider means of a closer co-operation with the National Electric Light Association and to consider also the question of amalgamation, if such course should seem desirable.

In the discussion of the two papers on comparisons between gasoline and electric vehicles, which was taken up following Mr. Lloyd's address, J. W. Brennan cited an instance where electric vehicles were employed by a coal contractor, who supplied coal to the plants of the Detroit Edison Company. A competing contractor using gasoline vehiciles was enabled to quote a price fully 60 per cent lower than that of the contractor using electric vehicles, with the result that the electrics were disposed of by the former. Mr. Brennan thought that this was an instance of where electric vehicles were sold without regard to the conditions under which they had to operate, and he believed that this practice was harmful to the industry.

W. C. Brandt of Pittsburgh referred to conditions in that city, particularly in regard to the use of electric vehicles by a leading department store. Accurate cost records kept by this establishment indicated a saving of 1.5 cents per package in favor of the electric vehicle.

Walter H. Johnson,

President-elect, Electric Vehicle Association of America.

C. E. Miller of Cleveland brought out the point that electric vehicle salesmen must necessarily convince the presidents or other executives of the merits of a vehicle before a purchase can be made. The operating force, however, are seldom approached to gain their co-operation, although the success of the vehicle ultimately depends upon these men.

Mathias Turner, Cleveland, thought that vehicle salesmen must make a study of transportation needs of the establishment which they are soliciting and thus be in a position to recommend the proper type and size of car for each service. Selling vehicle is comparable to selling motor service for factory use and scientific salesmanship is necessary.

The paper entitled "Electric Vehicles in Municipal Service" by A. J. Slade and R. D. Dumont, was then presented by the later. This paper deals exhaustively with the various departments of municipal service where transportation is needed and presents comparative data showing the adaptability and economy of the electric to this work.

The paper was discussed by Day Baker, S. G. Thompson and R. L. Lloyd, in which it was pointed out that the advertising value of electric vehicles in municipal service was of inestimable value. Results of operation for ambulance service and in fire departments has shown that the electric is the first on the street.

The report of the Insurance Committee was presented at the closing session of the convention on Tuesday afternoon. In the discussion of this report it was pointed out that the cost of insurance is becoming a big item in vehicle expense. Co-operation should be given the Committee in its work of impressing on insurance companies the reasons why electric vehicles are entitled to lower rates.

W. P. Kennedy called attention to the low rates which are being secured by individual users in New York by combining and taking out collective insurance, and he thought this a field for activity on the part of the various Sections.

J. W. Brennan, of Detroit, thought that statistics should be collected to prove the contention that there are fewer accidents with electric vehicles than with gasoline. In this connection Secretary Marshall, reported that an effort is being made to have police department analyze accident reports with reference to passenger or commercial cars, and whether gasoline or electric vehicles.

The report of the Committee on Operating Records was presented by Mr. Kennedy, following which George B. Foster presented the report of the Committee on Garage and Rates. The later deals somewhat with battery exchange and suggests that this be handled through the garages.

A paper entitled "The Functions of the Electric Garage" was presented by R. Macrae of Chicago. This paper points out that the function of a garage is not only to store the car and supplying energy for battery charging, but to see that the vehicle receives proper care, and is kept continually in operation. Facilities for carrying on this work can best be provided by the large public garages, and the individual user should be encouraged to keep his car at such places. There is a great need for more garages to care for commercial vehicles and the establishment of these would give great impetus to commercial-vehicle growth.

In a discussion following, Mathias Turner expressed the view that scientific salesmanship is needed to place commercial cars in the field. Transportation problems must be studied by the salesman so that the proper vehicle be recommended for the service.

S. G. Thompson of Newark, stated that during the past few months the power salesmen of the Public Service Electric Company have been acting virtually as electric vehicle salesmen, it being a part of their duty to sell electric vehicles in the same manner as other power

Digitized by Google

appliances. The results have been exceptionally satisfactorily, the records showing that the sales made have equaled the aggregate sales in a number of the large cities in the country.

Day Baker, of New York, thought that one practice which should be remedied is that of using scientific terms when trying to interest a prospective purchaser; this not only is confusing but leads to the impression that a highly technical man is needed to operate the cars.

The report of the Nominating Committee was presented and the following officers elected for the ensuing year: President, Walter H. Johnson, of Philadelphia; vice-president, E. S. Mansfield, of Boston; treasurer, H. M. Edwards, of New York. The members of the Board of Directors whose term expired, were re-elected, and John F. Gilchrist was elected to fill the position made vacant by the election of E. S. Mansfield to the vice-presidency.

On Tuesday evening a banquet was held at the Hotel Statler at which brief remarks were made by John F. Gilchrist, W. H. Johnson, S. Scovil, P. D. Wagoner, and W. W. Freeman.

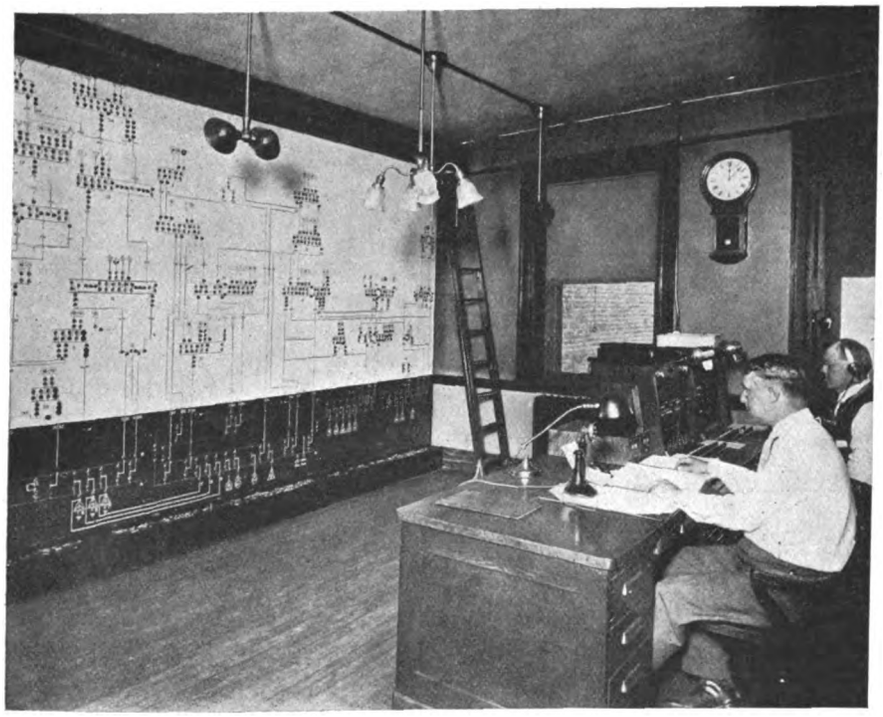
Business Convention in February.

As a forerunner of what is expected to be the most important gathering in the history of the Chamber of Commerce of the United States, comes the announcement that the fourth annual meeting will be held in Washington, D. C., Tuesday, Wednesday and Thursday, February 8, 9, 10, 1916, to the effect of the war on business a large attendance is expected.

Load Dispatching at Boston Described.

At the first meeting of the season of the Boston Section, American Institute of Electrical Engineers, held October 13 at the Engineers' Club, Boston, Pierce Kent, system operator for the Edison Electrical Illuminating Company of Boston, described the method of load dispatching in use by that company. The lecture was illustrated by lantern slides.

L. L. Elden, chairman of the section, presided. The meeting had the pleasure of listening to President J. J. Carty of the American Institute, who spoke on the co-operation of engineers and their recognition at the Panama-Pacific International Exposition. Mr. Carty outlined a plan for the further consolidation of interests of electrical, civil, mechanical and mining engineers. Secretary Ira M. Cushing of the section told of a project for a co-operative engineering society in Boston which should interest many young men.



Load Dispatcher's Board at L Street Station, Boston.
At desk, Pierce Kent, load dispatcher. At switchboard, D. O'Neil, station telephone system operator.

The load dispatchers' board is located in a room on the third floor of the office building connected with the Boston Edison Company's L Street generating station. Adjoining is a sleeping room, equipped with two beds, a kitchenette and other conveniences, to house the operators, if occasion demands.

The board is a large single-line diagram of the company's transmission system, including all inter-station transmission and tie lines and all generating and transforming units at generating and substations.

The board is divided into two sections. The larger section, covering the entire wall directly in front of the operator's desk with its telephone instrument and switchboard, exhibits the 13,200 and 6,600-volt systems; the smaller section, which forms a wing at right angles to the larger, shows the 2,300-volt transmission system. The 2,300-volt, three-wire, three-phase, the 4,000/2,300-volt, four-wire, three-phase, the 230/115-volt direct-current and the 600-volt railway distributing systems are not shown.

The lower part of the board is constructed of fireproof material and represents the engine and turbine generating stations at L Street. Appropriate symbols that are readily recognized represent the various generating, converter and transformer units installed throughout the system.

The upper part of the board is of wood, which permits of easy alterations. On it are grouped graphically all the company's substations.

Buses are shown in red, transformer lines and units are indicated by black lines and symbols on a white ground, while on the lower section these are in white on black slate. The disconnecting switches are represented by means of black-topped plugs for which receptacles in the board are placed at the proper locations. Oil switches are represented by red-topped plugs; except that for the generating stations at L Street they are shown by means of telephone-switchboard lamps under green lenses, automatically lighted as the oil switches are closed, by means of contacts installed on the switches.

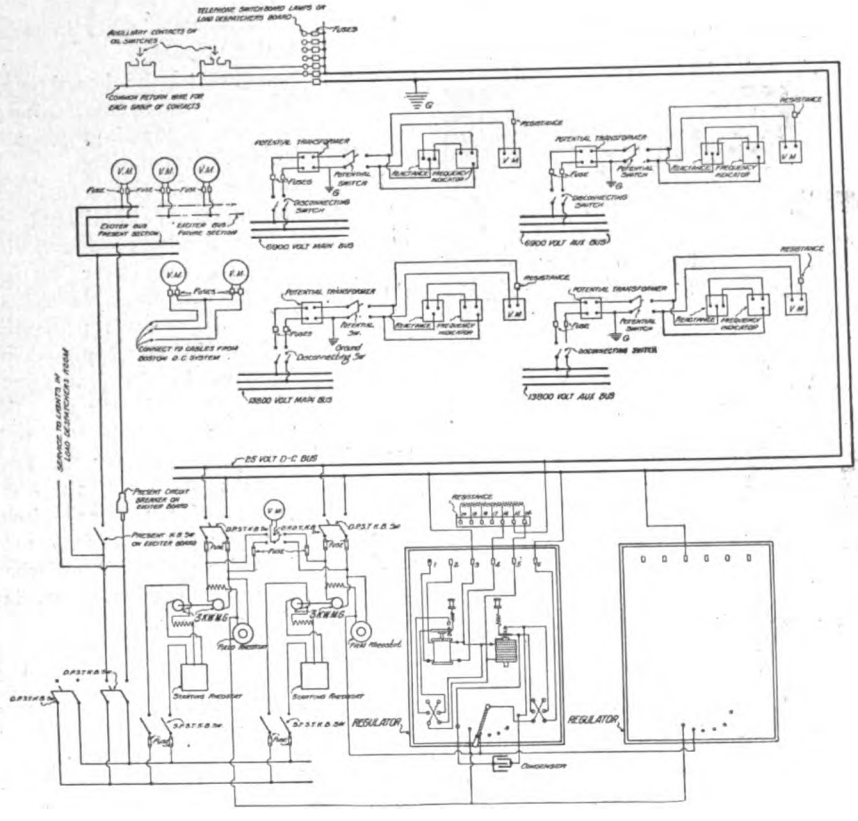
In addition, there is an instrument board on which are mounted alternating-current voltmeters and power-factor indicators connected with the main and auxiliary high-tension buses, and also direct-current voltmeters connected with the three sections of the exciter buses.

Two motor-generator sets, one of them a spare set, installed in the old engine-room station, supply 20-volt current for operating the lamps on the L Street portion of the dispatcher's board. The motor is operated from the 125-volt exciter system, to insure a reliable source of supply.

In operating, the plugs representing disconnecting and oil switches will normally be in position, representing transmission lines in service, and for the L Street end the miniature lamps will be lighted. If a plug is omitted or a lamp out, thus destroying the continuity at some point in the line diagram, it indicates that the line or circuit is open at that point, and therefore out of service. Similar indication applies to generators, transformer banks and other units.

Digitized by Google

One man, the load dispatcher, is in control of the dispatching over the entire system. His office is kept informed constantly by telephone in regard to all irregularities of operation and changes of load so that the dispatcher may correct the diagram before him by the removal or insertion of the proper plugs. In case a transmission line opens and drops the load or part of the load of one or more substations, the operator must at once inform the load dispatcher what switches opened, naming the order of opening, if possible, with added information available. Thereupon the dispatcher gives instructions for resuming service at the earliest possible moment.



Wiring Diagram of Load Dispatcher's System at L Street.

Substation operators are at liberty to start machines or resume service on any bus which is still alive, but must not transfer parts of transmission lines to other methods of operation without direct orders from the load dispatcher, as they might increase the trouble and place the system in such a condition that the dispatcher would be delayed in straightening it out. They need not be afraid of overloading transmission lines at such times, but must report to the dispatcher as soon as possible if they have reason to think transmission lines are overloaded.

The operators of substations are also required to report at once any serious irregularities, such as trouble with a generating unit, so that the load dispatcher may prepare to relieve the unit from load as is advisable. In cases of extreme emergency the substation operator may find it necessary to act without word from the dispatcher, but he must always report as soon as possible, with complete information. The provision of the two direct inter-station lines and the regular exchange telephone connection practically insures intercommunication, however.

If a line is to be taken from service for any reason, a permit, in triplicate copies besides the original, must be obtained. The permit specifies the time to start, what is to be done, and the time when the work will be completed. The load dispatcher must sign this and a copy is sent to the originator. Once the line is taken out it is tagged, and then the work is begun. When the work is completed, the same man who applied for the permit communicates with the dispatcher, who superintends the tests and again places the line in service.

The dispatcher's duties include the receiving of trouble reports on lines, apparatus, buses, etc., and the rendering of reports on troubles to the proper parties. He reports daily to the generating department.

Substation operators report approaching storm or darkness to the dispatcher, who takes measures to meet the situation. The vast extent of the Boston Edison system gives opportunity for weather conditions to be quite various at the outlying stations from those prevailing at the time at the central generating station. The load dispatcher's office may be called a clearing house for system operation.

George McMasters, load dispatcher for the Boston Elevated Railway Company, told of conditions and methods of operation. An order board is used, with a direct line to each substation, and the dispatcher does his own operating. Substation men report any extraordinary happenings. The load dispatcher is the final authority for putting in operation various generating units, though the operators of steam stations handle the cutting of third rail and electricity supply at night. Operators start up their rotaries, but must report at once to the dispatcher.

Two new members were admitted to the section, which has increased in membership 100 per cent during the last year. It is now the fourth in point of members, the sections at Schenectady, Lynn and Chicago exceeding Boston in this respect.

Water Powers of the Cascades.

The United States Geological Survey, in co-operation with the Washington State Board of Geological Survey, has made a comprehensive survey of the water resources of the drainage basins of Cowlitz, Nasqually, Puyallup, White, Green, and Cedar Rivers, in Washington. It includes all monthly estimates of river discharge derived from data collected by the water-resources branch of the Geogolical Survey in co-operation with the State Board of Geological Survey and by private persons.

The summaries of the available power in each basin are computed from the average flow for the lowest week on record and from the flow that could be realized from possible storage. The flow with storage is computed on the basis of the continuous discharge that can be maintained by the release of the stored water during the most extreme drought on record, considerable length and severity of low-water periods.

Copies of Water-Supply Papers 253 and 313 may be obtained free of charge on application to the Director of the Geological Survey, Washington, D. C.

Boston Outing.

The annual outing of the office employees of the Boston Edison Company and the General Electric Company at Boston was held October 16 at the Edison Welfare Building. Baseball, tennis, bowling, billiards and pool were afternoon events, while in the evening dancing, music and other attractions were enjoyed by the large number present.

Digitized by Google

Progress on the Electrification of the Chicago, Milwaukee & St. Paul Railway.

Construction work on the electrification of the western lines of the Chicago, Milwaukee & St. Paul Railway has been prosecuted most actively since the initial order for equipment was placed with the General Electric Company, Schenectady, N. Y., in September, 1914. In view of the magnitude of this project, the progress made to date has been remarkable.

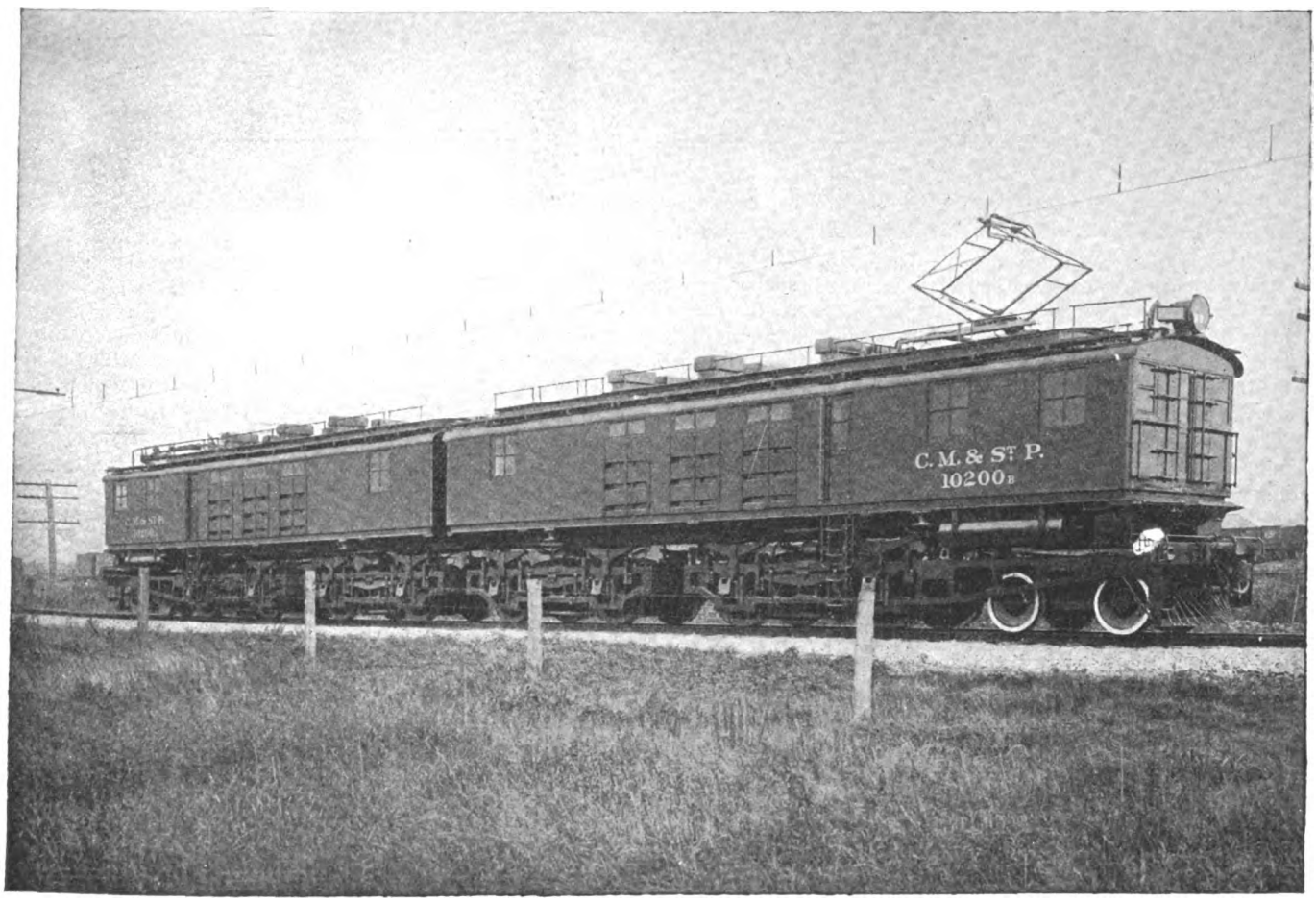
The overhead construction, which will include 650 miles of single track, has been completed for a distance of more than 200 miles. The 100,000-volt transmission line being erected by the railway company to parallel the electrified tracks has been completed for an equal distance, and tie-in lines from the 100,000-volt system of the Montana Power Company are ready for service. The trackage now ready for train operation includes extensive yards and sidings at Three Forks, Deer Lodge and Piedmont and passing tracks at other points. The rail-bonding crews have followed the overhead construction gangs, completing the ground circuits.

Illustrations show the general appearance of the new type of trolley construction and transmission lines. It will be noted that wood-pole construction is used throughout, both for cross-span and bracket constuction. The twin No. 4/0 trolley wires are suspended individually and separately from the same steel catenary and the hangers of one trolley wire are located at points midspan on the other. In the switching yards only one trolley wire is used.

Substations.—Seven substations designed to supply power to the first half of the 440 miles of route have been completed and electrical equipment is being rapidly installed. Complete shipments of transformers, motor-generator sets, switchboards and other accessories have been made by the General Electric Company for the stations first erected, and the equipment of four substations is practically ready for operation. Construction crews are proceeding with the erection of the remaining seven substations shown on the pofile between Deer Lodge, Mont., and Avery, Idaho.

Motor-Generator Sets.—Each of the motor-generator sets consists of a 60-cycle, three-phase 2,300-volt synchronous motor direct-connected to two 1,500-volt direct-current generators. The generators are connected permanently in series to supply 3,000 volts to the trolley. Each set is also provided with an exciter at each end, one providing excitation for the revolving field of the motor and the other supplying the separately excited fields of the direct-current machines.

These sets are in general similar to the five 1,000-kilowatt, 2,400-volt



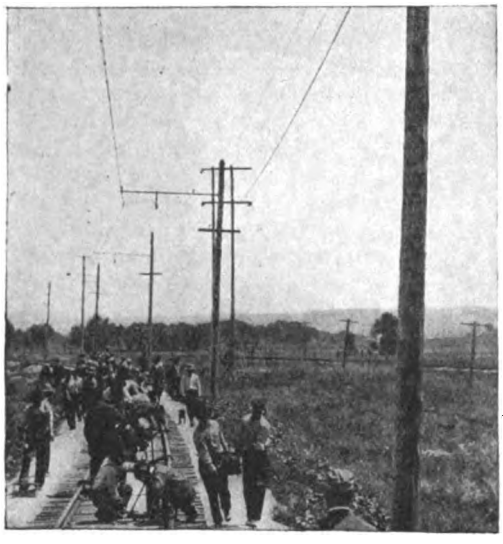
First of the 42 3,000-Volt Direct-Current Locomotives on Test Tracks.

TABLE OF SUBSTATION EQUIPMENT.

Name of Sub-station	Miles from Avery	Motor-Generator Sets No. of Units	Size KW.	Total KW.	Transformers Size K.V.A.	Total K.V.A.
Two Dot	425.6	2	2,000	4,000	2,500	5,000
Summit	392	2	2,000	4,000	2,500	5,000
Josephine	361.8	2	2,000	4,000	2,500	5,000
Eustis	331.8	2	2,000	4,000	2,500	5,000
Piedmont	289.1	3	1,500	4,500	1,900	5,700
Janney	261.7	3	1,500	4,500	1,900	5,700
Morel	228.3	2	2,000	4,000	2,500	5,000
Gold Creek	192.7	2	2,000	4,000	2,500	5,000
Ravens	160	2	2,000	4,000	2,500	5,000
Primrose	122.2	2	2,000	4,000	2,500	5,000
Tarkio	85.6	2	2,000	4,000	2,500	5,000
Drexel	47.5	2	2,000	4,000	2,500	5,000
East Portal	23.7	3	2,000	6,000	2,500	7,500
Stetson	3.6	3	1,500	4,500	1,900	5,700
		32		59,500		74,600

Digitized by Google

units in operation on the Butte, Anaconda & Pacific Railway except as regards voltage and capacity. One new feature, however, has been added which deserves mention. This consists of a longitudinal ventilation of the core and field coils similar to that employed in the well known General Electric ventilated railway motor. The use of this method of cooling has effected a considerable reduction in the floor space required per kilowatt.



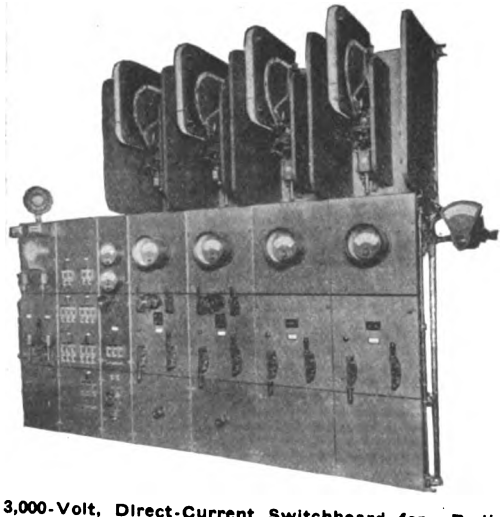
Typical Overhead Construction on Single-Track Curve. Construction Crew Bonding the Rails.

The direct-current generators are equipped with commutating poles and compensated pole-face windings to insure sparkless commutation under heavy overloads. This overload capacity is 150 per cent normal load for 2 hours and 300 per cent normal load for periods of five minutes. This will provide ample margin for starting a train of maximum tonnage on the most difficult grades.

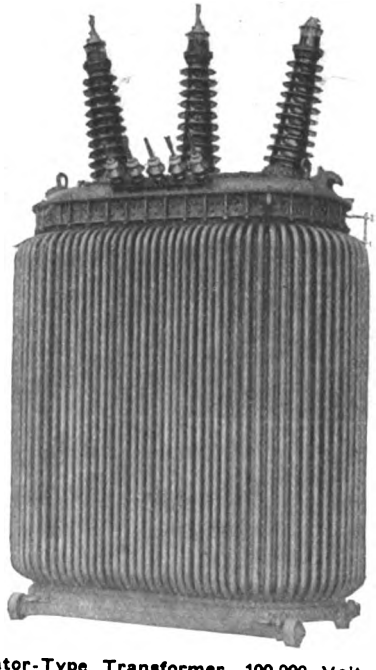
It is interesting to note in connection with these substations that the motor-generator sets are designed to operate inverted in case the regenerated power exceeds that required by other trains operating nearby. For this reason, there is no necessity for water boxes or other energy-consuming devices, since the excess energy is transmitted to the 100,000-volt system.

Switchboards.—The main direct-current switchboard in each station is of special interest, since it represents the latest practice in high-voltage direct-current switching apparatus for heavy currents. A panel is provided for each set and two panels are provided for feeders in each direction.

The circuit-breakers and switches are mounted on separate panels located above and a short distance back of the main panels, similar in general to those now operating in the Butte, Anaconda & Pacific substations. The control handles for operating the breakers and switches are located on the main panels and are connected to the circuit-breaker panels through insulated wooden rods.



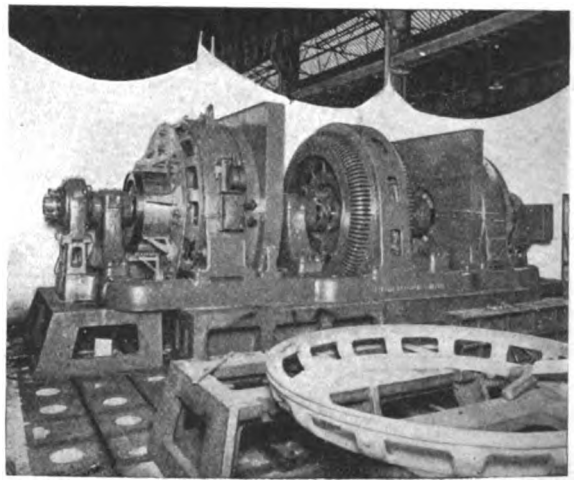
3,000-Volt, Direct-Current Switchboard for One of the Substations.



Radiator-Type Transformer, 100,000 Volts, 1,900 Kilovolt-Amperes.

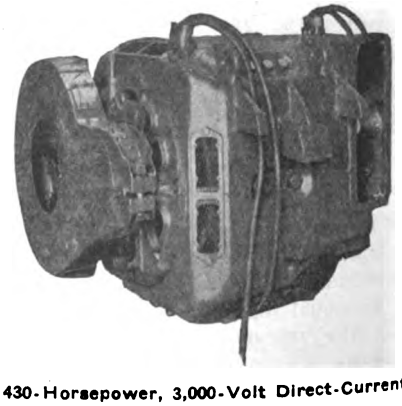
In addition to the special high-voltage direct-current panels, switchboards are also being furnished for the synchronous motors and auxiliary circuits. Oil switches and other standard 100,000-volt equipment are also being installed for the high-tension circuits.

Transformers. — The transformers, which are under construction in the Pittsfield Works of the General Electric Company, are an example of the most recent design and construction. A total of 32 of these units are to be used for stepping down the power supply from the 100,000-volt transmission line to 2,300 volts as required for the synchronous motor-generator sets. These transformers will be installed in the 14 substations which will furnish power for the entire electrification from Harlowton, Mont., to Avery, Idaho. There are 23 2,500-kilovolt-ampere and 9 1,900-kilovolt-ampere units located as shown in the accompanying table.



2,000-Kilowatt, 3,000-Volt, Motor-Generator Set Assembled for Test at the General Electric Company Factory.

These transformers are all of the three-phase core type with a ratio of voltages of 102,000 to 2,300. For regulating purposes taps are provided for 97,200 volts and 94,200 volts. Taps are also brought out on the secondary windings to give 1,150 volts, or half voltage, for starting the motor-generator sets.



430-Horsepower, 3,000-Volt Direct-Current Motor.

The transformers are oil-cooled and the tanks are of the tubular type, the main body consisting of steel plate with tubes welded to the side of the tank at the top and bottom, giving ab-

Digitized by Google

solutely oil-tight joints. An air dryer and breather is attached to the tank so that all interchange of air between the interior of the tank and the outside must take place through this channel. This dryer is provided with chambers containing a moisture-extracting medium, thereby preventing the entrance of moisture to the tank.

The bushings furnished with these transformers are weatherproof and as all joints are tight, they are suitable for outdoor as well as indoor operation. At the top of the high-tension oil-filled leads is a glass cup which shows the height of oil in the leads. Accessories, consisting of thermometer, oil gauge and drain valve, are also provided. Each transformer is mounted on flat wheels to facilitate movement for making repairs and a lifting device is furnished for removing the transformer core.

Auxiliary Transformers.—In addition to the main transformer equipment, each substation will be furnished with a standard 10-kilowatt, three-phase transformer stepping down from 2,300 to 110 volts for lighting and auxiliary power circuits.

For operating the railway signal circuits, a standard 25-kilowatt, single-phase transformer is being installed in each substation stepping up from 2,300 to 4,400 volts. A portable oil-drying outfit will be used for removing moisture from the transformer oil. This outfit consists of a motor-driven pump, which forces the oil through a specially designed filter, and the electric drying oven for drying the filter paper. A portable transformer dryer and an oil-testing set will also be supplied.

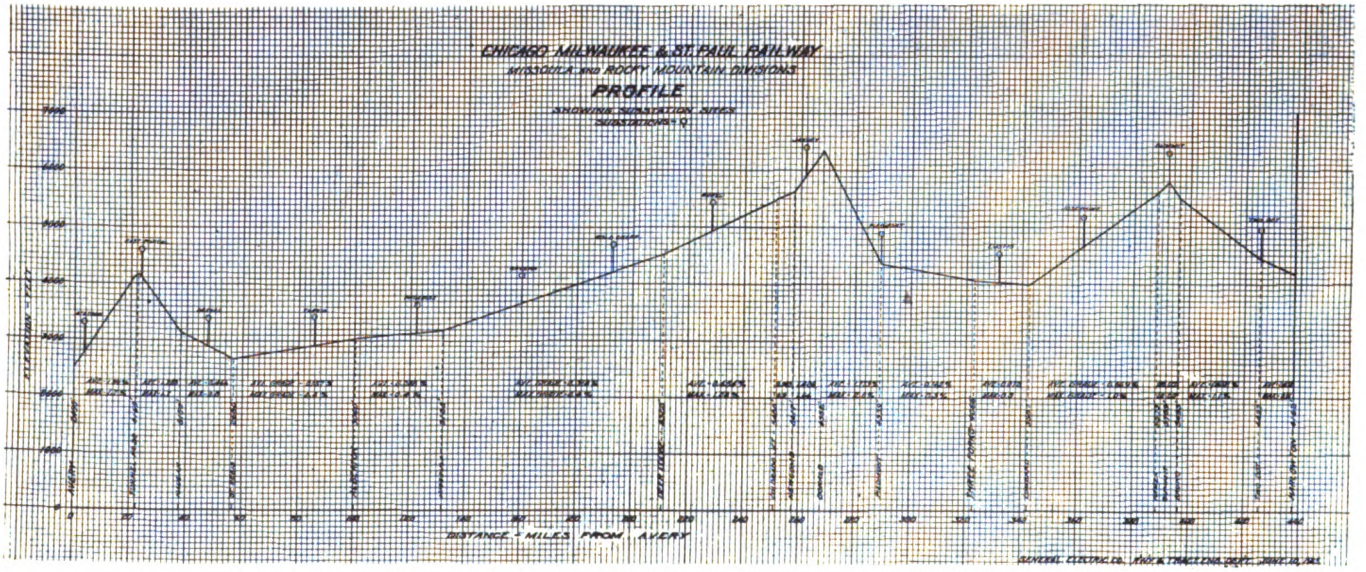
For housing the families of the substation operators, a four-room and five-room bungalow is being constructed at each station and these will be furnished with light and power from the low-voltage auxiliary circuits.

Locomotives. — Work on the construction of the 42 282-ton locomotives for this electrification is progressing rapidly at the Erie Works of the General Electric Company and in the Schenectady plant of the American Locomotive Company. The first complete locomotive was placed on the test tracks early in September and shipment was made as scheduled on September 25. This locomotive was taken in charge by the railway company at Chicago and is now being exhibited at various points on the Chicago, Milwaukee & St. Paul system under the direction of C. A. Goodnow, assistant to the president. A complete set of tests indicate that the locomotive will easily exceed the expectations of the designers.

The actual weights of the completed freight unit are as follows:

Total	564,000 pounds
Weight on drivers	448,000 pounds
Weight per driving axle	56,000 pounds
Weight per guiding axle	29,000 pounds

Twelve of the locomotives on order are geared for passenger service and the remaining thirty are geared for freight service. Both freight and passenger types are equipped for regenerative braking, this apparatus being under control of the engineer. All of the passenger locomotives and several of the freight locomotives will be equipped with oil-fired steam boilers for heating the passenger trains. This equipment will include ample storage tanks for oil and water.


CHICAGO MILWAUKEE & ST. PAUL RAILWAY
MISSOULA and ROCKY MOUNTAIN DIVISIONS
PROFILE
SHOWING SUBSTATION SITES
DISTANCE IN MILES FROM AVERY

Profile of Electrified Division, Showing Location of 3,000-Volt Direct-Current Substation.

Primary Mercurial Resistance Standards.

The Bureau of Standards, of the Department of Commerce, has just issued a publication, Scientific Paper No. 256, dealing with the construction of four standard ohms.

This unit was defined by the London Congress in 1908 as the electrical resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grams in mass, of a constant cross sectional area and of a length of 106.300 centimeters. The work done at the Bureau of Standards consisted in the construction of material standards representing the unit realized in the form of mercury columns in glass tubes, and the work involved measurements of the highest accuracy of the length, the departure from uniformity of the cross section and the mercury content of each tube, as well as their comparison with working standard. All measurements had to be made at the melting temperature of ice prepared from specially purified water which was used in order to avoid any temperature uncertainty due to possible impurities in the ice.

Electrical comparisons of the four standards showed the average deviation of their individual values from their mean value to be less than one one-hundred thousandth of an ohm.

England, Germany, France, Russia, Japan, and the United States now have mercury standards of resistance which all agree to a high accuracy.

Similarly accurate work has been done at the Bureau with regards to the ampere and the standard volt, so that the public can be assured that the electrical standards maintained at its national standardizing laboratory are of an accuracy far exceeding any commercial requirements.

Copies of the publication referred to may be obtained without charge from the Bureau of Standards, Washington.

Digitized by Google

New Electrical and Mechanical Appliances

Barrier Cutout Panels and Cabinets.

An ingenious innovation in the design of cutout units for assembly into panelboards has been made by the C. & P. Electric Works. The cutouts are made up as two-circuit units for either two-wire or three-wire systems. They are made of high-grade porcelain and arranged for Edison plug fuses. The busbars are made sectional with one set of sections supplied for each cutout unit. End blocks are provided which, with terminal sections of the busbars, enable a panel of any size to be readily assembled, as shown in Fig. 1. All that is required is a pair of end pieces and the proper number of cutout units. The latter, as well as the end blocks, are reversible to facilitate assembly.

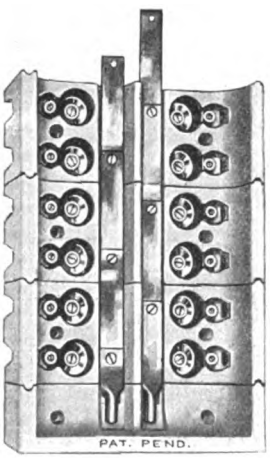


Fig. 1.—Barrier Cutout Panel Partly Assembled.

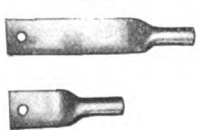


Fig. 2.—Busbar Ends.

The most unique feature of these new units is that they have an upturned outside edge, as do the end pieces; these edges, after the units and end pieces are assembled, act as a continuous barrier between the cutout portion of the panel and the surrounding wiring gutter. This integral barrier eliminates the need of putting in a separate slate or other barrier and saves much time, labor and expense. It also makes a very neat and workmanlike job. A view of an assembled six-circuit, three-wire panel in a steel box is shown in Fig. 3. These steel boxes are 3 inches deep and the gutter is 3 inches wide or 3 by 3 inches in section, making a liberal continuous wireway about the entire panel. Fig. 4 shows the complete cabinet after the steel front plate, including trim and door, is clamped to the box, which is readily done. The views in Figs. 3 and 4 show special cable lugs fitted to the busbar ends. In the latest construction the lugs and busbar terminal sections are combined, as shown at the bottom of Fig. 1 and separately in Fig. 2.

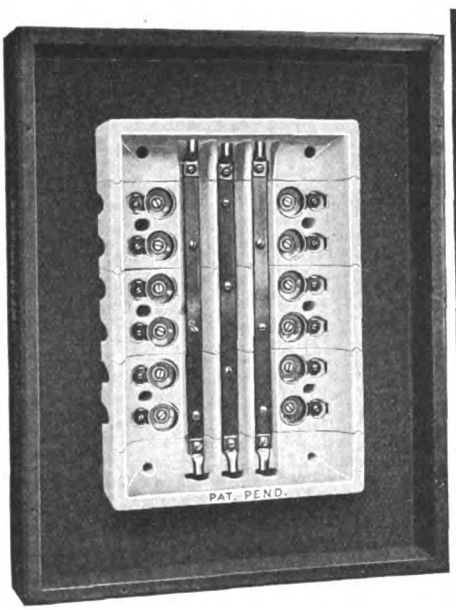


Fig. 3.—Cutout Panel in Steel Box, Showing Wire Gutter.

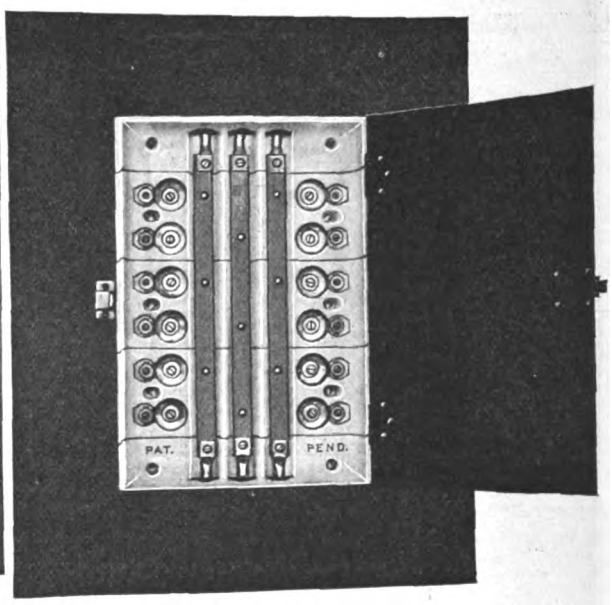


Fig. 4.—Barrier Cutout Cabinet Complete.

These barrier cutouts, panels, boxes and complete cutout cabinets are manufactured by the C. & P. Electric Works, 92 Hayden Street, Springfield, Mass. James C. Phelps is president of the company, and Henry H. Curtis is secretary and treasurer.

Forty-Watt Gas-Filled Lamps.

Among the exhibits which attracted exceptional attention at the New York Electrical Show that closed last week was the display of the new 40-watt and 60-watt 110-volt nitrogen-filled incandescent tungsten lamps that have just been put on the market by the Lux Manufacturing Company, Hoboken, N. J. This company is the first in this country to produce such small units in nitrogen lamps, as it was also the first to introduce the 100-watt nitrogen lamp in 1914.

The new 60-watt lamp, giving a brilliant white light of about 75 candlepower, is recommended by the company for replacing the 100-watt vacuum tungsten lamp with a saving claimed thereby of about 25 per cent; similarly the new 40-watt lamp, giving about 45 candlepower, is recommended in place of the 60-watt vacuum tungsten lamp. The 40-watt nitrogen lamp is listed at 75 cents, and the 60-watt lamp at 90 cents. The Lux Manufacturing Company anticipates a very great demand for the new lamps.

The Largest Central-Station Battery in the World.

The Detroit Edison Company, of Detroit, Mich., has contracted for the building and erection of a new central-station storage battery, which will make it the largest in electrical output ever built for emergency use.

The battery will consist of 150 cells, each containing 169 plates of type H Exide construction. Each of the 150 lead-lined tanks will measure 6 feet 7.625 inches in length, 21.75 inches in width, and 4 feet 2 inches in height. Each cell complete with plates and electrolyte will weigh 7,700 pounds.

Digitized by Google

The capacity of the complete battery will be 12,600 amperes for one hour, or 26,040 amperes at the 20-minute emergency rating. In connection with the operation of this large battery the Electric Storage Battery Company will build four seven-point, 10,000-ampere, motor-driven, end-cell switches, two of these to be placed on each side of the three-wire system. This battery plant will be installed in the Congress Street substation of the Detroit Edison Company, and is expected to be completed for service about December 15 of this year.

Hamilton-Beach Sewing-Machine Motor.

The increasing demands of style are requiring many housewives to spend idle moments in either making or rehabilitating garments to bring them up to the prevailing modes. The sewing of children's clothes, household linens, etc., also remains to be done. To work over an ordinary sewing machine for any length of time is very trying, however, and the development of inexpensive and satisfactory electric motors for operating them is therefore an achievement that meets an urgent demand for means to reduce the labor of working the machine.

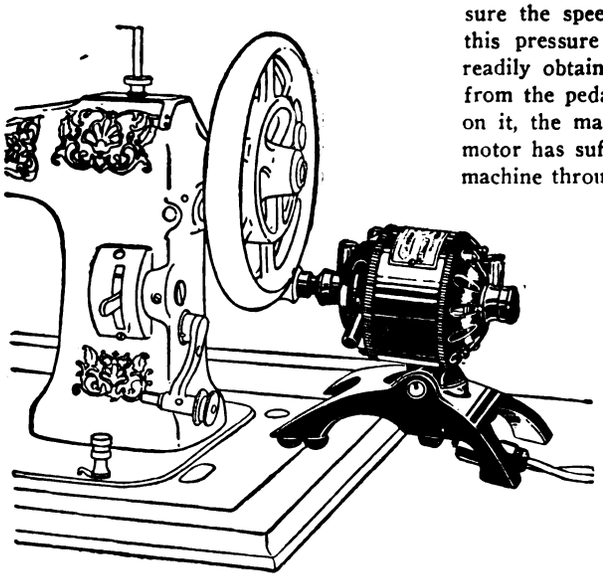


Fig. 1.—Sewing-Machine Motor Readily Applied to Machine.

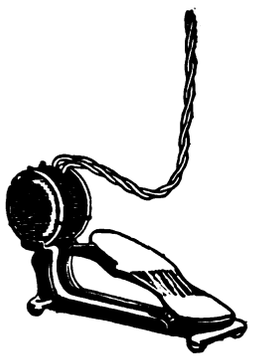


Fig. 2.—Pedal Controller.

A new type of motor recently put on the market is that manufactured by the Hamilton-Beach Manufacturing Company, Racine, Wis. This motor has been called the "Sew-E-Z" which appropriately explains its value in this connection. A near view of the motor and of its convenient means of application to the machine is shown in Fig. 1. It is apparent from this that no alteration of the machine is necessary to apply the motor. The latter is merely set close to the handwheel so that its grooved pulley presses against it. This friction drive has been found completely satisfactory. The motor is mounted on a simple adjustable stand which permits it to be used with any sewing machine, either of the latest or of the older types. No screws or tools of any kind need to be manipulated in applying the motor; it is merely necessary to remove the old belt from the pulley.

The motor is of the universal type and can be operated on either direct-current or alternating-current circuits of standard frequencies and ranging from 110 to 120 volts. The motor runs smoothly and quietly and can be easily reversed. It is compact and light in weight. Its current consumption is very small and it therefore can be readily connected to any lamp socket or other outlet. The control of the motor is in a simple pedal controller shown in Fig. 2. A slight pressure of the foot starts the motor at a low speed so that the needle operates up and down very slowly. By slight additional pressure the speed increases and by varying this pressure any desired speed can be readily obtained. On removing the foot from the pedal, or releasing the pressure on it, the machine instantly stops. This motor has sufficient power to operate the machine through the heaviest fabrics, and all of the various attachments with the machine can be used just as freely as when the machine is operated by foot in the old-fashioned way.

Heating Steel Shrunk Tires by Electricity.

A machine for heating, by means of electricity, railway and tramway tires preparatory to shrinking them into place is described in a recent issue of *La Revue Electrique*. Its inception is due to the Oerlikon Company. The machine is based on the same principle as the electric induction furnace. The tire to be heated forms the secondary of an induction coil, of which the primary is fed with an alternating current at 220 volts and a periodicity of 50. The temperature required is only 150 degrees centigrade, which is sufficient to increase the diameter of a tire by nearly 3 mils per inch, the shrinkage allowance being 0.7 to 1 mil per inch. The heating is, of course, extremely uniform, and the operation very clean. A tire measuring 32 inches over treads, and weighing 265 pounds can be heated up in nine minutes, the energy expenditure being 2.58 kilowatt-hours.

The electric heater is mounted on wheels for easy transport, and weighs about 950 pounds. The windings of the primary are arranged so that certain sections can be cut out, so that the rate of heating can be adjusted as required.

New Foolproof Electric Hand Lamp.

To the varied assortment of electric hand lamps operated by single dry cells of standard size there has recently been added the Mescolite, made by the Manhattan Electrical Company, 17 Park Place, New York City. In the design of this device special efforts were made to produce a foolproof and reliable lantern.

The outfit comprises a japanned metal container with cover, fiber disk with battery contacts, polished metal reflector, clear glass lens, miniature lamp, lens cap or rim with three bayonet catches, a dry cell and a bail handle large enough to allow the arm to go through it.

New Mescolite Lantern.

The battery cannot be inserted in the container in any other way but the right way. The slotted fiber disk prevents mistakes of this kind. The contact points inside the cover are of unequal width, so that it is absolutely impossible to close the circuit accidentally. After the cap is placed on the container a turn of the button connects the lamp in circuit. The fiber disk with its two phosphor-bronze connectors, is attached to the cell, the slotted part of the disk facing forward as it is being put into the container; a gentle push is all that is required to set it into place.

This lantern is made to take a Red Seal dry battery, size A, and is supplied with a 1.5-volt lamp. The same container will also take a special two-cell dry battery, and when so fitted, a 2.8-volt lamp is furnished.

Digitized by Google

RAILWAY EQUIPMENT FOR 5,000 VOLTS DIRECT CURRENT.

By Clarence Renshaw.

On June 1, 1915, 5,000-volt direct current was applied for the first time to the motors and control installed by the Westinghouse Electric and Manufacturing Company, for a service test of six months or a year on the Grass Lake and Wolf Lake division of the Michigan United Traction Company. It is expected that this event will prove a memorable one in the list of important contributions toward advancing the art of electric railroading. While there were a few wrong connections and adjustments at the start, as is always the case in the initial operation of any new equipment, these were of a minor nature and were easily overcome; the 5,000-volt car used has now made over 3,000 miles in commercial service. A description of equipment and of the reasons leading to its installation are given in the following article:

In the use of direct current for electric railways, the trolley voltage of 600, so long considered the limit, has, during the past few years, been increased to 1,200 and then to 1,500 volts. The lines where this was first done operated with such universal success that these voltages quickly became common and are now firmly established as standards for interurban work. This development has been of great importance to the art of electric railroading, effecting essential economies in the cost of construction and operation and making possible the handling of heavier train units on light railway lines.

So few were the difficulties experienced in building and operating apparatus for 1,200 and 1,500 volts and so similar to those for 600-volt apparatus were the requirements found to be, that the probable success of further increases in voltage was quickly foreseen. For interurban lines, however, so great a mileage can be operated economically at 1,200 and 1,500 volts and these voltages lend themselves so readily to the interchangeable operation of the same cars on 600 volts also, that no further increases seemed necessary. For heavy electric traction, however, even these voltages leave much to be desired and the increasing interest in this branch of the art led to several installations at 2,400 volts. Here again, it was at once apparent that even at 2,400 volts, the limiting direct-current trolley voltage had not yet been reached.

The next step on a commercial basis was the electrification of the Chicago, Milwaukee & St. Paul Railway, not yet in operation, which will use a trolley voltage of 3,000. Even this voltage, while it will no doubt give excellent results in the case at hand, is not sufficiently high to eliminate current collection from among the serious problems in the design of large locomotives as is done by the use of 11,000 volts alternating current or to hold the number of substations and the cost of line copper within the desired bounds.

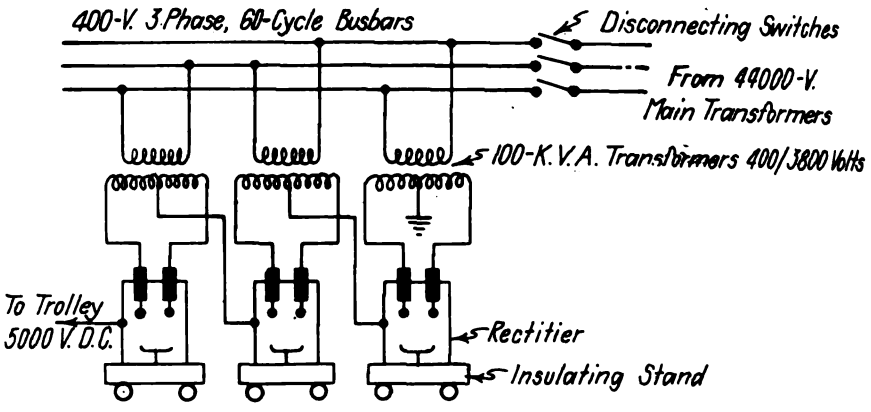


Fig. 1.—Diagram of Rectifier Connections for 5,000-Volt Direct-Current Railway.

With direct-current railway apparatus at this stage of its development, it appeared to the engineers of the Westinghouse Electric & Manufacturing Company, studying the situation, that railway apparatus for 5,000 volts direct current might be entirely feasible. It also appeared that with practical apparatus for this voltage available, the problems of distributing and collecting the necessary power for the largest locomotives likely to be required could be readily solved, so that further increases in voltage would then be unnecessary. It was realized from experience with the use of 1,200 and 1,500 volts that an unnecessary multiplicity of voltages, with comparatively slight difference between them, tended to lead away from the broad ideas of standardization which have heretofore proved so valuable to American railroads and that such a multiplicity of voltages thus tended to handicap the industry. It was evident, therefore, that in view of the tendency toward high direct-current voltages for certain classes of electrification it was desirable to determine as quickly as possible whether apparatus for use at 5,000 volts was practicable or not and, if so, to adopt it as soon as possible as a standard instead of increasing the voltage by small steps in each successive installation.

While a great deal of information can of course be gathered from factory tests, it was obvious that actual commercial service was the only really satisfactory way in which the success of railway apparatus, differing in so many particulars from previous practice, could be conclusively demonstrated and it was to secure such a demonstration that the experimental equipment described was installed.

The lines of the Michigan United Traction Company are in the south central part of the state. The section from Jackson to Grass Lake is 11.4 miles long, two miles of which is in the city of Jackson itself, over tracks of the 500-volt city lines. At Wolf Lake Junction, 9.24 miles from the Jackson

Fig. 2.—Exterior View of Substation Feeding 5,000-Volt Line.

Digitized by Google

terminal, a branch extends 2.71 miles to Wolf Lake, at which there is a small colony of summer cottages.

From the latter part of May to the latter part of September the service requires two cars, except for one trip late at night. Opportunities for running the 5,000-volt car during this period therefore were somewhat limited. During the remainder of the year, however, a single car service is sufficient and as this is now going into effect, it is expected that the high-voltage car will perform practically the entire service and thus be given a thorough test.

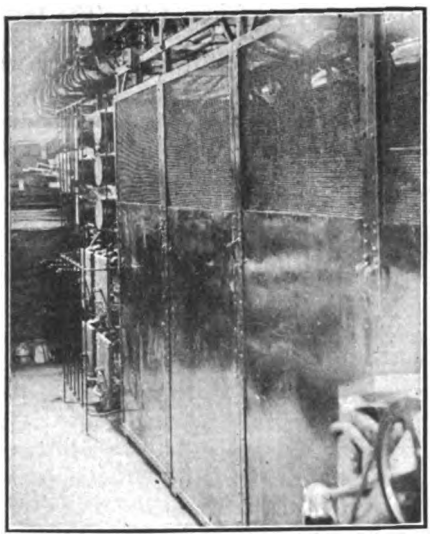


Fig. 3.—Steel-Tank Rectifiers.

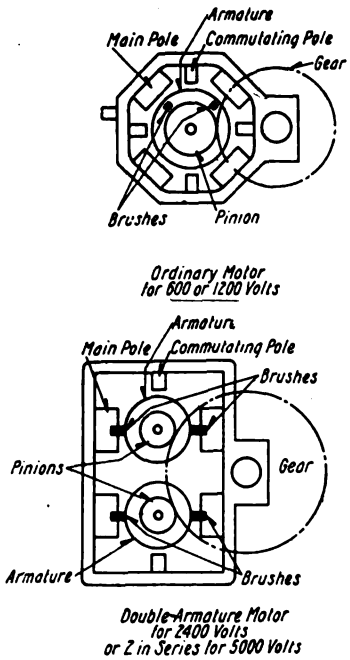


Fig. 4.—Comparison of Motors.

In revising the 600-volt trolley line for use on 5,000 volts, the construction was modified by merely removing the usual 600-volt insulator and replacing it by a type PG porcelain strain insulator located in the span wire at each side. This simple and inexpensive arrangement has been remarkably satisfactory and has not given a minute's trouble during the many months the line has been in use.

The 5,000-volt trolley is separated from the 500-volt one at the outskirts of Jackson by an insulated section of slightly greater length than the car. This is normally dead, but by holding a long rope attached to an air-break switch on an adjacent pole, it can be energized with 5,000-volt current. When the car is coming from the 500-volt line, it is stopped on the dead section until the change-over switch has been thrown. By holding the rope, the section is then energized with 5,000-volt power until the car has left it, after which the rope is released and the section again becomes dead. When the car is coming from the 5,000-volt line, it coasts entirely over the insulated section to the 500-volt line and the change-over switch is then placed in the 500-volt position.

Direct-current power at 5,000 volts for operating the car is obtained from steel-tank, mercury-vapor converters located in the substation at Grass Lake, which supplies 600-volt power for the normal operation of the line and for operating a neighboring line of the Detroit United Railways. Three of these converters, with their alternating-current terminals connected one set to each phase of the 400-volt, three-phase, 60-cycle busbars of the station and their direct-current terminals connected in series as shown in Fig. 1, are used for normal operation and a fourth is installed as a spare unit.

The use of vapor converters for supplying power is in no way an essential part of the test for the 5,000-volt equipment, but is an entirely separate experiment. These converters seemed to afford the most convenient and inexpensive means for obtaining power at the desired voltage, particularly in view of the small space available in the station for the installation of additional apparatus, and they were adopted for this reason. As it was, the transformers had to be located out of doors and the converters themselves crowded into an out-of-the-way corner. Fig. 2 shows an outside view of the station including the ransformers and Fig. 3 shows the sheet-iron cells in which the converters are mounted, as well as the switchboard which controls them. This installation is the first in which vapor converters have been connected in this way to a three-phase circuit or have been used to produce so high a direct-current voltage. It is also the first case in which converters of the steel-tank type have been operated from 60-cycle power.

The most interesting and important items of the installation are, of course, the car used and its equipment. Car No. 62 is a standard wooden interurban car, approximately 56 feet long overall and weighing approximately 40 tons complete with equipment but without load. The equipment consists of four motors, each rated at 100 horsepower, 2,400 volts, connected two in series for operating on 5,000 volts, together with a suitable outfit of type HB unit switch control. Operation in the city of Jackson is provided for by a change-over switch, which regroups the motors for the service.

The gearing is such that the car attains a free running speed on the level of about 48 miles per hour on 5,000 volts, or 20 miles per hour on 500 volts. When running at full speed on the former voltage, it requires approximately 30 amperes with a maximum during acceleration of about 2.5 times this amount. The car is particularly "snappy" in its action and accelerates rapidly yet smoothly on both voltages.

The use of so high a voltage as 2,500

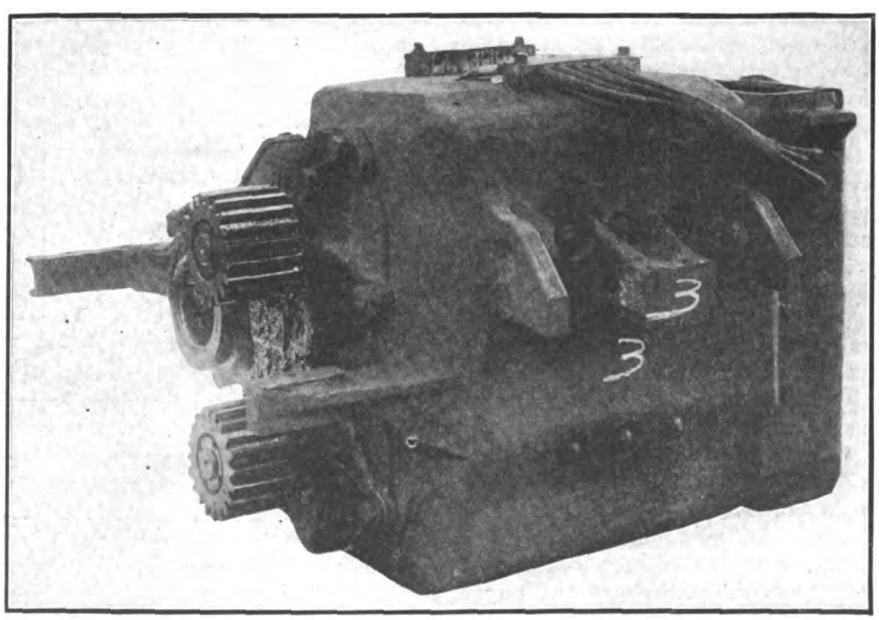


Fig. 5.—Exterior View of 100-Horsepower, 2,400-Volt Double-Armature Motor.

Digitized by Google

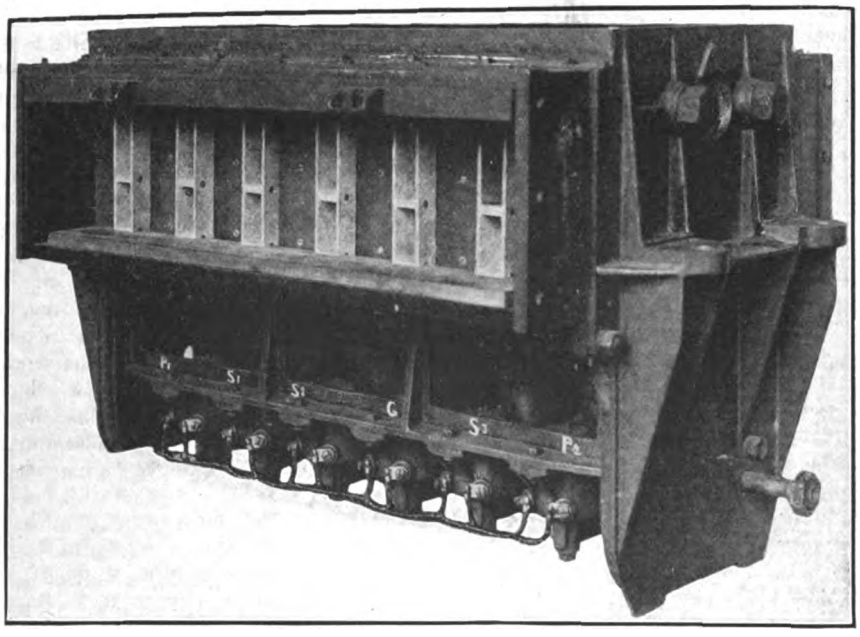


Fig. 6.—Switch Group for 5,000-Volt Service With Covers Removed.

at the terminals of each motor is made possible by the fact that the motors are of the double-armature type. In this type of motor each field frame contains two entirely separate armatures with independent pinions which are connected together by meshing in a common gear. While the voltage at the terminals of a motor is 2,500, therefore, that on any one commutator is limited to 1,250 volts.

This principle, perhaps, will be more clearly understood by reference to Fig. 4, where the arrangement of this type of motor as compared to the usual 600 or 1,200-volt railway motor is shown in diagrammatic form. The appearance of the actual motor from the pinion end is shown by Fig. 5. While this motor looks extremely deep as compared to the more nearly circular forms in general use, there was no difficulty in mounting it on 37-inch wheels with entirely satisfactory clearance. Access to the upper brushes is obtained by the usual commutator lid at the top of the motor. The lower ones can be easily reached from a pit through a similar opening at the bottom.

Opening and closing of the 5,000-volt circuit is accomplished by switches of the double-break type so that a large number of circuit-opening breaks in series is obtained with a comparatively small number of switches. The general arrangement of these switches is similar to that of the single-break electropneumatic switches ordinarily employed for 600 or 1,200-volt equipments, except for having double breaks. One of the two six-switch groups of these switches which are employed on the car is shown, with covers removed, in Fig. 6. Certain additional switches, which are never subjected to high voltage, are of the ordinary 600-volt type.

Power for operating the air compressor, arc headlight, car lights and control circuits is obtained from a 150-volt storage battery, which is charged by being connected in series with the motors during 5,000-volt operation and by being connected to the trolley through a resistance during 500-volt operation. The battery is protected from the action of heavy peak loads by a set of counter-electromotive-force cells, connected in parallel with it. These act as a safety valve and shunt off some of the motor current from the battery in case this exceeds the safe capacity of the latter. Experience has proven that in the case of this equipment the battery is of such ample size that the counter-electromotive-force cells are really not necessary.

Overload protection is afforded, as is usual with equipments of unit-switch control, by an overload trip relay. This relay, on being operated, causes all of the main circuit-breaking switches of equipment to open and thus cut off power. The change-over switch for modifying the connection for 500-volt operation is of the oil-insulated type and is manually operated by a suitable lever at the side of the car. The trolleys are of the ordinary wheel type; each is mounted on a suitable insulated base. Protection in handling the trolleys is afforded by a long wooden insulator inserted in each of the ropes. The reverser, resistance, master controllers, control switches, etc., are of the usual type and require no particular comment. The operation of the control apparatus on both 5,000 and 500 volts is clearly indicated by Fig. 7, which shows a schematic diagram of the main circuit connections and a sequence numbering to indicate the order of closing of the switches, etc.

The development of this equipment along the lines described has been so straightforward and difficulties of every kind have been so noticeable by their absence that the case seems a most remarkable one. Operating as circumstances permitted, for one or two round trips per night, since the initial trial on June 1, the car has made over 3,000 miles with a record of 100 per cent. The equipment has not required repairs of any kind, nor even cleaning, and it has not given a minute's trouble. The commutators of the motors have taken on an excellent polish and many of the switches in the control look as though they had never been subjected to current. Owing to the intermittent running which has been necessary so far, the mileage is of course small, but for the class of troubles which would be most expected on such an equipment, intermittent periods of running and of standing without attention probably afford as severe a test in many ways as a much greater mileage made by more continuous operation.

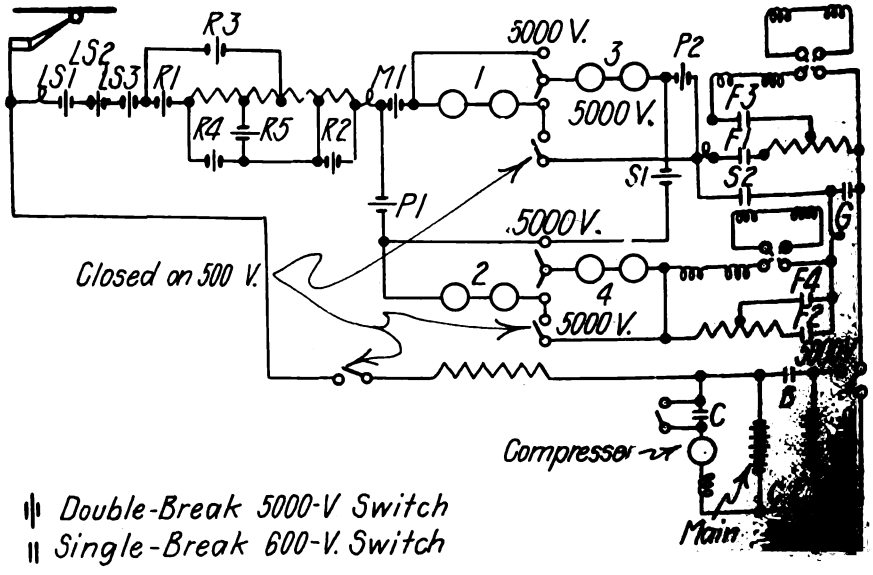


Fig. 7.—Diagram of Control Circuits, Showing Sequence of Operations.

Digitized by Google

Without any particular effort to secure small dimensions or light weight, it has been easily possible to mount the apparatus on this small car without crowding and without placing any parts under the platforms. The weight of the complete motors is not excessive and the armatures are particularly small in diameter and light in weight. Commutators and brushes are reduced to a minimum so that at least two of the ideal characteristics for railway motors have thus been secured. The high-voltage switches are small in dimensions and the entire control equipment is reasonable in weight and moderate in its space requirements.

While it might be expected that in handling current at so high a voltage excessive arcing would result, it has been found that on account of the extremely small currents required and the greater number of breaks in series the results are just the opposite. With the covers of the switch groups removed, the car locked by the brakes, and the control thrown on and off, the arcing at the switches on this car with 5,000 volts on the trolley is noticeably less than when a 600-volt car is handled in the same way.

An incidental effect of considerable interest is the operation of the car lights and auxiliary circuits from a storage battery, so that a brilliant uniform illumination is secured at all times. Until the crews became used to this feature, it sometimes led to amusing results on account of the trolley coming off of the wire and the men not noticing it because the lights continued to burn.

One of the fundamental requirements of any system of electrification, in order that it may be generally applicable with best results, is that it shall be suitable for operating small multiple-unit cars as well as large locomotive units. It is obvious from this installation that the 5,000-volt direct-current system can readily meet this requirement, as the present car and equipment is smaller than it has heretofore been possible to secure even for 2,400-volt service.

The installation of this equipment on one of the lines of the Michigan United Traction Company is due to the broadmindedness and foresight of the late W. A. Foote and his associates, Messrs. Silliman and Collins, and is an evidence of the growing appreciation of the modern idea that the development of more efficient apparatus, and improved systems, is not a matter which concerns manufacturers alone, but is of vital importance to operating companies as well. Much of the success of the operation is due to the hearty co-operation of Messrs. Morgan and Taylor and other operating officials of the road. That the announcement of the main facts and preliminary results of this experiment is made at the present time, instead of keeping the matter entirely quiet until the final results had been attained, and the apparatus is ready for the market, is likewise evidence of another modern idea.

New Vacuum Pump.

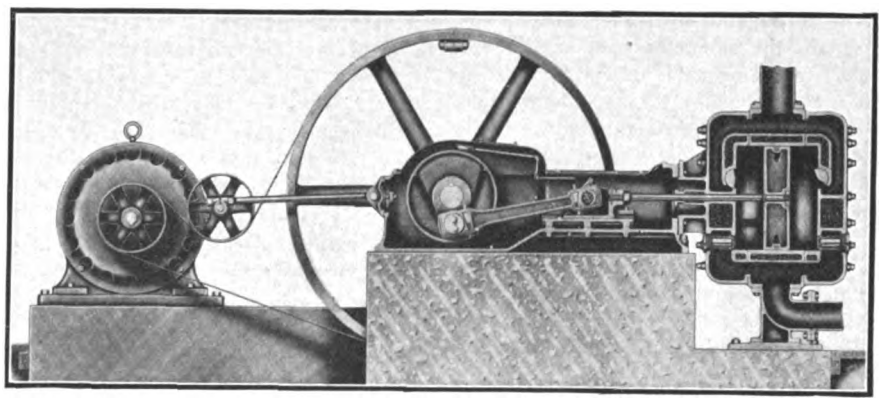
The vacuum-pressure impregnation processes in common use for impregnating electrical field coils, armatures, and the like bring into use a vacuum pumping apparatus. Again, the modern power house invariably includes a condenser plant, the efficiency of which depends upon the degree of vacuum within the condensing apparatus. For maintaining this vacuum and for general service in other lines where a high degree of vacuum is desired, the Ingersoll-Rand Company, 11 Broadway, New York City, has recently introduced a complete line of steam and power-driven, duplex type, Imperial vacuum pumps.

In general design these machines follow that of the Imperial air compressors, a type with which engineers and power-plant operators are long familiar. The vacuum cylinders, as will be seen from the sectional illustration, are somewhat different from those ordinarily met with. The intake valves are of the Corliss type, so placed in the cylinder head that the clearance is exceptionally low. This is a desirable feature in that the air trapped in the clearance spaces at discharge pressure will not reach such a volume, upon being expanded to intake pressure, as to greatly limit the pressure reduction which may be obtained. The action of the valve is positive and quick, and its action being independent of the cylinder and intake pressures, the pressures within and without the cylinder are as nearly equal as possible. The intake ports are large and direct which, together with the water jacketing of the valve, tends to cool the intake gases or vapors.

The discharge valves, which are of the direct-lift poppet type, are placed in the bottom of the cylinder heads so that any entrained moisture or water is immediately discharged, a feature that makes for safety in handling moist or even saturated vapor. Clearance at the point of discharge has been reduced by making the valve partially fill the port in the cylinder head. The discharge passages are also water-jacketed.

The cylinders are said by the manufacturer to meet fully the requirements of satisfactory and efficient operation. Air passages are unobstructed. The bolts pass from head to head and hold cylinder and heads tightly assembled. Both cylinder and heads are completely water-jacketed, which is said to be an essential feature in the design of vacuum pumps, as the high ratios of compression tend to create high discharge pressures unless the heat is removed as generated.

Unusually low clearance in Imperial vacuum pumps has been obtained, not by dangerously close piston clearance, but by improved design of the valves and valve ports. Owing to the extremely low clearance, the complete water-jacketing, the use of mechanically operated Corliss inlet valves and other refinements of design, the manufacturer guarantees the easy maintenance of a vacuum of within one-half inch of barometer.



Motor-Driven Duplex-Vacuum Pump.

The running gear, that is, the main frame with its inclosed reciprocating parts, the crankshaft, connecting rod, crosshead, valve gear and flywheel on both belt and steam-driven machines are of the same design as in the Imperial air compressor. Lubrication is by the bath system, providing automatic flood lubrication yet retaining by the removal of covers from the casing, all the points of accessibility of the open type of machine.

These machines are built in capacities from 798 to 7,048 cubic feet per minute, both for atmospheric and low-pressure (five pounds) discharge. The manufacturer claims for these vacuum pumps that they operate practically independent of attention.

Digitized by Google

New Weston Portable Electrodynamometer-Type Ammeters, Voltmeters and Wattmeters.

Problems hitherto considered impossible of solution have been solved in the designing of a new line of portable electrodynamometer instruments recently put on the market by the Weston Electrical Instrument Company, Newark, N. J. They are the latese development in instruments of this type and embody characteristics never before attained.

Included in this line are ammeters, voltmeters and single-phase and polyphase wattmeters. They are all instruments of precision adapted for use on either alternating-current or direct-current circuits, even in the case of the polyphase wattmeters. Their movable systems have an extremely low moment of inertia and are very effectively damped. Indications are independent of room temperature and of the heating effect of current passing through the coils, and the instruments are shielded from external magnetic influences.

The scales are 5.25 inches long and, in the case of the wattmeters, are uniform throughout their length. In the case of the ammeters and voltmeters, owing to the principle of operation, these instruments cannot be made with scales that are uniform throughout their entire length, but the upper four-fifths portion of the scale is remarkably legible and uniform. Each scale is hand calibrated and is provided with a mirror over which the knife-edge pointer travels and the pointers are equipped with a simple zero-setting device.

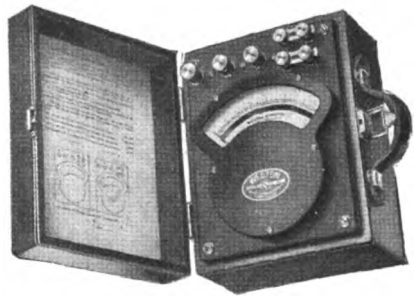
Each of the instruments is contained

Electrodynamometer-Type Voltmeter.

in a highly polished mahogany box provided with carrying handle, lock and cover with slip hinges. The weight complete is about 11 pounds, except the polyphase wattmeter, which weighs 17.5 pounds.

The voltmeters and ammeters are guaranteed to an accuracy of one-fourth of one per cent full-scale value either on direct-current or alternating-current circuits of any wave form and of any frequency to 133 cycles per second, and any commercial frequency even as high as 500 cycles per second with very slight error. Single or double ranges are furnished in these instruments. Potential transformers or multipliers can be obtained for increasing the range of the voltmeters. For increasing the range of the ammeters on alternating-current circuits, current transformers can be secured.

The single-phase wattmeters have a similar guaranteed accuracy. Each of these instruments is provided with double ranges for both current and voltage circuits. All of the current ranges can be



Portable Ammeter.

used for 100 per cent overload indefinitely without introducing error. This permits use on power-factors as low as 33 per cent when used to full scale capacity. A special model of these wattmeters is made for measurements at very low power-factors, such as involved in tests of core losses in transformers; this type of instrument gives full scale deflection for 20 per cent power-factor, that is, the scale value in watts is 20 per cent of the volt-amperes applied.

The polyphase wattmeters have a guaranteed accuracy of one-half of one per cent full scale value on circuits of any wave form and of any frequency to 133

Single-Phase Wattmeter.

cycles. They can be used on circuits of any frequency, even as high as 500 cycles per second, with very slight error due to phase displacement. All current ranges can be used for 100 per cent overload indefinitely without introducing error. This form of instrument really consists of two single-phase wattmeters, electrically independent, but with their movable coils mounted on a common shaft so that they rotate together; each coil, however, moves in its own set of field coils.

These wattmeters have double current and double voltage ranges in each phase. The current ranges are controlled by a set of links in each phase, as in the case of the single-phase wattmeter; the potential ranges are controlled by a full set of independent binding posts for each phase. This arrangement permits these

Polyphase Wattmeter.

wattmeters to be used directly for power measurements on direct current, on single-phase two or three-wire circuits, on two-phase three or four-wire circuits, and on three-phase circuits.

Electrically Driven Dry-Dock Pumps.

The electrification of the F. O. Smith Shipbuilding & Dry Dock Company's dock at Norfolk, Va., is a notable example of the saving that can be effected by the use of electricity in shipyards.

Previous to July, 1912, the dry dock was operated by old-fashioned steam-driven bucket pumps. With this equipment practically half a day was required to make a haul and occasionally trouble was experienced with the operating machinery. Being aware that with these defects the dock could not meet with great success, the owners sought for means to improve the operation and shorten the time required to lift a vessel. As a result of investigation it was decided that electrically driven pumps should replace the steam equipment. Accordingly twelve 20-horsepower Westinghouse vertical motors, coupled to 10-inch Morris centrifugal pumps, were installed.

The installation met with such immediate success that not long ago another section was added and six additional pumping units, duplicates of the ones previously installed, were purchased and placed in position.

It is now possible with this new equipment to lift a vessel high and dry in 17 minutes at an energy cost of about $4.50, whereas with the old equipment it required half a day and cost from $12 to $15.

In addition to the electrically driven pumps on the dock, the shipyard is provided with an electric welding outfit, equipped also for cutting.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

LUDLOW, VT.—This municipality has voted to authorize the Light Commissioners to contract with the Colonial Light & Power Company for electricity in either auxiliary or unlimited service and to borrow $3,000 to pay for the construction of a transmission line to connect the local power plant with the Colonial Company's system.

OXFORD, MASS.—The Webster & Smithbridge Gas and Electric Company will make extensive additions to the street-lighting system of this town.

WORCESTER, MASS. — The city council has voted it inexpedient to act on requests for 684 new luminous-arc street lamps, the council preferring to wait until a systematic plan for uniform distribution of illumination has been worked out. The superintendent of street lighting favors a general extension of the present street-lighting system to cross streets, which, if adequately lighted, would tend to divert traffic from the congested main thoroughfares. A number of new tungsten lamps will be installed at once, and the extension of the arc-lighting system may come after December 1.

ROCKVILLE, CONN. — The Rockville Chamber of Commerce is planning to install a modern lighting system about Central Park. Address William A. Howell.

NEW YORK, N. Y.—The General Erecting & Improvement Company, 9 East Fortieth Street, New York City, has the general contract for the construction of a $5,000,000 plant for the Continental Dry Dock & Shipbuilding Company. Contracts for the different parts of the plant will be sublet, and the company will be interested in corresponding with engineers and contractors with respect thereto. The company is also interested in receiving lists and quotations regarding machinery and equipment.

SYRACUSE, N. Y.—The Syracuse Lighting Company will shortly erect three concrete and steel substations.

PHILADELPHIA, PA. — Three school buildings, to cost $500,000, $250,000 and $200,000, respectively, will be erected by the Board of Education here. Bids will be asked for in a few weeks. J. Horace Cook is the architect in charge.

PHILADELPHIA, PA.—A hospital building and a power plant to cost $250 000 will be erected for the Misericordia Hospital at Fifty-third Street and Cedar Avenue. E. F. Durang & Son are the architects.

WILKES-BARRE, PA.—A four-story brick, stone, concrete and steel Masonic Temple will be constructed here. The interior illumination will be of the highest order. Sturdevant & Poggi, Reading, Pa., are the architects.

BALTIMORE, MD.—Plans were laid before the Board of Estimates of Baltimore last week by Lighting Superintendent Mohr, under instructions from Mayor Preston, for the extension of the white way lighting system to Hanover Street, from Lombard to the approach to the new Hanover Street bridge, and also for the lighting of the bridge. Mr. Mohr told the board in a letter that the lighting of the new bridge would cost the city of Baltimore about $6,000 a year. He said that the structure was 8,600 feet long. Of this distance 2,300 feet represent the bridge proper, the remaining 6,300 feet being the length of the roadway from the Baltimore County end of the bridge to the Brooklyn shore of Spring Gardens. It was stated that the State Roads Commission would install the lighting fixtures, the plan being to erect combination trolley and electric lighting poles spaced about 100 feet apart. Ornamental poles will be used, and there will be two incandescent 100-watt lamps on each pole. The type of lighting, so far as the candlepower and globe fixtures are concerned, will be the same as has been adopted for other municipal bridges. Mr. Mohr said there would be 356 lamps on the Hanover Street bridge. He stated that the cost of installing and equipping white way lamps on Hanover Street, from Lombard Street to Windser Street, the approach to the bridge, would be $11,765.

BALTIMORE, MD.—Harbor Engineer H. Kent McCay was instructed by the Board of Estimates to prepare specifications for advertisement for the conversion of the old gate house at Druid Lake into a hydroelectric plant, to supply electric current to the city for the lighting of the White Way lamps. The power for the operation of the plant is to be obtained from Jones Falls. The specifications will provide that the current is to be sold to the city at a flat rate, and with the further understanding that the plant would revert to the city at the end of 10 years. The current is to be brought into the city and distributed from a central station to be erected on the ground floor of the old Polytechnic Institute on Courtland Street. The decision of the Board of Estimates last week was the result of an opinion from City Solicitor Field that the city is not empowered to enter into a contract with the Convert Construction Company without open competition. This concern proposed to erect a $200,000 plant at the gate house and supply electricity.

NORTH CENTRAL STATES.

COLUMBUS, O.—A Cleveland electrical expert employed to go over the local municipal light plant, recommends that reserve equipment to cost $129,500 be installed and $134,000 for extension of serivce that will take care of domestic lighting in 1,000 homes. This plan would substitute a 4,000-kilowatt turbine for the present 2,000-kilowatt and mean installing two 500-horsepower boilers. It is proposed to submit to the voters this fall the question of a bond issue of $265,000 to increase the capacity of the plant. J.

RUSH RUN, O.—The American Gas & Electric Company, which has a big modern electrical plant at Wheeling, and which now, through the local light company, is furnishing Steubenville's supply of electricity for light and power purposes, is to build a branch plant to supply its constantly increasing demand.

SANDUSKY, O.—A temporary injunction has been issued stopping work on the ornamental street-lighting system by property owners who object to the plan to pay for it by assessment. A decision will be handed down by the court in a short time. L.

SHOALS, IND.—The Public Service Commission has ordered the municipal water and electric plant at Shoals to sell $7,500 in common stock and $10,500 in preferred stock, and to use the proceeds to improve the plants of the municipality.

MUSKEGON, MICH.—The retail merchants on Terrace Street are discussing plans for extending the boulevard lighting system of Muskegon. Address city clerk.

MEDFORD, WIS.—The Medford Light & Power Company will soon enlarge its plant. M. A. Sprague, of Washburn, Wis., is interested.

PORTAGE, WIS.—The city has voted to purchase the electric light and power plant. This confirms the vote taken at the election on November 3, 1914.

BAY CITY, MICH. — The City Council plans to install a new white way. Address Mayor Kelton.

ELY, MINN.—The council may establish an improved electric-lighting system. Address village clerk.

AMES, IA. — Improvements are planned to the local system of the Iowa Telephone Company, including switchboard and underground conduits. Cost about $25,000.

CLARMONT, IOWA.—Plans are being considered by C. Miller & Sons to double output of the local electric plant, including the installation of a turbine water wheel and a 300-kilowatt generator, directly connected; add to power house, new flumes and tail race. Cost, $20,000.

FAIRBANK, IA.—An election will be held November 1 to vote on the question of issuing $6,500 bonds for electric light plant. Address city clerk.

MEXICO, MO.—Material will be purchased at once for enlarging the lighting system. Address E. R. Locke.

POPLAR BLUFF, MO.—The city will construct an electric light and power plant. Bids will be received November 3. Address H. H. Wilcox, city clerk.

Digitized by Google

HARDTNER, KANS.—A proposition was presented to the City Council, asking for a franchise for an electric light system, and was acted upon favorably. Address city clerk.

PRESTON, KANS.—Estimates are being prepared for a $7,000 electric light plant. Address town clerk.

AINSWORTH, NEB.—The Ainsworth City Council has advertised for bids for lighting the city.

MAGNET, NEB.—P. J. Sandberg is planning to purchase supplies and material for an electric light system and water plant.

DUBOIS, NEB.—An issue of $7,000 electric light bonds was voted recently.

PLYMOUTH, NEB.—The Commercial Club is considering the proposition of procuring electric lights for the village. Address Otto Dorn.

SOUTH CENTRAL STATES.

FLEMINGSBURG, KY.—The Flemingsburg Light & Ice Company has decided to install a new 2,300-volt alternator to take the place of old equipment, with the intention of supplying surrounding towns, as well as Flemingsburg. The new machine will necessitate changing the equipment in use in the city.

LOUISVILLE, KY.—A new substation for the distribution of light and power will be erected by the Louisville Gas & Electric Company at 1919 Stevens Avenue at a cost of $13,000.

GOLTRY, OKLA.—The city will vote on $10,000 bonds to install an electric light plant. Address mayor.

BRYAN, TEX.—Fountain Brothers have applied to the City Council for a franchise for the construction of an electric light and power plant here.

DALLAS, TEX.—The Dallas Union Terminal Company will soon begin the construction of its new electric power plant which will be located near the union station that is now being built.

DECATUR, TEX.—The municipal electric light and power plant will be improved and repaired at a cost of about $10,000.

GREENVILLE, TEX.—The municipal street-lighting system here will be extended.

SHERMAN, TEX.—City Manager Karl M. Mitchell is considering plans for enlarging the municipal electric light and power plant. Considerable new machinery will be installed.

WESTERN STATES.

CHOTEAU, MONT.—Residents of Hobson Addition have petitioned the City Council for the extension of electric-lighting systems to this district. Unofficially reported that the Council will make the extension.

RED CLIFF, COLO.—The Colorado Power Company has been granted a franchise to install a street-lighting system. Address manager.

PHOENIX, ARIZ.—The City Commission has rejected all bids received for new ornamental lighting standards and ordered that advertisement be made for new bids. Nearly 300 posts are needed.

OGDEN, UTAH.—Among the improvements contemplated by the Ogden, Logan & Idaho Railway Company is the construction of new car barns and repair shops at the estimated cost of $140,000, a passenger station at Logan to cost about $30,000 and freight yards at Ogden to cost about $40,000.

SALT LAKE CITY, UTAH.—In accordance with the provisions of the new special lighting-district law, the Board of City Commissioners unanimously passed a formal resolution declaring the intention of the city to create special lighting district No. 1. The city engineer is authorized to prepare plans and specifications for the special lighting system, and to prepare an estimate of cost of installation and maintenance for a term of three years. Address City Engineer Sylvester Q. Cannon.

BOISE, IDA.—March & Stite have filed with the Public Utilities Commission an application for a certificate of public convenience and necessity, giving them permission to install an electric power plant to serve Rockland, in Power County, with light and power. Two applications were filed, one for rights in Power County and the other in the town of Rockland. The territory to be developed is not being served by any company.

EVERETT, WASH.—A. D. Butler, of Seattle, recently filed with the County Clerk, Snohomish County, water-right claims on Jim Creek and the Stillaguamish River. Butler has also filed claims on streams where power might be produced including the Sauk River. He proposes to utilize 3,000 cubic feet per second from the Stillaguamish River and 1,000 cubic feet per second from Jim Creek. Reported that the development of the sites will be started at an early date.

MONTESANO, WASH.—A second application for an electric franchise in Grays Harbor County has been made by George H. Tilden and associates, Hoge Building, Seattle. The former application for franchise was rejected by the commissioners on the ground that there was no evidence to show that Tilden or his associates had title to their power site from which current was to be derived, same being located at Lake Cushman. Subsequent to this refusal, the state courts have ruled that the site at Cushman belongs to Tilden.

OLYMPIA, WASH. — The City Council unanimously voted to enter into a five-year contract for street lighting with the Olympia Light & Power Company.

SEQUIM, WASH. — The Sequim Light & Power Company, here, J. L. Keeler, president and treasurer, reports that in the immediate future it plans the extension of its light and power lines in Ranges 2, 3, 4, 5, in Clallam County.

TACOMA, WASH.—Application has been made to the commissioners of Pierce County by the Pacific Traction, Light & Power Company, for a franchise to extend its lines in the districts of Puyallup, Burnett, Alderton, McMillan and Sumner.

BUTTEVILLE, ORE.—The Molalla Electric Company, of Aurora, Ore., has been granted franchise and has entered into contract with the City Council whereby the Aurora company will install a lighting-system in Butteville, and will furnish current for business and residence lighting as well. The company proposes to extend immediately its transmission lines from Donald to Butteville.

PROPOSALS.

LIGHTING FIXTURES.—Sealed bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until November 15, for furnishing and installing lighting fixtures in the United States Postoffice at Orange, N. J., in accordance with drawings and specifications, copies of which may be had at the office of the Supervising Architect.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids on November 2 for the following. Intending bidders should write to the Bureau for copies of the schedule numbers desired: Schedule No. 8832, electric hoists; schedule No. 8894, single-conductor wire; schedule No. 8895, ammonium chloride for battery use.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,704. ELECTRICAL SUPPLIES.—An American consular officer in India reports that a company in his district desires to be placed in communication with American manufacturers and exporters of electrical supplies, such as lamps, globes, shades, brackets, fixtures, fans, etc. It is explained that cheap goods are generally popular in that district. The firm will arrange to pay cash against shipping documents forwarded through the foreign banks. Correspondence may be in English.

NO. 18,787. ANNUNCIATOR WIRE.—The Bureau has received a report from an American consular officer in Canada stating that a firm in his district desires to communicate with American manufacturers of annunciator wire such as is used in connection with electric bells. The size required is No. 18. It is stated that orders of 500 pounds would be placed.

NO. 18,789. ELECTRICAL HOUSEHOLD APPLIANCES.—The commercial attache of the Department of Commerce in England reports that a business man desires to represent American manufacturers or exporters of electrical household appliances, such as electric irons.

NEW INCORPORATIONS.

TOLEDO, O.—The Standard Electric Stove Company, $100,000 to $300,000.

PULASKI, WIS.—The Pulaski Light & Power Company has been incorporated with a capital of $20,000, by Frank Phillip and others.

WINTON, N. C.—The Ahoskie Light & Power Company has been incorporated with a capital of $50,000, by W. S. Herring and others.

BISMARCK, MO.—The Bismarck Electric Light & Power Company has been incorporated with a capital of $12,000, by G. A. Wahl and others.

TYRONE, OKLA.—The Tyrone Electric Light, Ice & Power Company has been incorporated with a capital of $10,000, by H. Gilmore, G. W. Riffe and others.

NEW YORK, N. Y.—Fort Wyane Electrical Contracting Company, Incorporated. Capital, $2,000.

Digitized by Google

FINANCIAL NOTES.

The Kentucky Utilities Company has closed a deal by which it takes over the plant and properties of the Cynthiana Electric Light Company, and has taken possession. Cynthiana is thirty miles distant from Lexington, and it is understood will be supplied from Lexington.

The annual meeting of the stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, was held in the executive offices of the company last week. Four directors were elected to fill the vacancies on the board. Those elected were: Howard Bruce, vice-president and general manager of the Bartlett-Hayward Company; Siegmund B. Sonneborn, of the firm of Henry Sonneborn & Company; Morton Otis, of London, England, a member of the banking firm of Aldred & Company, and Frank M. Tait, of New York.

Dividends.

	Term	Rate	Payable
Am. Rys., pf.	Q	1.75%	Nov. 15
Bellows Falls Pw., pf.	S	2.5 %	Nov. 1
Col. Ry., Pw. & Lt.	Q	1.25%	Nov. 1
Col. Ry., Pw. & Lt., Series B	Q	1.25%	Nov. 1
Com. Pw., Ry. & Lt., pf.	Q	1.5 %	Nov. 1
Com. Pw., Ry. & Lt., com.	Q	1 %	Nov. 1
Elec. Bond & Share	Q	2 %	Oct. 15
Elec. Bond & Share, pf.	Q	1.5 %	Nov. 1
Empire Dist. Elec., pf.	—	0.75%	Nov. 1
Ft. Worth Pw. & Lt., pf.	Q	1.75%	Nov. 1
Havana Elec. Ry., Lt. & Pw.	—	3 %	Nov. 13
Havana Elec. Ry., Lt. & Pw., pf.	Q	3 %	Nov. 13
Jacksonville Trac., pf.	Q	$0.75	Nov. 1
Keystone Tel., pf.	S	3 %	Nov. 1
Milwaukee Elec. Ry. & Lt., pf.	Q	1.5 %	Nov. 1
Sierra Pac. Elec., pf.	Q	1 %	Nov. 1
Third Ave. R. R.	Q	1 %	Jan. 1

Reports of Earnings.

WESTERN UNION.

The Western Union Telegraph Company report for the nine months ended September 30 (September estimated) compares as follows:

	1915	1914
Total revenues	$37,653,422	$35,486,659
Maintenance, repairs and reserve for depreciation	6,092,182	6,049,060
Operating expenses, taxes, etc.	23,931,590	24,499,985
Total expenses	30,023,772	30,549,045
Balance	7,629,650	4,937,614
Interest	1,001,836	1,002,938
Net income*	6,627,814	3,934,677

*Equal to 6.61 per cent on $99,786,759 outstanding stock for the period, or at yearly rate of 8.82 per cent.

AMERICAN TELEPHONE & TELEGRAPH.

The American Telephone & Telegraph Company report for the nine months ended September 30 compares as follows:

	1915	1914
Total earnings	$34,769.036	$34,602,915
Net	30,587,915	30,490,430
Interest	5,049.384	6 241,562
Dividends	21,592.195	20.679.165
Surplus	3,946,336	3,569,703

PERSONAL MENTION.

MR. A. W. EVANS has been appointed commercial manager in charge of the Athol (Mass.) Gas & Electric Company's business in that city and in Orange and Gardner.

PROF. A. E. KENNELLY, head of the graduate research department of electrical engineering at Harvard and Technology, Boston, addressed the first meeting of the Wireless Society, October 7, on the possibilities of improving the radio station at the Institute.

MR. C. F. NAGLE, superintendent of the Citizens' Electric Illuminating Company, of Pittston, Pa., was accidentally shot and seriously wounded on October 16 by a hunter who was shooting wild ducks along the Susquehanna River at Pittston. Mr. Nagle was at the plant of his company 100 yards away at the time of the accident.

MR. VERNE KENNEDY and MR. HILDING N. CARLSON have been appointed assistants in electrical engineering at the Massachusetts Institute of Technology, Boston, Mass., and MR. A. S. DANA, who was previously appointed research assistant in electrical engineering, was assigned to be part time assistant in the course on alternating currents.

MR. DANA H. HOWARD, superintendent of the advertising department of the Commonwealth Edison Company of Chicago, addressed the Des Moines Admen's Club at luncheon on October 12. He illustrated the value of different methods of advertising, displaying lantern-slide pictures. He said that it is as necessary for the seller to advertise as it is to have goods to sell.

MR. FIN GRAFF, Norwegian technical agent of Christiania, is at present in Chicago on his way to the Panama-Pacific International Exposition, to study electric heating and telephony. Mr. Graff spent considerable time in the factory of the Hughes Electric Heating Company, studying the Hughes ranges. Mr. Graff was one of the many out-of-town visitors to the Jovian convention held in Chicago last week, and particularly enjoyed the "Feast of Jupiter."

MR. R. P. BENEDICT has been chosen manager of the Electric Lighting Department of the city of Chicopee, Mass. For the past five years Mr. Benedict has been commercial manager for the Athol (Mass.) Gas & Electric Company, and prior to that was connected with the Stanley Electric Manufacturing Company, Pittsfield, Mass., the Pittsfield and the Northampton lighting companies and the R. W. Parks properties at Westfield, Mass. The Chicopee department operates a municipal plant which generates about 1,500,000 kilowatt-hours a year and supplies 1,400 commercial customers. Mr. C. W. Whiting, of Boston, has been temporary manager, pending the appointment of a permanent incumbent.

MR. JESSE LEE JONES, recently elected president of the American Institute of Metals, was born at Martins Ferry, O., in 1865. After his graduation from the high school at Martins Ferry, he served his apprenticeship in a gray-iron foundry and here laid the foundations for his subsequent metallurgical work. He graduated from the Ohio State University, at Columbus, in 1890 and soon thereafter took a position with the Junction Iron & Steel Company at Mingo Junction, O., (now a branch of the United States Steel Corporation) where he gained experience in connection with the manufacture of steel, blast-furnace work, etc. He later took up work as chief chemist of William Cramp & Sons, Philadelphia, Pa., where he remained for nine years. During this time he gained a very wide experience

Jesse L. Jones.

in general metallurgical work, having much to do with the manufacture of the various alloys manufactured by that company, in addition to carrying on the chemical control work. In 1903 Mr. Jones became connected with the Westinghouse Electric & Manufacturing Company, being attached to the manager of Works Department, his particular duties being in connection with the control of the manufacture of the various metals and alloys which are used in this company's product. Later Mr. Jones was attached to the Research Division of the Engineering Department and became chief chemist, but still paying particular attention to the various foundry problems. Mr. Jones has been a frequent contributor to the technical press on foundry matters and is author of the book on "Brass." In his present position Mr. Jones has the technical control of the manufacture of approximately 35 different alloys, in addition to having charge of all the chemical work done by the company. Mr. Jones' wide experience as a chemist and engineer and his sterling worth as a man, together with his energy and push, insure an active and successful administration of the American Institute of Metals for the coming year.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 18	Oct. 11
American Tel. & Tel. (New York)	124	123⅞
Commonwealth Edison (Chicago)	136	136
Edison Electric Illuminating (Boston)	239	241
Electric Storage Battery common (Philadelphia)	73	73
Electric Storage Battery preferred (Philadelphia)	73	73
General Electric (New York)	178¾	176
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	6⅜	8
Massachusetts Electric preferred (Boston)	39	38
National Carbon common (Chicago)	150	150
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	133	131½
Philadelphia Electric (Philadelphia)	26	25¾
Postal Telegraph and Cables common (New York)	78	76¼
Postal Telegraph and Cables preferred (New York)	65⅛	65⅛
Western Union (New York)	78½	79
Westinghouse common (New York)	76	76
Westinghouse preferred (New York)	142¼	144

Digitized by Google

MR. GEORGE B. MULDAUR, the genial and efficient field representative of the Society for Electrical Development, Incorporated, was a visitor to Chicago last week, and has returned to New York for treatment for acute inflammatory rheumatism. Mr. Muldaur suffered a great deal during his extended trip covering the last four months, and succumbed to the indisposition, and was laid up in a hospital at San Francisco practically all of September. He is making a rapid recovery, and in all probability will be actively at work again in the near future.

MR. THOMAS A. EDISON was the guest of honor at the Panama-Pacific International Exposition this week, culminating in a specially appropriate celebration of Edison Day, October 21, the thirty-sixth anniversary of his invention of the incandescent lamp. A round of festivities was arranged, beginning with a special reception by a committee of prominent California men on his arrival at San Francisco. Later he was tendered a luncheon and presented with a medal by President C. C. Moore, of the Exposition. Following dinner he was escorted through the exposition grounds where a special illumination program was carried out in his honor; this included the most brilliant and beautiful electrical effects, also fireworks.

OBITUARY.

MR. ANDREW RADEL, prominent as an eastern electric traction builder, died of apoplexy at his home in Bridgeport, Conn., on October 15. He was born in Newark, N. J., 54 years ago. He was one of the leaders in the building and development of the Newark and South Orange street-railway lines, which later became a part of the great network of trolleys covering northern New Jersey. Shortly after coming to Bridgeport, he built the traction system of that city, which is now a part of the Connecticut Railway & Lighting Company. At the time of his death Mr. Radel was a director in the Newark & South Orange Traction Company, vice-president of the New Brunswick Traction Company, and president of the Seaview Railroad and Narragansett Company.

DATES AHEAD.

Independent Telephone Association of America. Annual convention, San Francisco, Cal., October 26-29. Secretary, W. S. Vivian, Chicago, Ill.

American Physical Society. Columbia University, New York City, October 30. Secretary, A. D. Cole, Columbus, O.

Electric Power Club. Homestead Hotel, Hot Springs, Va., November 8-10. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 12-13. Secretary, H. F. Wheeler, Hattiesburg, Miss.

Electrical Supply Jobbers' Association. Quarterly meeting, Homestead Hotel, Hot Springs, Va., November 17-19. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olsen, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

Hughes Electric Heating Company, 211 West Schiller Street, Chicago, Ill., has been awarded the gold medal for its display of electric ranges and ovens at the Panama-Pacific International Exposition, San Francisco, Cal.

Belden Manufacturing Company, Western Avenue and Twenty-third Street, Chicago, Ill., has issued a new discount and price-list applying to its catalog No. 6, dealing with its large assortment of wires and cables.

American Cyanamid Company announces the opening of its general offices at 200 Fifth Avenue, New York, N. Y., on October 1. The Nashville and Buffalo offices were discontinued on that date. A southern office is maintained in the Walton Building, Atlanta, Ga.

Central Electric Company, 326 South Fifth Avenue, Chicago, Ill., has issued catalog No. 55, dealing with Alexalites. This catalog is very attractively illustrated by a large number of fine vignetted half-tones, showing a variety of new and handsome designs of these well known indirect lighting fixtures. Full data are given for each design.

Pass & Seymour, Incorporated, Solvay, N. Y., is sending out a memorandum relative to the supply of Swan strain relief caps and regular pendent caps on its various sockets. This is of value in connection with the new requirements of the National Electrical Code that socket bushings smaller than the three-eighths-inch type will not be approved for pendent work.

Westinghouse Lamp Company, 1261 Broadway, New York, N. Y., has issued a booklet entitled "Lighting that Makes the Home Attractive." This contains a large number of views in a typical home and gives many valuable suggestions for the artistic lighting of the various rooms at comparatively low cost. The views shown of several of the rooms give more than one method of lighting. The use of Westinghouse Mazda lamps is recommended for all parts of the home.

Weston Electrical Instrument Company, Newark, N. J., has issued a number of new bulletins dealing with its line of new electrodynamometer-type portable instruments. Bulletin 2002 describes the single-phase and direct-current wattmeter, model 310, and the polyphase wattmeter, model 329. Bulletin 2003 is devoted to the direct-current and alternating-current portable ammeters, model 370. Bulletin 2004 describes the direct-current and alternating-current portable voltmeters. In each of these bulletins the instruments are illustrated and described in great detail.

Dickinson Manufacturing Company, Springfield, Mass., has issued catalog No. 7, dealing with molded electrical insulations and sundry composition goods. These are phenolic condensation products and are modifications of the one known as "Condensite." Among these products are Stern-Condensite, Sternoid, Sternoid-A and a number of rubber substitutes and special compounds. These all have very desirable electrical characteristics and can be molded into an almost infinite variety of shapes. The Dickinson Manufacturing Company is prepared to mold electrical parts to specifications.

Roth Brothers & Company, 1410 West Adams Street, Chicago, Ill., has issued bulletin No. 212, dealing with home lighting plants, particularly for country homes. The cover has an attractive illustration of such a home brilliantly illuminated electrically. The bulletin describes the various parts of these equipments, including the engine, generator, storage battery, automatic battery-charging switch and voltage regulator. The various parts are illustrated; also the complete plant. These equipments are made in several sizes to meet the varying requirements of plants of this type.

Julius Andrae & Son Company, Milwaukee, Wis., recently celebrated the fifty-fifth anniversary of its starting in business. It was in the year 1860 that Julius Andrae, the founder and president of this well known electrical supply and manufacturing firm, started a blacksmith shop on West Water Street, Milwaukee. Gradually broadening out the scope of his business and steadily increasing its magnitude necessitated the removal of the establishment at least four times to larger quarters, each of which when occupied was considered to be adequate for all future needs. The company now has one of the finest business houses in the city, located at Broadway and Michigan Street. It also has four large warehouses in other portions of Milwaukee, which give it unsurpassed facilities as the largest electrical supply and jobbing house in the Northwest.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is supplying electrical equipment to several prominent paper mills: Crown Willamette Paper Company, Portland, Ore., will increase the capacity of its generating station at Oregon City by the installation of a Westinghouse 1,250-kilowatt water-

Digitized by Google

wheel driven alternating-current generator to operate in parallel with two smaller machines at present installed; the present switchboard equipment will be replaced with a six-panel board. American Writing Paper Company is about to start up a 550-horsepower Westinghouse motor at its Platner & Porter Division plant, Unionsville, Conn.; this motor will obtain power from the local electric light company, and will be used to supplement the water power. Berlin Mills Company, Berlin, N. H., ordered 20 alternating-current motors, aggregating 365 horsepower. Unity Paper Mills, Incorporated, having recently taken over the old property of the Potsdam Paper Company, Potsdam, N. Y., is bringing this mill up to date through the installation of electric motors.

Record of Electrical Patents

Issued by the United States Patent Office, October 12, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,156,046. Safety System for Electric Railways. P. L. Bailey, Indianapolis, Ind. Block signal system; signal wire extending beyond block is adapted to cut out car motor, the extension being controlled by car in block.

1,156,061. Electric Typewriter. M. C. Crawley, assignor to Addograph Co., Los Angeles, Cal. Typebars operated by electric motor.

1,156,064. Electric Illumination. H. Deschere, New York, N. Y. Series lamps have auxiliary filaments to prevent open circuit on breaking of service filament.

1,156,078. Air-Vending Machine. A. P. Holden and R. J. Copeland, Toronto, Ont., Canada. Coin-controlled, electric-motor-driven compressor.

1,156,089. Insulator for Overhead Conductors of Electric Lines. F. Libano, Trieste, Austria-Hungary. Details of trolley hanger.

1,156,113. Azimuth and Other Indicator. G. S. Tiffany, assignor to Gray National Telautograph Co., New York, N. Y. Electrical means operated on Wheatstone-bridge principle for causing movements of an indicator to follow movements of a member at a distance.

1,156,121. Combination Switch. A. F. Wise, assignor to H. C. Dunning and C. E. Dennis, Columbus, O. Particular structure of multiple-contact rotary switch with quick break.

1,156,126. Time Switch. J. M. Andersen, assignor to A. & J. M. Anderson Mfg. Co., Boston, Mass. Details of mechanism.

1,156,136. Method of Operating Polyphase Motors. H. W. Doubrava and J. Heineman, assignors to Wagner Electric Mfg. Co., St. Louis, Mo. In starting inducing conductors are distributed through more than 360 electrical degrees, the conductors being distributed over a smaller number of degrees under running conditions.

1,156,157. Receiver. O. M. Leich, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Particular structure of telephone receiver having improved magnetic circuit.

1,156,163. Manufacture of Insulators for High-Potential Electric Conductors. F. M. Locke, Victor, N. Y. Formed by fusing a glass base and boron material into homogeneous body.

1,156,171. Carbonizing Pipe-Bowls. W. A. Paul, Moline, Ill. Electric heater inserted into smoking-pipe bowl closed against admission of air.

1,156,192. Apparatus for Improving the Stability of Furnaces with Magnetically Extended Electric Arcs. E. Troye, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Steadily burning arc is secured in arc-disk furnace by providing stationary body of relatively great conductivity adjacent the electrodes.

1,156,201. Electric Switch or Contactor. T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Electromagnetically operated laminated brush and carbon break.

1,156,223. Electric Laundry-Roll. W. S. Hadaway, Jr., New Rochelle, N. Y. Comprises particular structure of electric heater.

1,156,226. Recording Electric Meter. A. Herz, Chicago, Ill. Recording apparatus controlled by variable resistance of selenium cells.

1,156,227. Low-Resistance Vapor Electric Device. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Positive electrode is located in region in which negative-electrode component of fall of potential occurs.

1,156,228. Controlling Means for Vapor Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. Mercury-arc rectifier with a condenser shunted between the anodes and A. C. terminals.

1,156,253. Telephone System. L. W. Stanton, Cleveland, O., assignor of one-half to F. W. Dunbar. Automatic mechanism for connecting calling lines with operators' sets.

1,156,255. Combined Timer and Distributer. A. L. Strahle, assignor of one-half to L. P. Byars, Benson, Nebr. Timer has wiping contacts.

1,156,257. Gas or Vapor Electric Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co. Vapor chamber created in central portion of W-shaped tube by vaporizing mercury therein, this driving out liquid mercury which forms seals at the ends.

1,156,258. Cash-Register. E. J. Von Pein, assignor to National Cash Register Co., Dayton, O. Motor switch controlled by key which controls connections of totalizers and driving mechanism.

1,156,270. Trolley Wheel. S. G. Buskard, assignor of one-half to L. Lyons, F. G. Mummery and H. Carpenter, Hamilton, Ont., Canada. Wheel-shaft lubrication.

1,156,282. Electric Switch. W. H. Farmer, assignor of one-third to H. I. Phinney, Boothbay Harbor, Me. Simple structure for connecting conductor ends.

1,156,288. Electric Typewriter. E. Hausberg, Des Moines, Ia. Key-controlled electromagnets operate typebars.

1,156,297. Method of Assembling Cores of Electrical Apparatus. E. R. Knight, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Laminated core is formed outside of machine and then forced into the yoke.

1,156,314. Connector for Ground Terminals. A. R. Rheinberger, St. Paul, Minn. Device for securely connecting line wire to ground rod.

1,156,315. Electrode. W. H. Rowley, University, Mo. Storage-battery plate comprises supporting grid carrying screen of metal, lead fiber forming uneven surface to which oxide of lead is applied.

1,156,316. Process of Making Electrodes. W. H. Rowley, St. Louis, Mo. Oxide of lead paste applied to frame is pressed and surface moisture partially removed and treated to bath of sulphuric acid.

1,156,317. Electromedical Apparatus. C. Santos and R. Boerner, assignors to Siemens & Halske A. G., Berlin, Germany. For diathermic treatment.

1,156,321. Expression Device for Musical Instruments. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. Sonorous bodies actuated by impulses in electromagnets are controlled by resistances in the circuits.

1,156,334. Electrical Signaling System and Apparatus. C. W. Ward, Lakewood, O. Structure of trolley-actuated switch.

1,156,344. Pull Pendent Switch. F. A. Brogden, assignor to Pass & Seymour, Inc., Solvay, N. Y. Has detachable, two-part casing, switch mechanism being secured to one part and exposed by removal of other.

1,156,349. Connector for Electrical Conductors. H. E. Denham, Slayden, Tex. Axially spring-pressed member has binding post at one end connected with contact plate at other.

1,156,352. Selective System and Apparatus. J. F. Engle, Cleveland, O. Step-by-step signaling apparatus for party-line telephones.

1,156,364. Induction Motor. B. McCollum, Washington, D. C. Resistance in squirrel cage has temperature coefficient such that it has abrupt rise in resistance with starting currents.

1,156,366. Collision-Prevention Device. C. Martin, New York, N. Y. For vessels: feelers controlling signal circuit carried on floats in advance.

1,156,400. Clock-Driven Controller. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Electromagnetically operated recording mechanism controlled by time mechanism.

1,156,412. Electric Wattmeter. P. M. Lincoln, Pittsburgh, Pa. Heating in two derived circuits compared, both circuits carrying superposed currents proportional to voltage and current respectively, the currents being opposed in one circuit and cumulative in the other.

1,156,413. Volt-Ampere Meter. P. M. Lincoln. For alternating circuits; several components of energy are separately measured and measurements combined to give joint indication.

1,156,414. Electric Indicator. P. M. Lincoln. Ammeter operating by differential temperature changes between two chambers, one of which is electrically heated.

1,156,415. Electrical Controlling Apparatus. D. L. Lindquist, assignor to Otis Elevator Co., New York, N. Y. For hoisting machinery; has auxiliary slow-down shunt field with resistance controlled to slow down at different rates according to direction of movement.

1,156,416. Telephone-Exchange System. F. R. McBerty, assignor to Western Electric Co., New York, N. Y. Comprises step-by-step switch intermittently connected with continuously operated power device by electromagnet controlled by sender.

1,156,422. Metal Pole. C. L. Michod, Chicago, Ill. Wire-supporting pole built up of structural iron.

1,156,426. Apparatus for Electric Welding. T. E. Murray, New York, N. Y. A number of pairs of pieces to be welded are connected in parallel with the current source and whole current may be sent through one pair, the time periods during which the circuits may be closed being automatically determined.

1,156,433. Hydraulic Elevator. C. R. Pratt, assignor to Otis Elevator Co. Electrically controlled differential mechanism controls power connection of hoisting drum.

1,156,442. Insulator. L. Steinberger, Brooklyn, N. Y. Structure of suspension insulator.

1,156,450. Cord Circuit for Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of relays controlling supervisory signal.

1,156,452. Insulating Composition. L. H. Baekeland, assignor to General Bakelite Co., New York, N. Y. For impregnating coils, etc.; comprises phenolic condensation product, which is fluid at normal temperatures and infusible and elastic at higher temperatures.

1,156,453. Signaling System for Automobiles or the Like. E. T. Banes, Ogontz, Pa. Tail light controlled in response to movements of auxiliary carbureter air-valve.

1,156,454. Electric Lighting Fixture. G. W. Bayley, assignor to Bayley & Sons, Inc., Brooklyn, N. Y. Paneled shade with dish suspended therefrom.

1,156,473. Shade-Holder. G. A. Gauthier, assignor to Arrow Electric Co., Hartford, Conn. Holder secured to sleeve about socket by fingers forced into sleeve openings by sliding collar.

1,156,475. Automatic Telephone-Exchange System. C. L. Goodrum, assignor to Western Electric Co., New York, N. Y. Has provision for selectively calling subscribers on party lines.

1,156,477. Lighting Apparatus. W. M. Grosvenor, Grantwood, N. J. Structure mounted in wall lights several compartments.

1,156,481. Electrical Controlling Apparatus. J. D. Ihlder, assignor to Otis Elevator Co. Slowing down mechanism for electric motor controlled manually and by load magnet has effect automatically made variable with motor speed.

1,156,494. System of Motor Control. S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Particular manner of controlling direction of rotation and acceleration of motor.

1,156,491. Frequency-Indicator. D. R. Price, assignor to General Electric Co., Schenectady, N. Y. One of two relatively movable elements has two opposed wind-

Digitized by Google

ings tuned to different frequencies, acting upon the other member, with means for accentuating the torque of a winding when its frequency is greatly departed from.

1,156,492. Method of Drawing Refractory Materials for Incandescent Lamps. H. C. G. Remane, assignor to General Electric Co. Tungsten wire is coated with sulphate of tungsten before drawing and sulphate is decomposed afterward.

1,156,496. Process for Annealing Magnetic Material. W. E. Ruder, assignor to General Electric Co. Silicon steel is heated in nonoxidizing atmosphere and cooled in air.

1,156,502. Arc Welding. J. A. Seede, assignor to General Electric Co. Electrodes connected to opposite sides of current source are alternately used.

1,156,509. Microphone. E. Weintraub and L. W. Miller, assignors to General Electric Co. Contains hard granules made by carbonizing resinous phenolic condensation product.

1,156,524. Selenium Cell Especially Adapted for Use in Connection with Telegraphy. K. C. Cox, Norfolk Island. Has alternate conducting and insulating plates with selenium carried by insulating plates and contacting with conducting plates.

1,156,526. Testing Cutout for Arc Lamps. E. J. Guay, assignor to General Electric Co. Has testing shunt across arc opened by arc-starting means and spark gap in shunt with arc gap, the spark gap being reduced when arc fails to start.

1,156,528. Photographic Printing Apparatus. T. Harbers, Deipzig, Germany. Compact apparatus contained in box, for printing by electric light.

1,156,536 and 1,156,537. Illuminating Apparatus. W. Lumley, assignor to General Electric Co. First patent: Bowl made of superposed rings. Second patent: Similar to 1,156,536, the bowl being made up of overlapping sections.

1,156,542. Electric Switch. E. B. Merriam, assignor to General Electric Co. Oil switch; contact moved laterally through opening in arc-restraining bell.

1,156,560. Incandescent-Electric-Lamp Fixture. E. G. Smith and F. J. Mantel, assignors to Crouse-Hinds Co., Syracuse, N. Y. For lighting car berths, etc., lamp being movable into and out of wall recess.

1,156,583. Electric-Conduit Fitting. C. H. Pissel and F. Smith, assignors to Crouse-Hinds Co. Box for mounting electrical appliance and switch and adapted for securing to conduit.

1,156,585. Electric-Light Fixture. W. J. Bohan, St. Paul, Minn. Simple integral structure of pedestal and reflector for table lamp.

1,156,594. Electric-Generator-Operating Device. W. S. Fiscus, Steubenville, O. Generator driven by turbine in engine exhaust of automobile.

1,156,610. Elevator-Despatcher. G. W. Meyers, Chicago, Ill. Gearing and circuit arrangements for electrically operated signal element.

1,156,624. Duplex Lighting System. J. R. Pagin, Valparaiso, Ind. Headlight utilizes both gas and electric lights.

1,156,625. Wireless Receiving Improvement. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., New York, N. Y. Arrangement of magnetic amplifier.

1,156,626. Telephone System. R. L. Quass, assignor to Western Electric Co. Automatic ringing controlled by link conductors.

1,156,630. Method of and Means for Measuring the Flow of Fluids. M. A. Savage, assignor to General Electric Co. Variation of resistance of electrically heated conductor in conduit is observed.

1,156,635. Flow-Meter. J. W. Shepardson, assignor to General Electric Co. Gaseous flow in conduit is measured by varying resistance in wattmeter circuit associated with Venturi tube.

1,156,636. Telephone Repeater. H. E. Shreeve, assignor to Western Electric Co. Magnetically operated microphone adapted to radiate heat and prevent packing of granules.

1,156,638. Flow-Meter. L. A. Simmons, assignor to General Electric Co. Conduit flow measured by electric current regulated to maintain resistance element in conduit at constant temperature.

1,156,639. Dynamo-Electric Machine. C. W. Starker, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Structure of laminated stator.

1,156,645. Dynamo-Electric Machine. M. Walker, assignor to Westinghouse Electric & Mfg. Co. Structure of field magnet effecting particular distribution of magnetism in direct-current machine or converter, to improve commutation.

1,156,650. Basing Incandescent Lamps. G. Wright, assignor to General Electric Co. Base is detachably clamped to bulb.

1,156,655. Circuit-Interrupting Device. W. M. Austin and J. N. Mahoney, assignors to Westinghouse Electric & Mfg. Co. Automatic circuit-breaker having gang of contacting arms operated together and an independent contacting arm.

1,156,656. Motor-Control System. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. For controlling two or more series-wound motors by altering relative connections of their elements.

1,156,660. Method and Apparatus for Measuring the Flow of Fluids. E. J. Berg, assignor to General Electric Co. Modification of No. 1,156,638.

1,156,666. Electrolytic Rectifier. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Arrangement for cooling of electrodes.

1,156,668. Electric Furnace. E. F. Collins, assignor to General Electric Co. Has resistance heaters at top and bottom of heating chamber, the top being nonoxidizable and having negative temperature-coefficient and higher resistance when cool than the bottom heater.

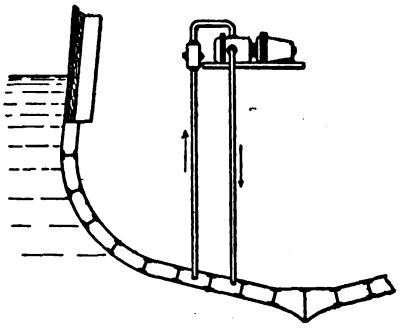
1,156,671. Electromagnetic Relay. E. B. Craft, assignor to Western Electric Co. Flat structure occupying small lateral space.

1,156,675. Dynamo-Electric Machine. H. F. T. Erhen and W. J. Delles, assignors to General Electric Co. Structure of field member having compensating winding.

1,156,677. Apparatus for the Transmission of Energy by Electric Oscillation. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Wireless receiving system.

1,156,679. Method of Changing the Composition of Iron and Steel. B. Ford, Philadelphia, Pa. Iron and steel carburized by melting in chamber from which air is excluded, molten metal being covered with carbon-supplying material and electrically maintained in molten condition.

1,156,680. Temperature-Indicator. C. Le G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Temperature of oil-immersed transformer indicated by thermometer subjected to current of device and immersed in the oil.



No. 1,156,829.—Cooling Marine Generator.

1,156,681. Electric Switch. H. G. French, assignor to General Electric Co. Locking device for knife-blade switch.

1,156,682. Motor-Control System. E. A. Hanff, assignor to Westinghouse Electric & Mfg. Co. For a number of series-wound motors.

1,156,686. Negative-Pole Plate for Secondary or Storage Batteries. G. M. Howard, Philadelphia, Pa. Structure adapted to receive charge readily which may be safely handled and will not heat when immersed in electrolyte, active material being dry metallic lead bound with sulphate of lead and free from oxide.

1,156,688. Electric Railway-Signal. J. B. Howell, Leavenworth, Kans. Trolley-controlled block-signal system.

1,156,696. Electrode. C. R. Krueger, assignor to General Electric Co. For arc lights: contains white flaming material and a steadier composed principally of a lithium compound.

1,156,705. Fire-Alarm Box. A. Mozdziers, Shelton, Conn. Arrangement of hand entrance and contacts.

1,156,708. Transformer Casing. E. G. Reed, assignor to Westinghouse Electric & Mfg. Co. Has cast-iron body and end members with external cooling tubes passing between plates cast in end members.

1,156,710. Method of Making Terminal Devices. B. P. Rowe, assignor to Westinghouse Electric & Mfg. Co. Formed from a sheet-metal tube.

1,156,711. Armature Winding. Y. Sakai, assignor to Westinghouse Electric & Mfg. Co. Two windings of different pitch have corresponding points connected together at ends of armature.

1,156,715. Electro-Osmotical Filter Press. B. Schwerin, assignor to Gesellschaft für Elektro-Osmose M. B. H., Frankfort-on-the-Main, Germany. Comprises perforated electrodes having filter cloths on their adjacent sides, constant volume between them, and device for supplying suspension to the space.

1,156,717. Automatic Fire-Alarm. J. B. Smith, Manchester, N. H. Weight closes contacts on fusing of support.

1,156,727. Electric Fitting. C. Wagner, assignor to Bryant Electric Co., Bridgeport, Conn. Switch, wire conduits, casing, etc., in structure simulating candle.

1,156,782. Device for Under-Water Exploration. C. F. Jenkins, Washington, D. C. Rigid tube is detachably secured to ship side by electromagnet.

1,156,796, 1,156,797 and 1,156,799. Spark Plug. J. W. Meaker, Detroit, Mich. First patent: particular integral structure insuring proper spark gap. Second and third patents: particular structures of case and insulating body.

1,156,809. Burglar-Alarm Bolt. T. L. Pidgeon, St. Barnebe, Que., Canada. When sliding-door bolt is rocked, alarm circuit is closed.

1,156,825. Gas or Vapor Electric Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co. W-shaped mercury-vapor lamp is steadied by permitting escape of vapor, on too great pressure, from central operating portion to end condensing chambers.

1,156,825. Electrolytic Meter. J. N. Tuttle, assignor to General Electric Co. Has mercury anode supported on diaphragm of silk.

1,156,827. Electric Meter. J. Vivell, assignor to General Electric Co. Time is recorded during which metered energy exceeds certain value.

1,156,829. Cooling Device for Electrical Machines Mounted on Vessels. H. Weiss, Vienna, Austria-Hungary. Apparatus has air jacket communicating with air chamber between inner and outer shells of hull. (See cut.)

1,156,862. Pneumatic-Tire Gauge. R. C. Sibley, Boston, Mass. Pressure gauge on wheel electrically controls telltale on vehicle body.

1,156,864. Computing Weighing Apparatus. H. A. Carpenter and A. W. Warner, assignors to Riter-Conley Mfg. Co., Pittsburgh, Pa. Motor-shifted weight controlled by switch mechanism from a single point to provide gross and tare weights, the switch mechanism being controlled by a scale beam.

1,156,865. Sound and Light Amplifier. H. J. Farrar, assignor to Universal High Power Telephone Co., King County, Wash. Comprises telephone receiver and lamp, the light and sound being delivered through same horn-like structure.

1,156,867. Universal Sound-Transmitting Means. P. J. Hackett, assignor to Universal High Power Telephone Co. A number of particularly constructed microphones connected by sound tubes with a common source of sound.

Patents Expired.

The following United States electrical patents expired on October 18, 1915:

612,410. Electric Trolley Device. A. J. Gairing, Johnstown, Pa.

612,426. Electric Meter. W. D. Marks and G. R. Green, Philadelphia, Pa.

612,441. Electric Time Alarm. H. D. Tenny, Milford, Mich.

612,457. Electric Railway. C. H. Myers, Buffalo, N. Y.

612,556. Electric Arc Lamp. C. A. Vigreux and L. V. Brillie, Levallois-Perret, France.

612,560. Electric Lamp Socket. J. E. Crigg, Newark, N. J.

612,629. Means for Controlling Operation of Electric Motors. J. D. Ihlder, Yonkers, N. Y.

612,644. Depressible-Rail System for Electrical Railways. W. Grunow, Jr., Bridgeport, Conn.

612,649. Battery Electrode. H. S. Lloyd, Philadelphia, Pa.

612,670. Electric-Cable Switch. A. Norman, Toronto, Canada.

612,681. Telephone-Exchange Mechanism. H. P. Snow, Erie, Pa.

612,696. Rail Joint for Electric Railways. M. Barschall, Berlin, Germany.

612,702. Automatic Electrically Controlled Railway Switch. R. V. Cheatham, Louisville, Ky.

612,708. Electric Signaling Apparatus. W. F. Decrow, Boston, Mass.

612,781. Electric Meter or Indicator. W. D. Marks, Philadelphia, Pa.

612,782. Coin-Actuated Signal Apparatus. U. R. Mason, Ludington, Mich.

612,789. Electric Self-Loading Street-Cleaning Car. A. J. Reynolds, Worcester, Mass.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII. No. 18. CHICAGO, SATURDAY, OCTOBER 30, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.
E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Electrical Construction and Operating Rules..... 785
Making Extensions Pay for Themselves..... 786
The Law of Hysteresis..... 787
Some Remarkable Magnetic Material..... 787
DEPARTMENTS:
Commercial Practice..... 792
Electrical Construction..... 796
Dollar Wiring Kinks..... 801
Public Service Commissions..... 802
New Electrical and Mechanical Appliances..... 813
Latest Approved Fittings..... 817
Current Electrical News..... 819
Record of Electrical Patents..... 823
LEADING ARTICLES:
Electricity in Textile Mills..... 789
What the Dealer and Contractor Can Do to Cash in on Electrical Prosperity Week..... 797
American Institute of Electrical Engineers..... 806
BOOK REVIEWS..... 812
MISCELLANEOUS:
Dr. Steinmetz Addresses Chicago Electric Club-Jovian League 788
Transatlantic Wireless Telephony..... 788
Joint Meeting in New York..... 788
Armory Lighted for Tennis..... 788
Year's Record Shows Value of Wireless in Saving Lives.. 788
Important Topics To Be Discussed by Ohio New-Business Men 792
Effective Central-Station Post Card..... 792
Vermont Company's Active Wiring Campaign..... 792
Novel Advertising Display for Combination Company..... 792
Improvements Made in Louisville Panel Board..... 792
Battery Rental Systems as an Aid to Electric-Vehicle Development 793
Clerical Error not Libel..... 795
Central-Station Celebrates Thirty-fifth Anniversary..... 795
H. E. Young..... 795
Standards of Electrical Construction and Operation..... 796
English Guarantee Scheme Fails..... 800
Electrical Contractor Wins Prize..... 800
Among the Contractors..... 800
Convention of National Safety Council..... 804
Railway Electrical Engineers Hold Annual Convention in Chicago..... 805
Convention of Kansas Association..... 809
Light and Illumination..... 810
Annual Meeting and New York Section Meeting, Illuminating Engineering Society..... 810
British Government Committee Report on Factory Lighting 810

Copyright, 1915, by Electrical Review Publishing Company, Inc.

ELECTRICAL CONSTRUCTION AND OPERATING RULES.

For years the only authority which attempted to exercise any control over electrical installations was the National Board of Fire Underwriters, which through its inspectors and by means of the National Electrical Code attempted to maintain some supervision over the safety and adequacy of electric wiring in buildings. Outside construction was left without supervision except that given it by the operating companies themselves. Until experience and experiment showed what was the best practice, it was undoubtedly inadvisable for any outside authority to step in and supervise, much less dictate as to what is and what is not safe and reliable construction. Furthermore, before the advent of the long-distance high-power transmission lines with their high voltages, the telegraph and telephone companies were left in undisputed possession of the public highways and railroad rights of way, and so far as inductive interference is concerned, this was confined mainly to cross talk. With the advent of the high-voltage power lines new difficulties were encountered. The paralleling of a telephone line for about forty miles by a power line in California led to the appointment of a Joint Committee on Inductive Interference. The report of this committee was used for the basis of a set of rules promulgated by the California Railroad Commission in August, 1914, dealing with the construction and operation of electric distribution systems and communication circuits which are, or are intended to be, so located as to create inductive interference.

The public utility commissions of other states have been studying the findings of the Joint Committee and the rules of the California Commission and are issuing rules for the guidance of public utility companies.

On October 22, at Madison, Wis., a joint hearing was held by the Railroad and Industrial Commissions of Wisconsin on a proposed set of rules which are to be known as "Standards of Electrical Construction and Operation." Attention should be focussed on the last word of the proposed title of the rules. The public utility commissions are no longer content to specify the kind of service a utility is to furnish, but as the above heading indicates, they intend to specify, to some extent at least, how the companies are to operate their plants in order not to interfere with the service given by some other utility. To do this the Railroad Commission of Wisconsin was given power by the last legislature. The law specifies that after a "hearing the

Digitized by Google

Commission shall determine what alteration in construction or location, or methods of operation are required for public safety or to avoid service interference and by whom same shall be made. The Commission shall fix the proportion of the cost and expense of such change or changes which shall be paid by the party or parties interested, and fix reasonable terms and conditions in connection therewith."

In conformity with the above mentioned law, the Railroad Commission formulated a tentative set of rules and submitted them to interested parties for consideration. The tentative rules on interference are taken literally from the rules of the California Commission, and as their enforcement would necessitate some radical changes in present practice, considerable discussion and opposition to these was developed. It seems inevitable, however, that greater authority will be exercised in the future by state utility commissions in this regard.

In view of this undoubted tendency, it is desirable to urge caution before the formal adoption of stringent rules on the subject. It has been the practice among the newer state commissions to be guided largely by the experience and rulings of the older commissions, like those of Wisconsin and Massachusetts. The Wisconsin Commission has wisely decided to defer final action on the rules until there is a wider consensus of opinion on the subject, at any rate until after the postponed hearing before the Bureau of Standards at Washington where the matter of safety rules will doubtless be discussed by electrical men of national prominence.

MAKING EXTENSIONS PAY FOR THEMSELVES.

The meeting of the American Institute of Electrical Engineers at St. Louis last week followed a program made up of papers dealing almost exclusively with technical subjects. There was one paper, however, which considered a broad matter of public policy in the relationship between municipalities and utility corporations. This was the paper by Mr. Philip J. Kealy, of Kansas City, in which he compared the new traction franchise in that city with the arrangements which have been adopted in other municipalities.

Aside from this comparison, there are several points in Mr. Kealy's paper which deserve more than superficial attention in considering the best policies for public adoption in connection with the operation and extension of utility service. Mr. Kealy showed that a wide extension of utility service is desirable. But policies are often adopted which restrict such extensions. One practice which has this tendency is the diversion of earnings into the municipal coffers for general purposes. This may take the form of a tax on gross earnings or a share in the surplus. Users of the utility are thus subjected to an increased charge for general purposes which might better be used in constructing extensions. Growth is often retarded by limiting the operating company to a rate of return which does not invite the investment of any new capital.

An important point brought out by Mr. Kealy is in relation to the values of land in the neighborhood involved in extensions. Any extension of utility service increases the value of real estate affected thereby, since sites are more desirable, for either business or residential use, in proportion to the degree in which they are supplied with water, gas, street car, electric, school, telephone or other utility services. Since extensions of service create values which attach to the land, it is only just that the recipients of such values should contribute to the cost of the extensions. In the case of utilities owned by the municipality this is sometimes, as in the case of sewers and water pipes, accomplished through the system of assessing benefits. This usually makes it possible to extend the service whenever a neighborhood demands it. It is proposed to apply this method to street-railway extensions in Cleveland and Philadelphia, but so far it has had little application to utilities outside of those mentioned above.

It has been estimated that the cost of New York City's subways is equaled or even surpassed by the increases in real-estate values thereby created. If the funds for this construction work were raised by assessing benefits against the land involved, there would be no bonded indebtedness hanging over the project, and prices for service could be fixed at a figure covering cost of operation and depreciation, without an enormous fixed charge to meet bond interest. Extensions would undoubtedly be made much more rapidly under such a system.

The application of such a method to utilities owned by corporations would not be easy. If it were arranged that extensions so financed were not to be included in the capitalization upon which a return must be earned the way would be opened, however. Under such a system a utility could expand and enlarge its operations without building up an enormous capitalization, with the result of lower rates and much more general utilization of service.

Attempts have been made in some cases by utility promoters to prevent the values created by extensions from going into the private pockets of outsiders. This can be done by buying up in advance the land through which a projected extension is to be run. In the cases of steam and electric railways this has been frequently done by promoters or others intimately associated with the management of such utilities. In most cases, however, such control is obtained in a private rather than a corporate capacity, so that the profits find their way into individual hands instead of helping to finance the utility. It will only be after a general understanding of the benefits to the public from utilizing the values so created to make extensions pay for themselves, that much progress can be made in applying such a principle, even though it is fundamentally just and would greatly accelerate the development of any community when adopted as a public policy.

Digitized by Google

SOME REMARKABLE MAGNETIC MATERIAL.

The paper presented by Mr. Trygve D. Yensen at the St. Louis meeting of the American Institute of Electrical Engineers last week calls attention to some alloys of iron having magnetic constants higher than have heretofore been observed in any other material. Mr. Yensen has for several years been experimenting with iron which is deposited electrolytically and then melted in a vacuum. The latter process serves to get rid of the hydrogen which is ordinarily present in iron prepared by the electrolytic method and furnishes a material which approaches more nearly to chemically pure iron than any which has been prepared in quantity.

Pure iron prepared in this manner shows itself to be highly magnetic and to possess desirable properties. The maximum permeability exceeds 20,000 and the hysteresis loss is low, and the figures are improved still more by appropriate annealing. It is when certain alloys are prepared from this pure iron, however, that the most remarkable properties become evident.

Certain alloys of silicon show maximum permeabilities higher than 60,000 and even allowing for possible inaccuracies in measurement, this represents a higher magnetic quality than has ever been attained before. These particular alloys are mechanically workable and have low hysteresis and eddy-current losses, so that they would appear suitable for industrial application. The specimens used, however, were in cast form. How much the magnetic properties may be altered by rolling into sheets remains to be seen. As to the commercial use of alloys of electrolytic iron, the excellent magnetic constants of such material must be weighed against the increased cost of producing such iron as compared with the open-hearth furnace.

The magnetic qualities of iron alloys and steels can always be affected by heat and by mechanical treatment. Annealing makes them magnetically softer while mechanical working makes them magnetically harder. It is common experience among all who have handled specimens which are especially soft in a magnetic sense, that these specimens are the most susceptible to treatment, and change their magnetic constants at the slightest provocation. While the silicon-alloys here considered do not appear to be as sensitive as might have been supposed, one can hardly hope that they would stand ordinary shop handling without change.

An alloy of cobalt with the electrolytic iron shows a higher value for magnetic saturation than any other known material. This alloy also has a high permeability in intense fields, as compared with other materials, and a low hysteresis loss. It would thus be indicated as a good material for the teeth of the cores of electric generators, were it not for the poor mechanical qualities, which would prevent such application. The cost would also probably be prohibitive, since this alloy is one-third cobalt.

THE LAW OF HYSTERESIS.

It has been nearly a quarter of a century since Dr. C. P. Steinmetz, as the result of an investigation into the variation of magnetic hysteresis with the limiting values of the flux-density to which the magnetic material is subjected, enunciated the law connecting these two variables. He found the energy transformed into heat in each unit of magnetic material subjected to a cyclic variation of flux to be proportional to the 1.6th power of the maximum flux-density; or, if the cycle did not extend to equal values in opposite directions, to this power of the range in flux-density. The relation then discovered has proven a very useful one in investigating the magnetic properties of materials and in computing values of iron losses in machinery. The extent of its validity led to the idea that it might be dependent upon some fundamental property and efforts were consequently made to find some theoretical basis for the value of the exponent involved. No result of consequence in this direction was achieved, however, and it has come to be recognized that the law is a purely empirical one, which applies over a considerable range, and that apparent departures from it are not due to inaccuracies of measurement, but to inaccuracy in the law itself.

With the improvement of experimental methods and apparatus and the attainment of greater accuracy in measurement and more definite conditions of magnetization, it has been found that the law of Steinmetz is of limited application and is not exact in any mathematical sense even in the ordinary ranges of magnetization. Where very high or very low values of flux-density are involved, the departures from proportionality to the 1.6th power of flux-density are marked.

The two latest contributions to this subject deal with magnetic cycles whose extreme values are not symmetrically related to the neutral condition. Measurements of such displaced hysteresis loops have been made by Mr. J. D. Ball of Schenectady and by Messrs. Chubb and Spooner of East Pittsburgh. The results were presented at the St. Louis meeting of the American Institute of Electrical Engineers last week. The condition in question is met practically in the teeth of armatures subjected to variations in magnetic flux.

It was formerly thought that the hysteretic loss per cycle depended only on the range of values of flux-density involved, regardless of the absolute values limiting this range. While it has been recognized for some time that this statement does not correspond with the facts, no extended investigation has heretofore been published. These investigations show that the further the cycle is displaced from the symmetrical range of values, the greater is the hysteresis loss per cycle. Much remains to be done, however, in determining how all of the possible variables in the case affect the result.

Digitized by Google

Dr. Steinmetz Addresses Chicago Electric Club-Jovian League.

In an address on "Central Station Development," before the Electric Club-Jovian League of Chicago, on October 26, Dr. Charles P. Steinmetz compared present-day civilization with that of the last century and graphically illustrated our dependence on an available supply of energy. Energy devised from fuel is economical only when generated in large quantities whereas electrical energy can be converted into mechanical energy in small quantities with practically the same efficiency as in bulk.

Dr. Steinmetz stated that we are now witnessing a development in central-station practice that will mean ultimately the centralization of generating plants and the tying together of transmission systems into a vast network, covering the entire country in somewhat the same manner as the railroads have covered the country with their lines. Electricity supply companies, like railroads, are not merely public utilities, but are public necessities and should have the right of securing right of ways by condemnation proceedings. When such development takes place the rates for electricity will be greatly lowered, because of the much greater use and likewise the cost of various appliances will be lowered and many more new appliances now unthought of will be developed.

At the meeting on October 21, F. A. Britten, United States congressman, discussed the question of preparedness, particularly of providing adequately for defending our Pacific possessions. Mr. Britten's remarks were based on observations made on a recent trip through the Far East.

Transatlantic Wireless Telephony.

The recent experiments in wireless telephony between Arlington, Va., and the Mare Island Navy Yard, California, and between Arlington and Honolulu, which resulted so successfully, have been followed by a similar success in the attempt to communicate between Arlington and the station on the Eiffel Tower, in Paris, France. The first conversation between the latter points was carried out on the night of October 12 and this success was repeated on the following night.

This work has been carried out by the engineers of the American Telephone and Telegraph Company in cooperation with the Radio Service of the Navy Department. The same equipment was used at Arlington as in the previous tests and it is stated that except for the interference due to war conditions these experiments would have preceded those which resulted in transcontinental telegraph by radio waves.

Joint Meeting in New York.

The New York Section of the American Electrochemical Society has arranged for a joint meeting with the Illuminating Engineering Society on the evening of November 11 at the Engineering Societies Building, New York City. The subject of the meeting will be electrical phenomena in vapors and gases. The following papers will be presented:

"Unstable States in Arc and Glow," by Walter G. Cady, of Wesleyan University.

"Gaseous Conductor Light," by D. McFarlan Moore, of the Edison Lamp Works.

"Electric Arc in Complex Vapors at Reduced Pressures," by W. A. Darrah, of Mansfield, O.

The New York Section of the American Electrochemical Society has arranged for other joint meetings during the season. These include the American Chemical Society, the American Institute of Electrical Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers and the Society of Chemical Industry. Every one of the meetings for the present season is a joint meeting with some other society or section thereof.

Armory Lighted for Tennis.

Re-equipment of the lighting system at the Jefferson County Armory in Louisville, Ky., so as to render that big structure available for indoor tennis has been decided upon and an agreement between members of an indoor tennis club which is forming in Louisville and the members of the First Regiment which occupies the armory has been reached to insure carrying out of the plan. Lighting plans are based on those which have been effective in the Seventh Regiment's Armory in New York. The present system of arc lamps by which the big drill hall of the Louisville armory is lighted will be replaced by 1,000-watt Mazda lamps. Henry Heyburn, head of the electrical supply department of the Belknap Hardware & Manufacturing Company, Louisville, and member of the club, will have charge of this installation.

Indianapolis to Have Electrolysis Survey.

Preliminary arrangements have been made for an electrolysis survey in the city of Indianapolis, Ind., by the United States Bureau of Standards. The Bureau found, on receiving the request to undertake this work, that there was considerable need of such a survey, as the electrolysis conditions are unfavorable and the property of utility companies is being effected.

Year's Record Shows Value of Wireless in Saving Lives.

During the fiscal year ended June 30, 1915, the radio inspectors of the United States Bureau of Navigation reported 26 cases of vessels leaving American ports which met with accident or disaster, requiring the use of wireless to summon assistance. Four of these were from fire; 12 were from running ashore, stranding, or getting into an ice jam; 3 were from the breakage of machinery; 4 resulted from collisions; 1 from shifting of cargo; 1 vessel was storm-battered and waterlogged; and 1 was torpedoed. Excepting in the case of the *Lusitania*, which was torpedoed, the assistance thus rendered resulted in but two lives being lost. Since the close of the fiscal year the disasters occurring have been:

On September 13, the Fabre Line steamship *Sant' Anna*, bound from New York to Naples with 1,700 Italian reservists and crew aboard, caught fire in mid-ocean and all persons on board were saved. The SOS call brought the steamship *Ancona* to the assistance of the disabled vessel and 600 persons were taken off. The *Sant' Anna* then proceeded to port, convoyed by the *Ancona*, and the entire 1,700 passengers and crew were saved.

Six days after the *Sant' Anna* disaster the Greek liner *Athinai*, bound from New York to Piraeus, caught fire in mid-ocean and was abandoned by the passengers and the crew, numbering 470. The call for assistance was answered by the steamships *Tuscania* and *Roumanian Prince;* 341 persons were taken on board the *Tuscania*, the remaining 129 being taken off by the *Roumanian Prince*. The vessel was entirely destroyed.

The use of radio apparatus on vessels carrying passengers or with 50 or more in the crew is now accepted as essential to the safety of those on board, and the report of the *Athinai* shows conclusively that many persons might have been lost and perhaps the cause of the disaster never known had not this vessel been equipped with radio apparatus.

Boston Radio Club.

In a lecture before about 50 members of the Radio Club at the Y. M. C. A. building at Boston on October 19, Prof. A. E. Kennelly, of the electrical engineering department, Massachusetts Institute of Technology, advised the adoption, by students in wireless, of the international telegraph code which he said is the great radio alphabet, the American Morse code being a mere dialect.

Professor Kennelly described the recent achievements in telephone and radio work, and pointed out the great field that the subject opens up to young men seeking a livelihood.

Digitized by Google

Industrial Power Series—Article No. 143.

ELECTRICITY IN TEXTILE MILLS

This article deals with the use of electricity in textile mills entirely from the standpoint of the central-station salesman, pointing out the arguments in favor of purchased power and the resultant satisfactory operation. The information contained herein formed the basis of a paper presented by H. A. Orr before the recent convention of the Southeastern Section, National Electric Light Association.

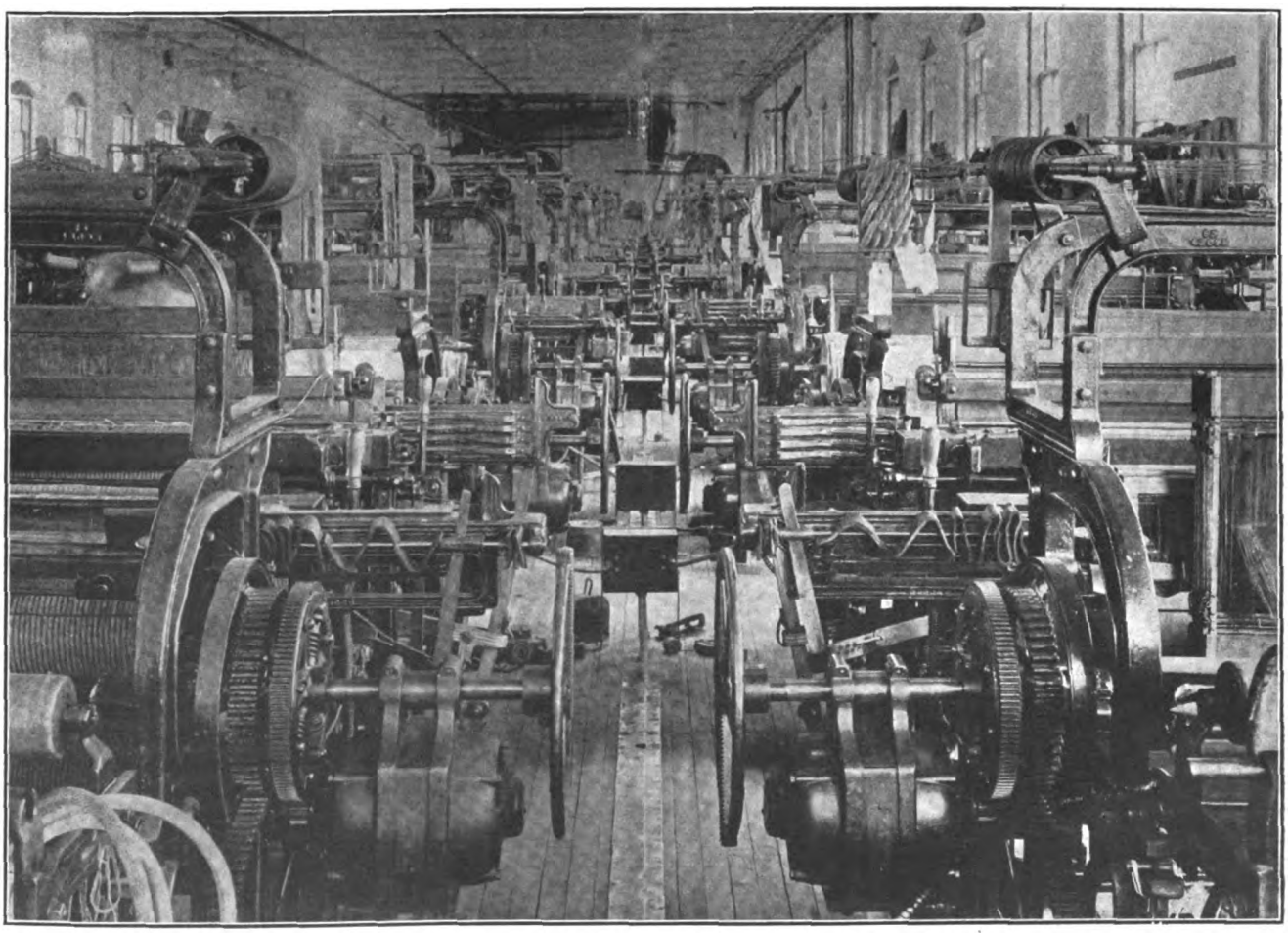
A cotton mill president who has had nearly twenty years' experience with both steam and electrically driven mills stated, in explanation of his installing electric drive in a new mill he had just built, the following: "The principal advantage of the individual drive for looms is increased production. Incidental to this advantage is the more uniform speed, and consequently more uniform quality of production, saving of power, flexibility in arrangement of machinery and buildings, freedom from dust and fly, the ability to measure quickly and accurately the power consumption of any machine, the lessened liability of serious shutdowns, less maintenance expense of transmission equipment, better natural lighting and absence of "oil drippings."

This statement aptly sums up the principal advantages of electric motor drive for textile mills.

The application of electric power for cotton mills started something over twenty years ago and today there is in the neighborhood of 45,000 motors furnishing nearly 750,000 horsepower to the textile mills of the United States. This record is in itself one of the most pertinent arguments in favor of electric drive.

Originally the machinery was grouped and driven by motors of from 100 to 300-horsepower capacity, retaining to a great extent, the mechanical drive feature, and in several mills the entire mechanical drives were retained, using a large synchronous motor to take the place of an engine, but as the individual motor drive was tried out and the small induction motors improved in both efficiency and weight, as well as decreased in price, the placing of a motor for each machine, with a few exceptions, is the latest approved practice of all first class textile engineers.

It might be of interest to give briefly the electrical "layout" as installed in one of the new mills that has adopted the individual motor drive. This mill has 818 motors, ranging in size from one-third to 100 horsepower. Each loom is driven through gearing by a one-third-horsepower motor, running at 1,800 revolutions per minute and

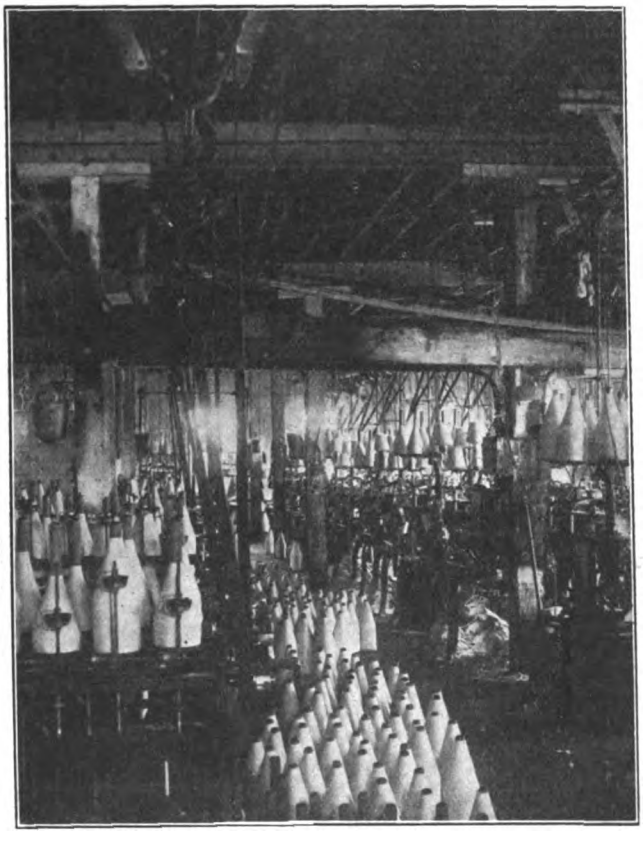


Battery of Looms in Cotton Mill, Each Driven by Individual Motor.

Digitized by Google

controlled by a snap switch. The warp spinning frames are driven by 7.5-horsepower motors, and the filling spinning frames by five-horsepower motors, running at 1,800 revolutions per minute, direct-connected to the cylinders and controlled by non-automatic oil switches. Individual motors of suitable size are direct-connected to the pickers, twisters and spoolers. The card room, cloth room, and machine-shop equipment are driven by large motors through a small length of belting and shafting. In this mill the completed cost of the individual drive was the same as it would have been for the group drive.

From years of experience with all



Motor Driving Group of Spinning Frames.

Motor Driving Group of Winding Frames.

form of drives, the foremost textile engineers and cotton-mill managers now agree that the individual motor with a few group driving motors, is the most efficient and flexible method in the application of electric power for textile mills.

Due to the uniform power of the motor, all of the slipping in the belts and the whipping of shafts are eliminated, resulting in a steady uniform pull at the loom, giving a perfectly even speed.

Reliable tests have proven that this even speed has made it possible to increase the speed of looms to over their rated speed, which materially adds to the increased production of these machines.

This is proven by the fact that one new mill, recently built, is getting an actual production of 98.5 per cent with an individual loom drive, while from 95 per cent to 96 per cent is the best production that can be secured with a mechanical drive; in other words, this mill is securing an average production of 3 per cent greater than it would have, had the mechanical drive been installed —which means that this increased production will pay for practically half of the total power costs.

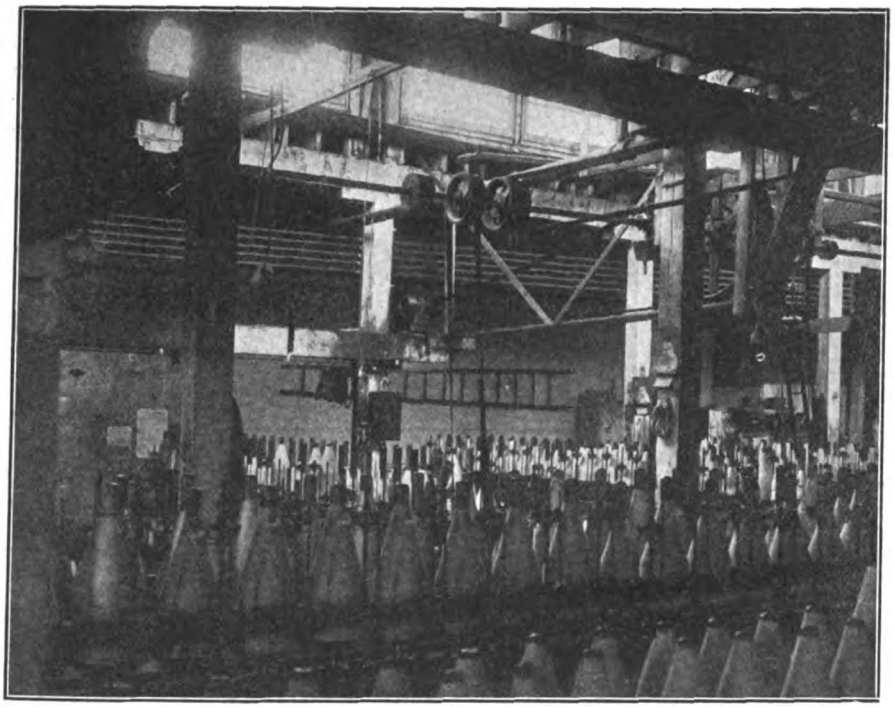
The ability to operate any part of the mill at any time is an item that is becoming more appreciated as the mill superintendents become better educated to the advantages of electric operation. In one instance, a cotton mill was able to secure a contract for its goods, with a very handsome profit, due to their ability to operate part of their machines over-time and make up a part of the order that was special and required an extra demand on a part of their machinery. Had not this mill been equipped with the electrical drive they could not have afforded to operate their entire steam plant with all of the shafting, etc., just to run a small number of their machines.

In this era of efficiency, the expert wants to know every detail before he can advise what is the best thing to do. If the mill operator takes an indicator card off his engine, how near accurate would his cost records be on spinning or weaving, or on any other particular process of manufacture? If his individual records are not accurate, how can he claim that his total records are, and how can he go about improving the major conditions if he doesn't know what the minor conditions are? With a meter on each group of motors he not only can tell the amount of power that every process is taking, but he can even tell how the operators are running their particular machines.

The last few years have been very severe ones on the textile industries—the necessity of cutting the costs were never so pronounced as they are today, and the first requisite of economical operation is—accurate information of the actual conditions.

The cost of electric drive, or the cost of the installation of the individual motor drive in textile mills is not the determining feature on which the acquestion of a textile-mill customer by the central station should depend and yet 99 per cent of the managers of cotton mills believe that this practically is the only feature they should give serious consideration. Their methods of computing their costs are as varied as are the different prices claimed. For instance, the value of the steam plant necessary to operate a mill is charged with interest at an average of six per cent and yet this part of the cotton mill is just as necessary a part of the plant as the textile machinery, and any cotton mill promoter who only offers to his prospective stockholders a six per cent return on their money would never succeed in building a mill. He hopes to make from 15 to 25 per cent on the capital invested, so in figuring his cost,

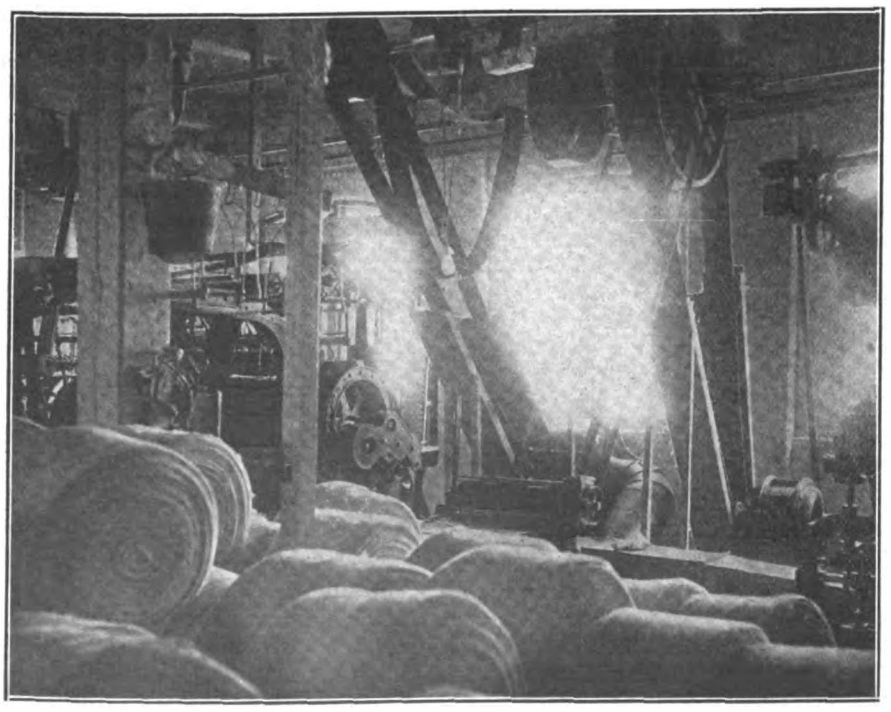
Digitized by Google



Motor Drive in Winding Room.

why should he not charge an interest against the steam plant, the same amount he intends to make on the rest of the plant? In other words, about 7.5 per cent of the total cost of the cotton mill is used for furnishing it power. The cotton manufacturer becomes a power manufacturer first and a cotton manufacturer second, therefore his capital invested in power machinery must bear its share of the interest charge.

The question of cost is answered in the experience of one of the foremost cotton mill manufacturers of the south, and his experience is characteristic of all the others. This manufacturer had a large mill that had been operating for years with steam, and he had kept very accurate cost records as to coal, oil, wages, etc., so he felt certain that he knew just what his power was costing him. He made a contract with a power company for electric power and equipped his mill electrically. After having run with the electric drive for one year he complained that he was paying the power company more money for running his mill than it had cost when operating by steam. But on questioning him closely he admitted that his production had increased, and his cost per pound decreased, even though he was paying the power company more money than he had previously paid for coal, oil, wages, etc., his net income had increased, and the mill was considerably better off than it had been.



Group Drive in Cotton Mill.

As the cost of power is only from 2.5 to 5 per cent of the total cost of the manufactured product, it can be very readily seen how a small increase in production will offset any claims, if they really existed, of the increased cost of power.

Actual experience of up-to-date individual-motor-driven cotton mills, is that a five-per-cent increase in production over the mechanical drive is obtained.

There is one difficulty that electric salesmen will encounter in soliciting cotton-mill business, and that is the amount of steam necessary to heat the mill, operate slashers, and furnish steam for the fire pump.

The present steam pump for fire protection and the inefficient hand-fired boiler should be discarded. An electrically operated centrifugal pump should be substituted for the steam fire pump. This is being fought to some extent by fire-insurance companies, who are still old-timey and refuse to acknowledge the reliability of the electric service, but as most of the power companies are now equipped with various sources of supplies, not only in the shape of differently located water plants, but stand-by steam plants and duplicate transmission lines, the dependability of their service is vastly more than that of a sleepy fireman to keep up steam for a fire pump.

For the heating and slashing, there is no reason why this should not be done by using an improved hopper feed, especially designed boiler, such as the large apartment houses and hotels are using. This would greatly increase the efficiency of the heating plant and would eliminate the uncertain cost for this service.

Peculiar Electrical Accident.

A peculiar electrical accident is reported in a technical paper on "Safety in Stone Quarrying," recently issued by the Bureau of Mines, Washington; D. C. A transformer supplying a stone quarry burned out, permitting 4,000 volts to pass to the hoisting motors. The man in charge placed his hand on the lever and as the machine was electrically charged he could not let go. As he was wearing rubber-soled shoes he sustained no injury. He called for help and the man who came to his assistance, instead of pulling the switch and cutting off the current, took hold of the engineer's hands and tried to pull them free and in so doing completed the circuit and was killed. The man with the rubber-soled shoes was uninjured except for slight burns.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Important Topics to be Discussed by Ohio New-Business Men.

A number of interesting papers have been arranged for the convention of the Committee on New Business Co-Operation of the Ohio Electric Light Association, which is to be held at Middletown, O., November 17. In the morning there will be a paper on "Electrical Advertising" by W. A. Wadsworth, of the Union Gas & Electric Company, Cincinnati, and one by H. J. Kunz of the Toledo Railways & Light Company entitled, "Power Sales Problems."

During the afternoon a paper will be presented by F. S. Dellenbaugh, Jr., entitled, "Increasing Small Motor Loads on Central-Station Circuits." An inspection trip to the plant of the American Rolling Mills Company will also be made.

J. E. North, of the Springfield (O.) Light, Heat & Power Company is chairman of the Committee.

Effective Central-Station Post Card.

The Pacific Light & Power Corporation, operating at Los Angeles, Cal., and vicinity, has issued an interesting and effective post card for general distribution, setting forth concrete data relating to its extensive electric power system in southern California.

One side of the card carries a reproduction of the Big Creek power station, known as Power House No. 1, Cascada, and incorporates tabulated information regarding general operations and extent of activities, relating to capacities of steam and hydraulic plants, total miles of transmission system and territory served, together with other supplementary data.

The reverse or address side of the card gives a map reproduction of southern California, on which is indicated by heavy lines the company's transmission and main distributing systems, reaching from the Big Creek district, about 225 miles distant from Los Angeles, to the smaller auxiliary stations at Riverside and Mentone. At a glance the extensive domain covered by the company is evidenced, including a total population of 750,000 persons.

This novel card has been distributed at the Panama-Pacific International Exposition, San Francisco, as well as at the San Diego exhibit, and has met with popular favor. Its attractiveness inspires mailing, affording the company distinctive publicity at small cost. The card not only suggests the operations of the corporation in its territory, but conveys the broad general message of electricity to the many visitors and ultimate recipients.

Vermont Company's Active Wiring Campaign.

On October 1 the Rutland Railway, Light & Power Company, Rutland, Vt., reduced its lighting rates from a primary rate of 14 cents to 12 cents, for the first two kilowatt-hours per 60-watt lamp per month, and from 7 to 6 cents for energy used in excess of that amount. Coincidently, a house-wiring campaign was inaugurated, by the terms of which the prospects may either accept the company's schedule of prices and thereby have the advantage of a deferred-payment plan by paying for the work in 12 monthly installments, or else may contract with the wireman direct. Contracts obtained from house owners by the company are turned over to local contractors on an agreed-upon schedule of prices.

During the three weeks to October 21, 125 contracts have been secured for wiring. The amount of latent business still available is indicated by the fact that only about 25 per cent of all the houses in Rutland are as yet connected to electric service.

Novel Advertising Display for Combination Company.

A novel advertising display is being constructed for the Louisville Gas & Electric Company, to occupy an elevated position over the roof of the general office building on Chestnut Street. It is to be a combined gas and electrical sign, the electrical flashes being supplemented by an intermittent flambeau of natural gas. The sign will be visible from a wide area and will make an appeal both for gas and for electricity. It will be highly decorative.

In construction the central item will be the two-inch gas supply pipe, which will be outlined with lights, the casing of the torch stem to be painted green. A conveniently placed motor will operate the valve regulating the flow of gas. In operation the name of the company will be shown and the sign, "Heat With Gas," in electric lights. Running lights will pick out the outline of the torch and as they reach the top of the steel torch the motor will open the valve and the pilot light will ignite the big flambeau. When that is shut off a burst of twinkling stars will lead up to the second part of the sign, "Use Electricity for Light and Power." One minute will be required to complete the sign, and then it will repeat continuously. Altogether about 1,000 five-watt lamps will be used and it is estimated that the gas consumed will represent the consumption of a $5 a month customer. The sign will be completed and in operation the early part of November.

Improvements Made in Louisville Panel Boards.

Since the first several hundred panel boards devised by Robert Montgomery, of the Louisville Gas & Electric Company, were made and put into service, Mr. Montgomery and others have made numerous improvements. The first model was rather crude, compared with the model which has now been perfected and patented, the patents assigned to the Louisville Gas & Electric Company. It was supplied with a regulation gate switch and a steel box which had to be opened in order to throw the switch on or off. This raised the question as to whether or not persons familiar with the subject would not maneuver so as to steal the current. In working on a plan to obviate this possibility, a combination of a locking box, with a snap switch, which the subscriber could throw at will without opening the box, was worked out and the whole thing further consolidated and compacted. A local manufacturing company is figuring with the Louisville Gas & Electric Company and proposes, it is understood, to manufacture the panel board, which the Louisville company is selling for $2.99, for national distribution.

Shirley Company Secures Street-Lighting Contract.

The Shirley (Mass.) Electric Light Company has secured the contract to furnish the town of Hollis, N. H., with electric lighting. The company has begun the construction of a transmission line to connect its station with Hollis, by way of Pepperell, Mass., which town it will also serve.

Digitized by Google

Battery Rental Systems as an Aid to Electric-Vehicle Development.

At the meeting of the Chicago Section, Electric Vehicle Association of America on October 26 the subject of battery rental for electric vehicles was considered, the paper on the Hartford Electrc Light Company's battery exchange system, presented at the recent Cleveland convention, being used as the basis for the discussion.

While this paper relates to battery service for commercial-car users, some experience with passenger cars has been had by a manufacturer in Chicago, the results being given in a discussion by Gail Reed, of the Walker Vehicle Company, and abstracted herewith.

A little over a year ago a new battery-maintenance plan was undertaken in a number of isolated cases on electric passenger cars in the city of Chicago. The results obtained from these plans were closely watched by the Walker Vehicle Company, for the company felt just as many other electric vehicle manufacturers, that if the battery-maintenance cost could be reduced, a most important step would be taken toward the promotion of the sales of more electric vehicles.

It is true that the largest single item of maintenance expense in electric vehicles has been batteries, and the first step taken to assure the consumer of better service at lower cost was a form of guarantee placed on the batteries, which pro-rated the renewal cost according to the service received from the battery.

In the past year through the introduction of low-priced gasoline cars with self-starters, electric lighting systems, etc., it was brought home to the electric vehicle manufacturers that more aggressive steps would prove necessary that the electric vehicle might hold its own and that sales might receive the stimulus they needed.

Before considering the adoption of the rental battery system, the sales requirements were not only thoroughly considered but the practical operation of several battery-rental systems was investigated. This investigation brought to light some very interesting data and information on isolated cases of battery rental service. In one case a commercial car was put into service of this nature seven years ago, which afforded sufficient proof as to the feasibility and practicability of renting batteries. The service afforded this car proved so satisfactory and economical that they have continued this service to the present day. The service was based on ampere-hours output but did not cover renewal or repair of jars and trays, these items being charged for extra when they were required.

The data on this particular case together with several others proved the following regarding a rental proposition. That basing the rent on ampere-hours output, or any means upon which meters were depended, proved unsatisfactory to the rental company for the reason that depending on meters and odometers they frequently were out of commission and for that reason made accurate records extremely difficult.

The first company in Chicago to consider the rental system on an organized basis was the K. W. Battery Company, and in considering the above isolated systems used, they found that the most satisfactory basis upon which to operate was that of time on which there was no question as to keeping accurate records.

The K. W. service for that reason was based on the question of time and from the company's standpoint, this has proven most satisfactory in every respect. As mentioned above, most vehicle manufacturers and battery manufacturers have adopted a form of battery guarantee for the last two years which guarantees were based on a time service and it was found that batteries could be rented outright on a time basis and net the battery company as much if not more than selling batteries outright and taking into consideration the adjustments necessary to assure the service stipulated by the guarantee. In other words, a vehicle manufacturer or battery manufacturer selling batteries with a guarantee attached, found it necessary to set aside a certain percentage for maintenance in making good adjustments which same amount if set aside on a rental battery proposition would more than cover all requirements. In this respect the rental battery proposition has the advantage in that the rental battery company is notified more quickly if any attentions are required, for the owner paying per month for full service expects full efficiency at all times and when this is lacking, the report is made immediately to the rental company.

In figuring the proposition from the rental company's standpoint, two methods can be adopted, first by dividing the monthly income into dividends on capital invested and a maintenance reserve, or by considering the rental battery as a sale and the income as deferred payments until the cost of the battery has been covered.

Inasmuch as all battery companies have large stocks of plates on hand at all times, the increase in capital for placing rental batteries on the market need not be so large as would at first appear. The capital necessary in placing these plates in operation would be the amount required for labor in building up the batteries. The result would be that instead of large stocks of plates being stored for future use, they would be placed in service and bringing in their cash returns. Judging from the experience which the Chicago company has had covering the past year, it has been proven that the average profit to the battery company on rental batteries will prove as large as on batteries sold on a guarantee basis where the guarantee is lived up to.

Since the rental battery service was inaugurated by the K. W. Company, one year ago, that company has shown an increase of at least 100 per cent on the business done for the last six months over that of the first six months, indicating clearly the favor with which such service is meeting. The most serious handicap encountered to date from the standpoint of service—as well as the cost of operation—has been the great diversity of tray and battery jar arrangements in the several makes of electric cars. In a great many cases the same maker will have different tray arrangements for every model and in a number of cases the same models will have different size jars for the same number of plates. The handicap of this lack of standardization is very evident to everyone in the electric vehicle industry but it is brought home more seriously when attention is given the rental battery service proposition and until a standard has been adopted by the manufacturers of electric vehicles, it will continue to prove a very serious handicap to the furthering of rental batteries on any but a very limited scale.

Another feature which proves of interest, particularly to those interested in the renting of batteries, is the collections. In cases where batteries were sold outright the same losses through collections have been encountered that is usual in all business, but through the rental system the battery at all times remains the property of the rental company and on failure of prompt payment, permits the battery company to take the battery out of service, which leaves the owner's car high and dry. This knowledge on the owner's part that his car may be laid up whenever his rental payments are not met, assures that these obligations will be promptly taken care of. Furthermore, it is very unlikely that any car can be shipped out of town with a rental battery for in such a case the taking of the battery with the car would prove straight larceny.

The basis upon which rental batteries are furnished the users of Chicago electrics, manufactured by the Walker Vehicle Company, is given herewith.

In the first place, a deduction of $270 is made from the list price of the car, which means that much less outlay in the purchase price. This deduction alone will cover the cost of rental battery service for a period of a year and a half to two years. Where old battery or a battery of any kind is turned in with the car for a new rental battery, the prices run as follows:

11 plate 40-cell battery	$16.00 per month
13 plate 40-cell battery	18.72 per month
15 plate 40-cell battery	21.60 per month

When a car is turned in without battery and the rental battery is procured,

Digitized by Google

$4.00 per month extra is required in addition to the regular rates given above for the first year. However, the Walker Vehicle Company has made arrangements whereby an additional payment of $25 is required with the first month's regular battery rent and in the case of the 11-plate 40-cell battery, which is the customary size used, this would make the first month's payment $41. Thereafter the regular rate of $16 per month holds good. By this plan, the customer is saved $23 on the first year's rent.

The understanding which the rental firm gives covering the battery is as follows:

The customer has the right to lay the car off for two months during the year's contract for which time there will be no charge for the battery after the customer has given the specified number of day's notice that the battery has been taken out. The capacity of the battery in ampere-hours will be guaranteed to be kept up at all times when fully charged in such a shape as to deliver 80 per cent of the full rated capacity.

The rental company will make repairs of all broken jars, terminals or such minor repairs as are necessary from time to time to keep the battery in good operating condition. In other words, the amount paid per month to the battery rental company will cover all expenses and will provide the customer with a battery in prime condition at all times. Whenever the battery, through use, fails to give the required mileage, a new battery is put in. The customer agrees to accept the responsibility for the loss of the battery in case of fire, theft, etc.

The rental company agrees also that a deduction may be made from the rental if the battery is out of commission for more than 24 hours after notification by the owner of the car that the battery is in need of attention.

The customer agrees to have the battery charged regularly and to give it reasonable care as to flushing and charging. The rental battery company has the right to inspect the battery at the customer's garage at a reasonable time and further has a right to remove the battery from the car without notice at any time upon failure of the customer to pay the regular rent.

The customer saves $270 on the first cost of the car, which alone pays for more than the first year's rental service. Figuring the cost over a period of two years based on 35 miles per day or an average of 12,000 miles per year, we have:

BUYING BATTERY WITH CAR.

To begin with	$270.00
For washing and incidentals	75.00
End of 1st year for renewal	270.00
Washing and incidentals	75.00
	$690.00

RENTING BATTERY.

1st year including $25.00 extra	$217.00
2nd year $16.00 per month	192.00
	$409.00
Deducting $60.00 for time not in use	$349.00

In other words, $341.00 saved by a rental battery on this basis.

These figures are based on 12,000 miles running which would necessitate an average purchase of a new battery every year and clearly shows the big saving made by the rental battery system.

This saving would not be so evident with users who average but five or 6,000 miles per year, but even on this basis it proves an economy as the following will show:

BUYING BATTERY WITH CAR.

To begin with	$270.00
Washing and incidentals—first year	75.00
Washing and incidentals — second year	75.00
	$420.00

RENTING BATTERY.

First year, including $25.00 extra	$217.00
Second year $16.00 per month	192.00
	$409.00
Deducting $60.00 for time not in use	349.00

There would be $71.00 saved by a rental battery on this basis, and it would be necessary at the end of this time for the owner to invest the cost of an entire new battery in order to insure future service for another two years. The saving in dollars and cents, however, on this basis is of little importance compared with the fact that the owner would have the advantage with the rental battery of continued full battery service.

Regardless of any difference in cost, the rental battery system has other advantages, viz., after any lead battery has covered three-fourths or four-fifths of its total life, and would still be able to give considerable service, it oftentimes happens that its mileage capacity has materially decreased and that before the full life of the battery has been obtained it is necessary to purchase a renewal in order to get the required mileage. With the rental battery, capacity is guaranteed, and when it has reached a point that sufficient mileage is not gained, a new battery is put in, thus assuring the user of a rental battery continued high efficiency.

Furthermore, most owners of electric cars will spend from one to two months out of town per year, at which time their car is taken out of service. In the case of a rental battery, during this time a deduction is made and for the time their car is out of use, their battery cost stops. The customer is also assured against any mishaps in regard to treatment and care of his battery, through the rental battery system, for the rental company is responsible for keeping the battery in prime condition at all times. In the case of the customer owning his own battery and through mistreatment or inattention its life is impaired or deterioraton sets in, he alone is responsible.

With a view to assuring the best ultimate service to the purchasers of electric vehicles, as well as to gain the interest and service of the electric garages, the Walker Vehicle Company has the rental batteries sold through the electric garages in Chicago and not direct from its own office. In this way, the garage man obtains his commission on the sale of the rental batteries in monthly payments, which nets him a clean profit per year with no money invested and requires no more of his personal service than would ordinarily be given to any electric car owner. Furthermore, it gives him a more than usual interest in seeing that the battery serves the customer well and assures his giving sufficient time to take care of any special service matters required in the changing of batteries, renewal of worn parts or repairs, by cooperating with the battery company.

The electric garage man can make a clean profit with less effort from the handling of rental batteries and when the business runs into large quantities at least as large a profit as through the sale of renewals. In selling renewals it requires an investment on his part not only in the plates and the supplies necessary, but the labor and time consumed in building up batteries. For the same profit in the case of rental batteries, he has no investment, makes no extra efforts in the way of service, does not have to entertain the expense of adjustments nor collections.

Another factor which is of importance to the garage man, and one of no little importance, is the fact that in the case of rental batteries, his car is running at all times with batteries at their maximum capacity. In other words, they are giving their customers full service which means satisfaction.

While the experience of the Chicago company has been confined to a little over a month, this brief time has proven sufficient to thoroughly impress it with the important sales advantages given through the offering of rental batteries.

In the first place, the deduction of battery cost from the list price enables the advertising of very attractive prices, which in themselves have stimulated far greater interest. The sales organizations of electric pleasure vehicles have always had to contend with the factor of battery upkeep, which question is put to them by the prospective purchaser due to the fact that the prospect has learned from different sources of the expense that other electric car owners have had incident to battery renewals. The figures which were given previously so clearly indicate the advantages from an economy standpoint, that little additional information is requested by the prospect.

After the arguments have been presented on the advantages of purchasing a car without batteries and procuring the rental battery service, it is found that the biggest obstacle has been cleared away toward the closing of a sale. This is particularly true of all prospects who have previously owned electric cars.

Digitized by Google

Clerical Error Not Libel.

A clerical error on the part of the Louisville Gas & Electric Company, which failed to credit payments on bills collected by a local druggist and led to further demands for payment, did not libel the druggist, according to the findings of the Kentucky Court of Appeals. The Jefferson Circuit Court found in part for the druggist, J. H. Wulf, but the Court of Appeals reversed the case. Wulf contended that notices from the company to subscribers who paid at the druggist's station that their bills were due and unpaid contained innuendo of embezzlement on his part. The higher court, however, held that since the bills were small and the plaintiff a prosperous merchant of good standing, the only impression the statements could make in the mind of a recipient would be that a clerical error has been made.

Salem Central Station Celebrates Thirty-Fifth Anniversary.

An electric light plant at Salem, Mass., was first installed in October of 1880. Several enterprising tradesmen became interested in the "new light" and incorporated a company with $10,000 capital to light their stores from a common source. Its charter was the third to be granted in Massachusetts, to do a lighting business.

The early plant was operated only from dark until 9 or 10 p. m. Early in 1889 land was acquired on the South River water front and a "model station" as it was then called, was installed. This plant was for a long time featured by the engineers of the Thomson-Houston Electric Company.

C. H. Tenney & Company, engineering managers, with headquarters in Boston, acquired control of the company in 1910, and a great expansion resulted. The brick generating station had the distinction of surviving the conflagration of June, 1914.

New Transmission Line in Connecticut.

The Connecticut River Transmission Company is constructing a high-tension transmission line from Fitchburg, Mass., to Milford, N. H., of heavy pole construction, mainly on private right of way. The way is cleared 60 feet wide through woods and sprout land. Owners are paid about $5 per pole for locations on sprout or wood land and $3 per pole on cleared land. Lumber cut on the right of way is the property of the land owner.

A preliminary summary of the exports from the United States during last August shows that electrical goods were shipped totaling in round numbers $1,806,000, compared with $1,024,000 a year ago.

SUCCESSFUL COMMERCIAL MANAGERS.

H. E. Young.

Doubling the kilowatt-hour output of a central-station company serving a community the size of Minneapolis, Minn., in the course of three years is an achievement that few executives of utility companies could hope to achieve. This, however, has been the record of H. E. Young, sales manager of the Minneapolis General Electric Company and represents no extraordinary efforts in any one direction, but consistent, energetic sales effort coupled with modern policies in dealing with the public.

Mr. Young was born at Bristol, Me., and grew up in the middle west, attending preparatory school at Coburn Institute, Waterville, Me., and Lincoln Academy, Newcastle, Me. He graduated from Massachusetts Institute of Technology in 1906, in the course of Electrical Engineering. Mr. Young was employed for about a year and a half by the American Telephone and Telegraph Company, spending most of the time traveling largely in the southern states, including the South Atlantic, Florida and Gulf states, laying out underground construction and future development work. While in the employ of this company, he took the United States Civil Service examination and received appointment in the department of Coast Geodetic Survey, going to Washington, D. C., and shortly after to Manila, Philippine Islands, in connection with the work of this department. In the latter part of 1908 he resigned his position in this department to accept the position of city electrician in Manila, the department of which he had charge in this connection, supervising the construction and maintenance and operation of the fire and police alarm systems, the street lighting of the city, and had charge of the inspection of electrical installations and outside construction work, tested all electric meters installed, etc.

H. E. Young,
Sales Manager, Minneapolis General Electric Company.

Mr. Young was later appointed by the government to make an investigation regarding lighting rates, street car service, etc., and this investigation took him through Europe and America, thereby completing a trip around the world. On returning to Manila he was appointed to make another investigation in connection with a gas franchise which was to be given to a concern in Bremen, Germany. He again went to Europe and America, completing a second trip around the world. In connection with this work he wrote a gas ordinance, with regulations regarding the sale and supply of gas, testing of meters, testing of gas, etc., and compiled a list of apparatus for installing a laboratory, and collected the necessary data and information for the supervision of this industry by the government.

In 1912 he resigned from government service to take a position with the Toronto Hydro-Electric System, where he had charge of the sales force, resigning the following year to take a position with the H. M. Byllesby & Company, with whom he is connected at the present time.

Lower Bulk and Cooking Rates in Boston.

The Boston Edison Company has changed its schedule for current supplied to users of miscellaneous energy so that limitations as to the time of use which governed the large customer's privilege of buying current at two cents per kilowatt-hour over 2,000 kilowatt-hours a month is now taken care of by an excess charge applicable to customers whose bills exceed $100 a month.

A third deduction is added, and only one cent a kilowatt-hour is charged for all energy over 10,000 hours a month. If high-tension alternating current is supplied, the rate is seven mills per kilowatt-hour for energy in excess of 100,000 kilowatt-hours a month.

The company's cooking, heating and refrigerating rate is reduced from ten cents for the first 20 hours and three cents thereafter, to ten cents for 10 hours and two cents thereafter. This rate brings the cost of electricity to a level with 90 cent gas and is likely to stimulate the use of electric ranges. In some parts of Edison territory the price of gas is as high as $1.40 a thousand feet.

Digitized by Google

Electrical Construction

STANDARDS OF ELECTRICAL CONSTRUCTION AND OPERATION.

Report of Hearing Before Railroad and Industrial Commissions of Wisconsin.

On October 22 the Railroad and Industrial Commissions of Wisconsin held a public hearing in regard to the standards of electrical construction and operation which these commissions propose to put into force in the state. The standards of electrical construction have been under consideration for some time and a tentative draft was considered at a hearing held by the Industrial Commission on March 13, 1914, a report of which was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 21, 1914.

The rules which have been promulgated by the California Railroad Commission, as a result of the report of the Joint Committee on Inductive Interference, are tentatively proposed for adoption by the Wisconsin Railroad Commission. It is also proposed to adopt the safety rules which have been prepared by the Bureau of Standards, Washington, D. C.

The hearing, which was conducted by Mr. Alexander, of the Railroad Commission, opened with a consideration of the regulations which were proposed by the California Joint Committee on Inductive Interference. These rules would necessitate some radical changes in present practice and considerable opposition is felt by the operating men of the Wisconsin utility companies.

The first objection at the hearing came from William Bennett who, in behalf of the telegraph and signal companies, protested against classifying these with power companies using the same voltage. He insisted that the proposed rules when judged from the viewpoint of the power engineer seemed reasonable, rational and applicable; but that when judged from the viewpoint of the engineer of a communicating company they are full of inconsistencies and absurdities. In his opinion it was an impossibility for anyone to formulate a set of rules for both types of lines and secure the desired results.

E. O. Seymour, general manager of the Wisconsin Telephone Company, objected to the definition of power circuit, which fixes the lower voltage limit at 5,000 volts between wires. In his opinion this limit is too high, and he recommended that the voltage limit be stricken from the definition. In reply to this, S. B. Way, vice-president and general manager of The Milwaukee Electric Railway and Light Company, pointed out that the Bureau of Standards and the power companies considered this limit too low, and he suggested that this question be left to the Bureau of Standards.

Prof. Edward Bennett contended that the rule for minimum horizontal separation between two parallel lines was too indefinite, as it merely specified that the minimum horizontal distance was to be equal to the height of the taller line. He pointed out that this did not specify at which point the height of the taller line was to be measured.

The rules of the California Commission specify that the type and location of transpositions to be made by the power company is to be prescribed by the communicating company within certain limits. To this, as well as to the necessity of making transpositions in power lines, considerable opposition was manifest.

Max Collbohm maintained that the proposed rule was entirely too strict, and imposed a too severe, and in many instances an unnecessary burden, on the power company. He pointed out the fact that transposing high-voltage lines is in some instances an expensive and difficult job. The difficulties are not all mechanical, either. The expense of patrolling a transposed line is greater, and the patrolling is more difficult than for a non-transposed line. This is due to the fact that when a fault is found on a transposed line recourse must be had to records and blue prints to determine which phase is involved. For a non-transposed line a hurried inspection is usually sufficient to determine this.

Mr. Collbohm also insisted that it was to a great extent impossible to foretell interference by a power line when it is built parallel to a communicating line, and that transposition was not always effective in removing interference if operation showed that it did exist.

Objection was also raised to the proposed rule which prohibited the operation of a parallel power line at any time with an open, grounded or short-circuited line wire or wires. Mr. Collbohm pointed out that the practice of grounding was employed on some lines for the purpose of suppressing arcs, and furthermore, that in some instances the continuous delivery of power was more important and essential than the prevention of a brief interruption in the communicating circuit. In his judgment the importance of the service should be considered. This position was also supported by other power men present, who joined in the general discussion.

As the effect of the proposed rules on air-break switches will be to exclude such switches, not only from parallel lines, which is the intention of the rule, but practically from others as well, F. C. Van Etten, of the Delta-Star Electric Company, read into the record a lengthy statement in which he gave many reasons against such exclusion. He insisted that the current opinion among electrical engineers that air-break switching produces more serious disturbances in communicating lines than opening the circuit with an oil switch was merely a matter of opinion, and that very few experimental data were available to substantiate such an opinion. He called attention to the experiments of Charles E. Bennett, which show that the surge voltage on a line is higher when it is opened with an oil switch than when it is opened with an air-break switch. For this and other reasons, Mr. Van Etten maintained that the exclusion of air switches from power lines was not justified and that before any radical action is taken, an investigation of the operating characteristics of oil and air switches with particular reference to the disturbance caused in communicating circuits is necessary.

In the evening the subject of safety rules was taken up and discussed. The same difference of opinion between engineers for power companies and communicating companies was manifest. As it was felt, however, that no action was to be taken before the hearing by the Bureau of Standards on the same rules, the manifested interest was not very keen.

Digitized by Google

What the Dealer and the Contractor Can Do to Cash In on Electrical Prosperity Week.[1]

Your activities must not be confined to boosting electricity and creating optimism, but must have one final result in view:—*more business for YOU.*

Your close contact with the people of your community makes it possible for you to make your store a wonderful drawing card during the *Week*. Then, if you magnify your store many thousand times—representing the total number of dealers and contractors in the country, you will readily see how important a part the dealer and contractor play in this country-wide optimism and sales-boosting campaign.

Therefore, act as if you had been personally appointed to represent E. P. W. in your town. Realize that by thoroughly broadcasting the benefits that electricity brings to mankind, and concentrating these upon your store, you will stimulate sales—increase your profits.

In Unity There is Strength.

Go directly to the central-station manager and tell him that you will support any plans that might be formulated by the electrical men of the community. In doing this, you are sure of being welcomed by the central station, for your success adds to its prosperity. Gladly grasp the opportunity of attending a joint meeting of the electrical men to discuss prelimnary plans to celebrate the biggest electrical event in the history of the industry. Show that you are with them, one and all, to make the *Week* a complete success in your community.

Offer to head, or serve on, a live committee to work out the details of the plan. In doing so, you will be getting a better chance to make sure that everything is done right. Your own interests dictate this much.

After collective action by the electrical interests of the community has been assured it is necessary, in order that you may personally profit, that you individualize your store, showing it to be the live headquarters of the E. P. W. Make its activity and unusual lighting effect draw passers-by to your windows and into the store.

The Society for Electrical Development has provided numerous co-operative helps for your use. Make good use of them! Ask the Society for as much material as you can profitably and effectively use to bring before the public in every way what E. P. W. is, and how it will benefit them to celebrate the *Week* at your store.

These helps have been planned to cover nearly every requirement; in fact, they enable you to put most of your personal efforts into *direct sales* and *money-making* work.

[1]From the Society for Electrical Development, Incorporated.

For Your Windows.

Starting with the window display, there are the window lithographs, 24¼ by 32 inches, in six colors, which can be pasted on the window itself, or used as a background to set off an attention-compelling display. Inside the store they will also prove effective.

There are window cards, 11 by 21 inches, that will brighten and sharpen the finest window display; also smaller window cards 7.5 by 13 inches.

Every package, every piece of printed matter and every letter that leaves the store should carry one of the poster stamps. This stamp, though small, carries the E. P. W. message and increases your success in celebrating the event.

Offer the stamps to poster stamp collectors, thus bringing these people also to your store. Use the stamps in your windows; brighten up every price-card with one of them.

Your delivery wagons should carry the message of the *Week* through the streets and out into the outskirts by means of the muslin signs, which can either be tacked on both sides of each wagon, or fastened by strings at the four corners. If your wagon has low sides, you can well afford to mount a 2 by 4 board on each side for the muslin signs.

See That Everybody Gets This.

The folder for the public has a strong and universal Electrical Prosperity appeal. It fits the standard business envelope, so that it can be distributed with all mail going out of the store, as well as over the counter or wrapped in packages.

The imprint space of these folders is especially large—nearly all of one page—which allows the making of some special offer for the *Week* right on the folders, thereby giving it the individuality of *your* store.

The street cars offer a splendid opportunity for advertising your store as headquarters for the *Week*. The cards provided by the Society are of standard size, printed in four colors, having a liberal space for imprinting name, address, and special sales message.

The proper use of newspaper advertising is most valuable in "cashing-in." Not only will you profit by the space you buy, but the newspapers will be glad to give good write-ups regarding the *Week*, particularly to those participating in it.

Use the Design of the *Week* in every advertisement. The Society will be glad to send you electrotypes in sizes suitable for use on everything from letterheads and billheads to full-page newspaper advertisements.

The Design is the Symbol of the *Week*. It must be so impressed on the minds of the people that just to see the design is to think of that most wonderful event—the linking of electricity and prosperity.

And don't forget to make good use of the bill posters!

They are big and bright; they catch the eye of everybody who has eyes to see. Lithographed in six colors, in eight-sheet size (8 feet 10 inches high by 6 feet 8 inches wide).

These are the heavy artillery of your advertising. Get the best space in town in advance.

The Society will be glad to furnish full information as to the cost of space in your town, and the number of posters required. Of course, if you have space on the side of your store, or other buildings which you control, you can order the bill posters and have them put up yourself.

Don't think that you can do too much to make the *Week* a full success! Every unique sales and attention-attracting plan that you originate means so many more possible consumers drawn closer to electricity and to your store.

Lantern slides illustrative of the *Week*, to be used in the movies, are also provided by the Society. "Everybody goes to the movies!" Put in an order for slides and make arrangements to use them now.

Are your city newspapers running an Electrical Page? Newspapers in thirty cities, with a combined circulation of 1,421,650, are now using the Electrical Page, which is sent out by the Society. This page is composed of practical, unique and humorous items on electrical subjects. The entire page is usually run as furnished, but the articles of more especial interest may be selected, if desired. And it will also bring much electrical advertising, which could not be obtained in any other way.

Why not go to the editor of your newspaper today, and tell him about this free electrical page? He will be mighty glad to know about it—particularly when he learns about the advertising you are going to do.

If he wants to be convinced of the value and utility of the page, tell him to write to the Society.

Don't Forget the Shop-Early Campaign.

You surely should not forget to push the shop-early campaign. Remember, the longer the gift-buying season, the easier and cheaper it is for you to do business during this rush season. And the more you'll sell.

Why not write a strong letter—opening with a few good-cheer remarks, following this by suggestions on Christmas gifts for the family—the wife, the husband, the boy and the girl? There's a joy-bringing electric gift for every member of the family!

Emphasize strongly that purchases made in a hurry are rarely satisfactory. Tell the public that if they shop early the clerks will be able to give them more attention, that they will be more com-

Digitized by Google

fortable, and that they will have choice of a larger assortment of goods than at the end of the season.

Every good-size community should have an Electric Show, a parade, or both. This, of course, in addition to your individual window display, demonstrations, lighting features or other special features. It would be well if you, as member of the "I Will" committee, wrote to the Society at once asking it for "How-to" booklets on electric shows, demonstrations, electrical parades and sociability runs, ornamental street lighting and slogan sign campaigns. These booklets go into details and give helpful hints on how best to proceed with these forms of community-lifters.

Window Displays and Demonstrations.

Too much time, too much effort can not be put into the window display for the *Week*. Something unique, eye-catching, desire-creating, convincing and otherwise business-attracting, should be installed.

A single, strong display for the entire *Week* would be best.

If you have but one window, you may not have room for good, workable demonstrations, but if you have the use of two windows (one window devoted to display features, the other to a series of demonstrations) it will help bring people into your store—purchasing appliances, contracting for wiring—all to be future boosters of electricity and of your store.

These demonstrations could be run in logical sequence so as to have additional sales-punch. For instance, cards telling the people that each day's demonstration would take up the electrical way of a certain important branch of housework, such as washing, or ironing. or cooking, or, possibly, different divisions of the home, such as the work in the kitchen, the dining room, the bedroom, etc., would be better than isolated demonstrations, without order or system.

Motion and human-interest features should be always provided. A crowd is composed of individuals, is human; it should be always appealed to through its human characteristics. It pays!

If, during these demonstrations, you conduct special sales of the appliances demonstrated, you will increase the sales-results greatly. These sales should be well advertised in the papers —the advertisement stating, of course, that a detailed demonstration of the use of the article will be given at your store at a certain hour.

Let the people really profit by E. P. W.

"Cash-in" Pointers.

Remember that every house wired means more electrical appliances sold —new missionaries for electricity and for you. Make friends with the architects and building contractors. Keep posted on the electrical requirements of every building that is going to be erected. Have your salesman impress on the home-builder the importance of having the house wired—for his own benefit, and also to increase the value of his property—so that in the event he wishes to dispose of the house or rent it, he can command a better figure.

A house that is not wired is not modern—does not command "modern-house" figures.

Help your clerks to "cash-in" on the *Week*. Imbue them with your enthusiasm. Give a bonus to the salesman or clerk who sells the most goods during the *Week*, or during a certain period before or after the *Week*. Or the bonus could be given according to the kind, amount, or variety of the goods sold. All this would create a friendly competition among the salesmen which is always productive of good results.

Make up a special E. P. W. set of household helps, such as a percolator, grill, toaster, or such other appliances as you wish to push. Advertise the set at a slightly lower price than ordinary, or offer them on an easy-payment plan.

Why not have an Odds and Ends Sale Saturday night? Many thrifty housewives will take advantage of this sale. All will be future customers.

Offer to loan to a hotel or restaurant, various electrical cooking appliances, such as percolators, chafing dishes, etc., which could be used right on the table. These appliances would interest the guests and cause favorable comment.

Perhaps you could get permission to hang a couple of lithographs or window cards in the lobby or hall. Be sure to have your name printed on every piece of advertising matter used.

The revolving red-and-white barber pole is one of the best business-getters the barber can install. How many illuminated "blood and bandage" poles are there in your town? Go after the barbers, beauty parlors, and the like, and tell them how important it is that everything in their shop be modern, clean, sanitary—electric.

There's lots of good business there in vibrators, hair dryers, besides installing modern illuminating methods. Go after it!

Advertise in the newspapers, and send a special mimeographed letter to customers and possible customers, telling them that you will repair free of charge, all electrical appliances you sold within a certain period, which are not working quite satisfactorily.

While doing this, you could interest them in additional electrical labor-lighteners.

How are you going to increase your list of customers and ought-to-be-customers during the *Week*?

If you have an exhibit at the Electric Show—have a registration book handy so that all visitors can leave their names and addresses.

Whenever you send out circular letters, be sure to enclose return postcards.

Use the Telephone.

Call up people you think would be interested in visiting your store during the *Week*, and invite them to a special Electrical Luncheon. Try to find out in advance what they are particularly interested in, and have them come the day on which you are going to demonstrate these articles.

Give an electric toy, a flashlight, or something to the children, if a purchase of a certain amount is made. Advertise this boldly. It will bring the mothers—the home purchasing agents —into your store.

Be sure to have plenty of manufacturers' literature on hand for distribution during the *Week*. A good way would be to distribute the literature according to daily demonstrations made, or in combination with the window display.

When you send out a piece of printed matter of exceptional value—something which will advertise your business as well as the manufacturer's—you may be sure that it will be kept and referred to if you stamp on the inside cover of each booklet, a number, duplicating this number in a register, with space where name and address can be written. Run these numbers from zero to any number you wish. Advertise in advance of the *Week*, by having circulars distributed by hand, that a number will be given out to all visitors at your store, which will entitle the holder to a chance on several prizes, exhibited in your store's display window.

The recipient of the booklet writes his name in the register opposite his number. The prize should not be given for several weeks after the event, the chief requirement to receive the prize being, that the booklet containing the number be surrendered to the store at the time when the prize is given.

This expedient will not only prove highly valuable from the added attention the booklet will receive, but you will derive considerable free publicity not obtainable in any other way.

The Society will be glad to send to members, without charge, a copy of its "S. S. S." booklet (Successful Selling Suggestions) containing 101 carefully selected sales ideas. Here's 56 pages of high-powered selling talk that every member should have on hand for ready reference.

Be careful not to advertise any "chance" proposition in the newspapers, or to send it through the mails. The United States postal laws forbid this.

Digitized by Google

Individual Lighting Schemes.

In addition to the co-operative lighting schemes your community might be planning—be sure to go strong on lighting yourself. Plan an arch in front of the store. Let it read: "E. P. W. Headquarters."

E. P. W. is a good time if there ever was one, to install an electric sign, if you haven't one already. The best way to make other people believe in electricity is to use it to the fullest extent yourself.

You really can't do too much to "cash-in" on this country-wide prosperity creator.

By good team work with the local interests as a whole, and by consistent and liberal use of the individual helps provided by the Society, plus your own investment of time and effort, you are not only going to make the *Week* a grand success as an event but from a personal-profit standpoint as well!

There is much in the foregoing, Mr. Contractor, which you can utilize. You should be quick to avail yourself of all the co-operative helps which will interlock with your business.

House Wiring.

Of course, you will concentrate your energies particularly upon house-wiring and "better-fixture" campaigns.

There are two ways for you to get after this business.

First, by going after it individually.

Second, by co-operating with the central station.

If you are going to take charge of the campaign, a flat price could be featured as a special inducement.

It has been found that with one or two rooms wired first, the owner wants the entire house wired within a short time.

A canvass should be made simultaneously with the newspaper advertising. Districts should be mapped out for the canvassers which should be covered in detail, until every section of the city has been covered.

In some cities a premium has been offered to those who responded—a percolator, an electric iron or something of the kind. This special premium offer brings into line that class of people who are always looking for a "bargain" or "something for nothing."

Newspaper space should be taken and advertisements run daily with the very lowest prices quoted which will make it possible to have that prince of servants—electricity—at their disposal.

The advertising need not be given entirely to promoting the house-wiring campaign, but could feature an electric appliance (if you sell appliances) in a somewhat incidental manner. This will visualize what electricity does besides lighting the house.

Your advertising should be of the "educational" or "informing" kind—that is, it should really tell why the people should have their homes wired, why electricity is a blessing, why electric light is cheaper and better than any other form of illuminant. Tell what a small fraction of a cent it costs to operate a lamp for an hour. Tell why an electric iron cuts down work, why it permits the housewife to have more time for herself.

And be sure to emphasize the fact that while all other commodities of life have increased in price, the cost of electricity has been decreasing constantly!

Most people think that wiring a house is accompanied by all kinds of muss and upsets; that the house must be literally turned inside-out in order to have it done.

Be sure to dispel this erroneous impression. Tell why it is possible to have the house wired without muss or dirt; how the workmen, the dirtless kind (which, of course, is the kind you employ) unobtrusively introduce the wires at the cellar, the garret, or the porch, and by cleverly "fishing" and "snaking," electrify the entire house from garret to cellar without leaving a trace of their work, except a better home.

Again, some people imagine that a house must be modern in order to be electrified. Explain that even the oldest homestead can be made modern and comfortable by electricity.

Expand on the investment feature of having a house wired. Why a house is not strictly modern, even though it may have running water and what-not, if it has not electricity. That the rental of houses which are wired for electricity is much greater than those which are without it. And in selling a house, the same fact remains; that a quicker sale and a better price can be effected with a house that is wired, than with one which isn't.

It would pay you to circularize a picked mailing list of people you think would be interested in installing electricity in their homes. A hard-hitting letter, filled with the same kind of selling points your advertisement should have, would do the trick—particularly prepare them for the call you, or your salesman, would make on them later.

With this letter, you might send a small stock booklet, regarding house wiring and electricity. These booklets can be obtained free from manufacturers or at small cost from publishers specializing on electrical subjects.

Possibly your central station has already planned a house-wiring campaign or would be glad to co-operate with you in pushing one. Remember, there is plenty of work for everybody, but all must give their hearty co-operation to make it a go.

You and the Central Station.

If you co-operate with the central station, make a very low flat price, a club rate, a single room or combination proposition, upon which the central station may base its campaign.

Newspaper advertising is used in the same way as by the contractor individually, but the central station usually signs up the contracts and turns them over to the contractor. Sometimes, the central station, in addition, makes the proposition a "monthly payment" or "small installment" one. In this way the house is wired, the occupant or owner paying off the cost of installation in small payments and enjoying the benefits of electricity at the same time.

In this instance, however, the contractor, upon showing a signed statement from the owner stating that the work has been done satisfactorily, receives cash in full from the central station for the job.

In some cases, where more than one contractor and the central staiton cooperate, the central station signs up a number of contracts and distributes them, according to a prearranged plan, among the contractors in the various sections of the town.

Whether you resolve upon a house-wiring campaign yourself, or co-operate with the central station, it will pay you to put your best efforts into the work.

Don't forget the co-operative helps prepared for your benefit by the Society.

Show the public that you are really in earnest, that you are not only thinking of getting the business, but that you are willing to give real service in return. That's what counts!

Fixtures and Other Accessories.

Offer to make suggestions for improving the fixtures already installed in the home. Do this by means of newspaper space, circularizing, or by personal canvass.

An exhibit at the Electric Show, if one is held, would prove mighty profitable. Here you would be sure of having a goodly audience interested in the latest ideas in right illumination of the home and places of business. You could give demonsrations on the right and the wrong way of lighting a room, a hallway, or a store front.

People who attend an Electric Show are usually looking out for something new. Show them how they can improve their homes, obtain more light, and at a lower cost, by installing the newer features of illumination—the indirect lighting schemes, the "bowls of sunshine" and the like.

Go after customers who have already been lined up, or for whom you have already done some work, and see if you can do any repair work or make extensions. Draw up plans for them.

Digitized by Google

Offer to make a liberal allowance on the old fixtures.

Be sure to remind those who have their houses wired that they should have plenty of outlets, especially baseboard outlets for appliances and extension lamps.

Electric Signs.

Canvass the merchants and see if you can't get the most of them lined up for a good-size electric sign before E. P. W. Tell them what ornamental street lighting will mean for them—what it has meant to every community in which it has been installed; that business will be brought to their street, yes, even into their store; that the electric sign "talks" to the people in the evening, when the rush and scurry of work is over, and when they are most receptive to its message.

Every electric sign which goes up in your town means a better knowledge of electricity in general, and naturally a growing demand for signs and other electrical equipment.

No doubt you can think of other ways in which you personally can cash in. It is impossible to give you specific details regarding your personal operations—your individual co-operation, because local conditions differ so greatly. And then there's the personal equation to be considered.

There's where you shine. Because no environment has been so hard, nor handicap so great that a six-cylinder man couldn't jump in and make the thing a success if he wanted to!

And to "cash in" on E. P. W. is going to be no difficult task if you only do your best. Your efforts placed at one end of the scale, will exactly balance your profits, at the other end!

English Guarantee Scheme Fails.

A hitch has occurred in connection with the guarantee scheme of the Electrical Contractors' Association (Incorporated) of England, which should have gone into operation on October 1. Before the scheme could be adopted by the Association it was necessary to alter its articles of association in order to embrace such activities as the guarantee scheme proposed. These amendments were duly formulated and sanctioned by the Association in general meeting; but in submitting the proposed additions to the Board of Trade the latter authority raised objection to their inclusion in the Association's articles. The Board of Trade takes the attitude that the Electrical Contractors' Association was formed for the purpose of improving the status of electrical contractors in general and for the protection and development of the installation trade as a whole. According to the Board of Trade, the guarantee scheme is opposed to this fundamental principle. The guarantee scheme proposes to confer a benefit upon a section of the installation trade—the members of the Electrical Contractors' Association.

Among the Contractors.

Henry H. Albrecht has opened an electrical supply house at 111 North Commercial Street, Neenah, Wis. Mr. Albrecht has had considerable experience in electrical work during the past few years. The firm is known as the H. H. Albrecht Electrical Supply Company.

One of the displays that attracted much attention at the recent New York Electrical Show was that made by the C. C. Bohn Electric Company, 820 Sixth Avenue, New York City. The company had a large booth adjoining the Westinghouse exhibit on the main floor. Included in the exhibit of the Bohn Electric Shop was an assortment of the new types of Santo vacuum cleaners and a large number of other electrical devices used in the modern home. The appliances shown were also demonstrated. Mr. Bohn's firm, besides doing wiring for light, heat and power in finished buildings, operates a very successful electric shop, where the best known types of electrical appliances and supplies may be purchased.

Charles L. V. Frank & Company is the name of a new house, which has opened at 335 West Main Street, Louisville, Ky., to deal in electrical equipment and machinery and mill supplies. The company is incorporated at $10,000 and the incorporators are Charles L. V. Frank, John R. C. Long and A. U. Stuberof.

Electrical Contractor Wins Prize.

In a recent industrial parade in Elkhart, Ind., the first prize was awarded to B. H. Reid, of the Brice H. Reid Company, electrical contractors, at 211 South Main Street, Elkhart. Mr. Reid's float is shown in the accompanying illustration. After the announcement of the award Mr. Reid withdrew his car from the contest on account of the commercial nature of the float, the name of the company having been displayed upon it.

Mr. Reid's car represented a huge sea shell in which were seated three small children driving a griffin. The car was decorated in white and lavender and the shell, wheels and body were outlined with tiny frosted electric lamps.

Prize-Winning Float in Elkhart Parade.

Boston Inspector's Report.

According to the recently issued report of the Wire Department, City of Boston, for the year 1914-15, there are 323 isolated electric plants in the city, with 390 generators, having an aggregate capacity of 30,377 kilowatts. Motors connected number 2,290, and there are 249,545 incandescent and 2,896 arc lamps connected.

The department made more than 40,000 inspections during the year. Defects reported numbered 2,111 and corrected 1,783. There were 71 fires and accidents to property due to electric causes, as compared with 83 the year before. Sixteen persons were injured, and the year previous 23.

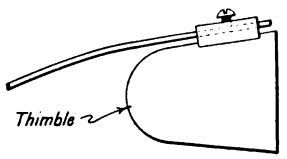
Digitized by Google

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Taping Hook.

While taping small coils or large ones in tight places, it is often difficult to start the end of the tape through the opening. When it is necessary to use a hook to pull the end through the opening, considerable time is lost in picking up and laying down the hook each time. To decrease the time and work of taping, a small hook was fastened to a brass thimble which is kept on the finger all of the time. Hooks or straight rods of any convenient



Taping Hook.

length and shape may be used. A small set screw in the piece of brass, which is soldered to the side of the thimble, holds the hook in place.

Arthur Heaney.

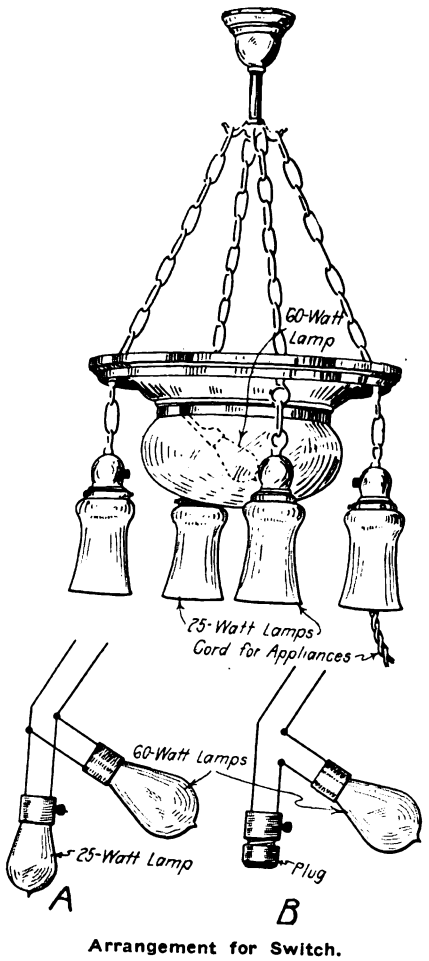
A Vest-Pocket Tester.

Almost every wireman now carries a pocket flashlight, and he usually requires a "bell and battery" testing outfit on new and old work. I made a neat outfit by using an ordinary watchcase buzzer with the base of an old miniature lamp soldered to the case of the buzzer and wired so that by closing the battery key one can test any circuit as with an ordinary outfit. It is necessary to put an extra binding post on the buzzer, if it is desired to retain the buzzer in its ordinary capacity. This is the neatest and most mechanical looking outfit I have seen and it is, I think, unique.

Ben R. Browne.

Switch for Center Light of Fixture.

In the dining rooms of an apartment building fixtures were installed of the type shown at the top of the accompanying diagram. The four pendent lights were equipped with key sockets. In the bowl was a single 60-watt Mazda lamp in a keyless socket. A single flush wall switch controlled the entire fixture. One of the tenants kept an extension cord permanently attached to one of the pendent sockets at the side, this was used for connecting percolator, toaster and other table appliances, since there were no other outlets in the dining room. For this purpose the wall switch and the key of the socket for the drop cord were always kept closed. Since this caused the center lamp to burn, it was the practice to keep it unscrewed a little during the day. To loosen and tighten this lamp in its socket proved very annoying, because to reach into the bowl necessitated standing upon a chair. The tenant therefore called me in to fix up some way by which



Arrangement for Switch.

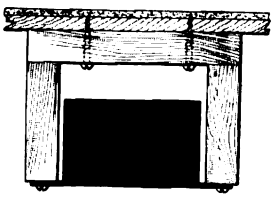
the center lamp, which gave the best illumination of the dining table, could be easily controlled.

At first I proposed fitting a pendent switch into the rim of the plate, midway between two of the side lamps on the least conspicuous side of the fixture, this switch to control the center lamp. This was objected to because it might mar the fixture. Finding that the side lamps were but seldom used, I utilized one of the key sockets as a pendent switch. It formerly was wired as shown at A. I rearranged the wiring as shown at B, that is, I put the socket in series with the center or 60-watt lamp. Into the socket I put an attachment plug whose terminals I short-circuited. An Edison fuse plug could be used in place of the short-circuited attachment plug.

F. Hugo.

Fastening a Wall Box.

A wireman is often compelled by lack of space to set boxes for wall switches or outlets parallel with the lath. This leaves no substantial lath to fasten to. To overcome this condition I make a U-shaped block which is screwed to the opposite wall and the wall box is



Wall-Box Mounting.

then screwed to this block, as shown in the accompanying illustration.

William P. Ullrich.

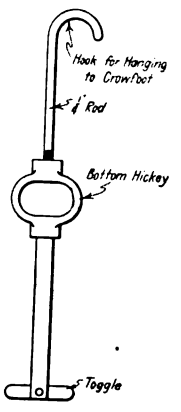
The Non-Spilling Flux Bottle.

While soldering joints in a very difficult place, the flux bottle I was using always tipped and spilled. So I took some cotton batting large enough to absorb the liquid and placed it in the bottle, thus preventing spilling when the bottle tilted. The flux should be applied to joints with a small brush. Plenty of liquid is taken by the brush from the soaked batting.

Fred J. Ley, Jr.

A Fixture Hanger's Helper.

When hanging a shower of any kind it is an awkward job to hold up the pan or canopy of the fixture and make the splices in the wiring. One good



Toggle Hook.

way to do this is to make a toggle hook and hook the hanger on the crowfoot and slip the toggle through the hole in the center of the canopy or pan; when through making the joints the device can be removed and slipped into the pocket while setting the pan or canopy up with the bottom knob; reference to the illustration shows clearly how nicely this works.

E. M. Raetz.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The Indianapolis Water Company. The Commission issued an order, October 23, approving a new rule of the water company in regard to metering of service. Under this rule the company reserves the right to, at any time, substitute meter service for flat-rate service, and whenever the company furnishes service through a meter of three-fourths inch opening or smaller, "it will exact a deposit of $10 or an acceptable bond to secure it in the value of the meter and for the water to be furnished." For larger meters a guaranty or deposit is to be required "to secure it in the value of the meter and the water to be furnished."

Under the company's former rule the exaction of a deposit was optional with the company while under the Commission's order the practice is made definite and uniform.

NEW YORK—First District.

New York Edison Company. A careful reading of the complete opinion and order of the First District Commission, which was rendered in the supplementary investigation of the rates of the New York Edison Company and the United Electric Light and Power Company, confirmed by advices from New York, shows that the announcement made in last week's issue of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN (p. 758) incorrectly stated that the additional one-half cent per kilowatt-hour to cover lamp service had been eliminated. This is not the case, however, and the maximum rate of 8 cents per kilowatt-hour without lamp service or 8.5 cents per kilowatt-hour with lamp service is not disturbed by the Commission's order.

The opinion of Commissioner Williams which was adopted by the Commission stated that the rate schedules filed by the companies have proved generally satisfactory. He says that at the time the reduction in rates was ordered, the Commission could not tell to a nicety just how it would work out. "I think the companies should have a chance to ascertain, and I doubt very much, if business conditions remain as they are at present, that the companies will realize, under the schedules filed, the amount of revenue which it was assumed they would when the order for the reduction was made."

Lamp Service.—In regard to lamp renewals the opinion says: "Both respondent companies, before May 1, furnished Gem lamps as free renewals to customers. No doubt, under many conditions the new tungsten lamps are more efficient, giving more light for the same consumption of current. The company under the new schedule furnishes Gem lamps and the larger sizes of tungsten lamps at the commutation rate of one-half cent per kilowatt-hour of current consumed. It was not contended by the complainants that this charge of one-half cent is unreasonable or excessive, but that the smaller sizes of tungsten lamps should be furnished under this rate without extra charge. This the companies claim they are unable to do at the prices now charged by the manufacturers for these lamps and that they furnish them to customers at a price representing the extra cost of this service.

"It appears from the evidence that over one-half of the lamps furnished as renewals by the New York Edison Company in the month of April, 1915, were tungsten lamps, and I recommend an order to the effect that all the lamps hereafter furnished as renewals should be tungsten lamps, the smaller sizes to be furnished at an extra charge, no more than the additional renewal charge." The order covering lamp renewals is as follows: "On and after January 1, 1916, the incandescent lamps furnished as renewals under the lamp service agreement by the said New York Edison Company (and United Electric Light and Power Company) shall be tungsten lamps of standard efficiencies and ratings, or other lamps of like or of greater efficiency and ratings, and that thereafter said company shall not so furnish to its customers Gem lamps or other lamps of an efficiency of less than 1.25 watts per candlepower. Tungsten lamps of 50 watts and above to be furnished as such renewals without extra charge, and the smaller sizes at an extra charge which shall be no more than the additional renewal cost of such smaller lamps.

"If said company, on and after January 1, 1916, undertakes to sell lamps aside from its lamp service agreements, its prices therefor shall be based upon the actual cost of said lamps and not on consideration of consumption of current, and that its schedule of such lamp prices shall be printed in its rate schedule."

Other Provisions Affecting Rates.—The opinion says: "There have been some complaints received by the Commission nearly all of them evidently dictated by the same hand and identical in wording. In one series, the request is made that the time for putting into effect the provision to install master meters be extended some two or three months, and another series complains in identical terms of the charge for the so-called breakdown service.

"All of the appearances in this case, with one or two exceptions, I think, have frankly admitted their interest in the establishment of private plants, in manufacture of machinery for these plants, or in the promotion of the so-called inspection companies.

"They ask, in effect, that the rates to the large consumer be increased so that he will save money by investing in a private plant and then as insurance against his private plant's failing at any time that a service in the nature of a breakdown service be provided by the public service corporations.

"They also request that a special rate be made for so-called 'Auxiliary' or 'off-peak' service to be called upon as well when the private plant will operate at a loss.

"It is proposed, in other words, to run the private plant in connection with a steam heating plant in the cold months of the year when the exhaust steam may be utilized for heating and when darkness comes early, and when the heat is no longer needed, and little light, the plant can be closed down and the current taken from the Edison or United Company's wires.

"In stores or office buildings the private plant can be shut down at closing time and the lighting companies' current used for the hallways, stairways, etc.

"These two classes of service were considered at the time the hearing on 'breakdown' service were held in 1908, and the rate for 'breakdown' service then established by the companies was made so as to meet them both.

Breakdown or Auxiliary Service.—"The charge of $24 per kilowatt of maximum demand is now made for this 'breakdown' service. It covers without extra charge the current consumed at standard rates up to that amount. All of this amount is actually used up in current, as appears from the evidence, excepting about 8 per cent, so that speaking in general terms, the breakdown customer is getting his current for exactly what the ordinary customer consuming a like amount pays,

Digitized by Google

and instead of complaining, I think a man having a private plant of his own, who desires this insurance and these connections with a public service corporation, should be satisfied if he pays no more than does the ordinary customer consuming a like amount, especially when he himself is allowed to fix the amount of demand for which he desires to contract.

"There is no question that if the companies contract to furnish this 'breakdown' service, they can be called upon at any time during the year and they must have the proper service and main connections for the maximum service, to say nothing of power house and converter station capacity. This extra expense, of course, must necessarily add to the expense of serving this class of consumers.

"There is nothing before the Commission to show that the charge for this service is unreasonable, or that it is in excess of the charge made in other cities for similar service." The order provides that the companies shall not refuse to supply electric current to any applicant therefor under the appropriate classification of the rate schedule on the ground that said applicant is either the owner or operator of an isolated or private plant, or a customer thereof; provided said applicant is not selling electric current to others outside of his own premises.

Standard Riders.—"It appeared during the hearings and it was stated to be the policy of the companies that they furnished service to customers who resold electric current to owners or tenants of adjacent buildings, thus entitling the consumer to a lower quantity rate. Undoubtedly the customer could compel the public service corporations to sell him the current whether he used it himself or resold it. The only thing the Commission is interested in is to see that this customer gets nothing by way of service or facilities that another customer consuming a like amount of current does not get. If the public service corporations furnished sub-meters or read them or performed any other extra service for this class of customers, it would be discrimination.

"I recommend that a change be made in the schedule pointing out the fact that customers may purchase current for resale in part and under what conditions the customer may do this, the meter or meters to be on the customer's premises in all instances, and any current to be resold to be measured by sub-meters, the public service corporations in no event to read or have any connection with them.

Conjunctional Service.—"The sale of current to customers who have two or more buildings under common ownership or leasehold and located within 100 feet was also attacked. It was claimed that many of these leases were made for the sole purpose of getting the current at a low rate. No such cases, however, were proven to exist, but such a case might develop, of course, at any time.

"It was not shown that the regulation, under which a customer could combine the consumption in two buildings located within 100 feet to get the benefit of a better rate, was unreasonable or improper, and the fact that someone has taken or may in the future take advantage of this part of the schedule and fraudulently place himself in a position to be benefited thereby, should not mitigate against a lawful consumer. Since the schedules allow a lesser rate for a large consumer, I do not see how the Commission can require that each building must be metered separately and charged for accordingly. If that were so, the owner or lessee of a large building would be getting current cheaper than the owner of several small buildings served conjunctively and using the same amount of current. Both companies have shown that they carefully examine every application relating to this class of service and I believe would be quick to cancel any contract found to have been obtained by fraudulent means. The fact that more than one meter is furnished by the public service corporations cannot be urged in this case, for the companies should be allowed to furnish as many meters to a customer as are needed for good service, but if any current is sold to tenants or sub-tenants, the public service corporations must not furnish or read these sub-meters.

Inclusion of Tenants' Consumption.—"Another provision of the schedule allows the landlord or owner of a building to combine the current consumed in his building, both by himself and his tenants, to get advantage of the lower rate for himself, on condition that all other electrical current shall be excluded from the building.

"It is but natural for those who are seeking to sell private plants to those landlords to ask that this clause should be cancelled, but no one else has complained. The tenants who pay a larger rate have not entered any protest. Indeed, it has been shown that the lighting of the halls, the running of elevators, etc., which service the landlord furnishes, is reflected in the rent the tenant pays. At any rate, this clause should be considered as a competitive rate. Surely the directors of the public service corporations, in this era of regulation, must have some little discretion left in dealing with competitors, and if a rate is established which is not shown to be so low that the company is actually losing money to the detriment of other consumers, I do not think that we should interfere.

"Certainly in these cases of inclusion contracts the companies lose no money. The current is being furnished to others in the building and by combining the current and furnishing sub-meters the landlord can, under another provision of the schedule, not only get his own, but his tenant's current, for exactly what his current costs him under this form of contract." * * *

The order provides that on and after January 1, 1916, the companies "shall determine the amount of current supplied to each customer by means of a master meter installed on the premises of the customer; the said company shall not be permitted to install more than one meter to a service under each contract, except where more than one meter is required to secure proper metering efficiency, the safety of the service or to meet exceptional local service conditions, but in no case shall additional meters be furnished solely for the convenience or purposes of the customer."

Value of the Service.—"As to the broad question whether or not the large consumer should be required to pay higher rates than those provided by the schedule, I can only repeat that these rates I consider as largely competitive. Private generating plants are competitors just as would be other competing public service corporations. The interests seeking to establish private plants demand of the Commission that rates be established which will show exactly the same percentage of profit from each class of consumers served; that the cost to serve each class or block of customers be determined separately, taking into consideration the maximum demand and the time of day when it occurs. As a matter of fact these factors are taken into consideration indirectly through the averages on which the rates are based. Special classifications are made, and I believe properly, for promoting and stimulating new enterprises and new classes of business, and these have been considered by the companies in making up their schedule.

"When the majority opinions of the Commission were adopted in the Ewoldt and Stradtlander cases, we knew that if the 'actual cost' of the service to each group of customers, plus a percentage of profit, were changed, a large group of over 25,000 customers of the Edison Company alone would be compelled to pay more than the maximum rate prescribed by the Legislature. We reduced the maximum charge, not because each customer or class should show the same percentage of profit at the new rate, but because we felt that the New York Edison Company was earning too large a return on its actual capital investment and that a fair return to its stockholders could, in our opinion, still be made if $2,000,000 of receipts were cut off, and its customers received the benefit of the reduction."

Then follows his expression of doubt as to how the reduction would actually work out, which was cited above.

Digitized by Google

In an opinion filed by Commissioner Hayward, reference is made to the testimony in which the complaint is made that the wholesale rates are so low as to cast an improper burden upon other classes of consumers, and says that it is an understood fact that these rates were established to meet the competition of private plants.

Rates to Meet Competition.—The opinion continues: "In none of the cases, however, is it held that competition in itself is vicious. If the competitive rate is also discriminatory, that is another matter. Of course, the companies claim that while their wholesale rate is competitive, it is not discriminatory or unreasonably low. It is true that competitive conditions do not justify discrimination, but they may to some extent justify a rate if it applies equally to all and is primarily based upon the difference in service. I have examined the record with great care, as well as schedules showing the difference between wholesale and retail rates in other cities, and while it may be that the wholesale prices given by the Edison and the United Companies are lower than is alone justified by the difference in cost of service, I agree with Commissioner Williams that there is not sufficient evidence for holding that the wholesale customers are served at such a low rate as to warrant our interferences. In fact, it seems to me that, considering the number of years this matter has been under investigation, and the great opportunity given both to the Commission and to the allied complainants to prove this fact, if it be a fact, the record is peculiarly barren of real evidence on this point."

Second District.

Certificate of Convenience and Necessity for Bus Lines. The Commission decided the first application for a certificate of convenience and necessity for a jitney bus line under the law passed by the last legislature upon the application of William B. Gray for authorization of six routes in New Rochelle. Certificates were granted to four of the six routes and refused to the other two routes.

The two routes for which certificates were refused would have run parallel to and on the same streets with existing trolley lines through their entire route. While it is held that the contention of the applicant, that the increased facilities provided by his bus line would help develop this territory and add to the convenience of its inhabitants might have been sustained, no proof was adduced of the "necessity" of these lines and their authorization was refused.

The duty of the Commission to protect established utilities under its jurisdiction from unnecessary competition is recognized.

"It was one of the wise and just provisions of the Public Service Commission's law to vest in the Commission requisite authority to prevent wasteful and unprofitable competition between privately owned enterprises engaged in any public utility field. The reasons for doing this were obvious. The people of New York State in their collective capacity have not as yet seen fit to engage largely in any form of government-operated utility enterprise. Individual courage, energy, foresight and a willingness on the part of private investors to risk large sums in bringing modern conveniences within the reach of all men—these have been the only agencies through which, speaking generally, it has hitherto been possible for the people of the State of New York to enjoy the benefits attaching to such necessaries of modern life as improved transit, lighting, telephonic and telegraphic facilities. Doubtless, therefore, when it passed the Public Service Commission's law, the Legislature included among its provisions the one we are discussing very largely from a sense of fairness to the private interests already engaged in these fields of work."

Convention of National Safety Council.

The fourth annual safety congress of the National Safety Council was held at the Bellevue-Stratford Hotel, Philadelphia, Pa., on October 19, 20, and 21, with a registered attendance of over 1,000 delegates representing practically every line of business in this country.

A very interesting feature of the convention was the Safety Exhibit prepared under the direction of C. W. Price, of the Wisconsin Industrial Commission, which included a very comprehensive collection of photographs, charts, first-aid and dispensary accessories, besides a number of terse signs which attracted the attention of all within sight by their compelling phraseology and "punch." Considerable space was also occupied by numerous manufacturers of safety-first appliances.

The deliberations of the convention were divided into two main classes—the General Sessions and the Round Table Discussions. The latter meetings were separately conducted according to the particular class of business represented, such as the public utilities, mining, foundry, etc.

The Public Utilities Round Table meeting was held on Wednesday morning with an attendance of about 150, representing most of the larger operating companies in the East and Middle West. E. B. Rosa, of the Bureau of Standards, as chairman of the Section, opened the meeting with a few remarks in which he directed attention to the greatly increased interest being shown in the safety idea by public utilities generally and exemplified by the very encouraging attendance at the convention by public-utility operators.

The first speaker of the session was C. B. Scott, secretary of N. E. L. A. Accident Prevention Committee and manager Bureau of Safety, Middle West Utitities Company, Chicago, who read a paper on "Linemen and Their Hazards." He said in part:

In dealing with the problem of the safety of linemen, it is very important that we do not forget that at least 85 per cent of the accidents to this class of employees is due to the human element and about 15 per cent to mechanical or physical conditions of the property. Consideration of this ratio is fundamentally necessary in any intelligent plan for their protection. A careful analysis and the study of this failure of the human element develops that chief among the contributing causes for man-failure are physical or mental unfitness for the work, lack of definite rules, dangerous practices and misundertsanding of orders.

The records of the Commonwealth Edison Company for the year 1914 show that in its street department, which includes both overhead and underground work, the percentage of employees who sustained accidental injuries was twice as great as the percentage of all the other departments combined.

Particular attention, therefore, should be given to the selection of men for this kind of work. Men of temperate habits, physically and mentally competent to perform the duties, should be selected. Men addicted to the use of intoxicants should not be employed in the line department. Frequently, sufficient attention is not given to the selection of linemen. Especially is this true where extensive construction work is about to begin, when the man who happens along and declares himself to be a lineman is given employment and no effort is made to ascertain his fitness or qualifications to perform the work with safety to himself and others.

Rubber gloves, line shields and other approved protective devices should be furnished by the companies. In order to insure the use of protective equipment provided, there must be complete co-operation between the lineman and the foreman. Such co-operation can best be secured by interesting both foremen and linemen in accident-prevention work. This interest can best be created by a direct appeal to the men, impressing them with the serious importance of such co-operation—of their own personal interest in their safety and of the beneficial results which may be accomplished by persistent co-operative effort. It cannot be maintained by occasional and spasmodic efforts in accident prevention, but the foremen and linemen must be impressed with the fact that accident prevention is an important part of their every-day work.

In opening the discussion H. L. Gannet, of Chicago, stated that every line accident in the experience of the Commonwealth Edison Company happened when the foreman's back was turned, and he advised that strict attention on the part of the line foreman is absolutely essential. He also asked for first-hand information on the effectiveness of the pulmotor or lungmotor, as did S. W. Ashe, of Pittsfield, who also wished to know what percentage of deaths are caused by electric shock and the fall sometimes incident thereto. In reply Mr. Scott said that perhaps 80 per cent of the fatal cases are due to shock, while, strange to say, sta-

Digitized by Google

tistics show that where the shocked lineman falls as a result, fatalities are much fewer.

Paul Spencer, Philadelphia, in his characteristically forceful manner, said that the 15 per cent of cases mentioned in the author's paper were probably due to rank carelessness. The fact remains after all is said and done that many linemen fail to use rubber goods when needed, usually on account of a false spirit of bravery or for other equally senseless reasons. The whole answer, he said, lies in the discipline of the foremen. Messrs. C. W. Clements, New Haven; Warnock, Youngstown; and H. J. Burton cited actual cases where resuscitating devices merely supplemented the prone-pressure method and all expressed the conviction that those machines are in reality "second-aid" appliances, and as such can usually be employed with good results.

The next paper on the subject of the "Danger of Low-Tension Shocks," by H. S. Warren, American Telephone & Telegraph Company, was presented by Elam Miller, of the same company, in the absence of the author. He said:

In the case of fatal injuries due to contact with 110 or 220-volt circuits, the last analysis usually shows that some important factor in connection with the case is not known, such as a possible diseased condition of the victim's system or the crossing of the low-voltage lines with high-tension currents. On the other hand, many cases are recorded where persons have come into direct contact with high voltage, without the least harm.

The deciding factors in their probable order of importance were given by the author as follows: (1) Distribution of the current through the body. (2) Rate of dissipation of the current in the body. (3) Amount of current forced through the body.

As a corollary to the above, it must be noted that the resistance of contact plays a large part in the damage done. As an expression of personal opinion, the author stated that voltages of 250 or lower are not of themselves dangerous, except under unusual conditions.

Elam Miller, New York, gave some extremely interesting results of research into judicial, medical and newspaper records of fatal injuries caused by currents supposedly under 500 volts. A very considerable percentage of these cases show no attempt at resuscitation, hence apparent death was taken as real death. In some of the remaining cases, the very good contact with the circuit was made or the shock was accompanied by dangerous falls. The remainder of the cases to all intents showed normal electrocution. Dr. Rosa stated that external conditions are usually the deciding factors while Mr. Ashe, Pittsfield, pointed out that in alternating current, the dangerous condition lies in the fact that the maximum value of the voltage is impressed as a series of shocks many times per second depending on the frequency.

B. E. Morrow, New York; H. L. Gannet, Chicago, and H. J. Burton recited the facts in many cases of low-tension shocks where some important out-condition, not connected with the voltage of the circuit, was proved to be the cause of the injury or death.

Bryce E. Morrow, chief engineer, Utilities Mutual Insurance Company, New York, next presented a paper on "The Hazard of High-Tension Lines," in which he emphasized the fact that the limits between low, medium and high-tension lines are not definite, where work is being done on lines employing what is usually understood as high-tension current, the line should be grounded and short-circuited and the switch controlling the line should be properly tagged. When all is said and done, however, the human element is the most important, especially in the roving class of linemen. These rarely realize that different conditions of atmosphere and kinds of work require different degrees of caution. As to the matter of instructions, printed rules are of very doubtful advantage. Personal talks to the foremen and their men will accomplish the best results.

In discussing this subject, O. K. Seldon, Atlanta, said that the meat of the entire subject can be summed up in one word—training.

On Wednesday evening an informal banquet was held at which Governor Brumbaugh, of Pennsylvania, Mayor Blankenburg, of Philadelphia, and Edson S. Lott, president of the United States Casualty Company, New York, were the speakers.

Railway Electrical Engineers Hold Annual Convention in Chicago.

The eighth annual convention of the Association of Railway Electrical Engineers was held, as has been the custom for the past several years, at the Hotel La Salle, Chicago, Ill., on October 19, 20, 21 and 22. The bulk of the work of this Association is done through committees which are active during the entire year and present the results of their efforts at the annual conventions for adoption or to receive suggestions for continued efforts. Among the reports submitted during this convention were the report of the Committee on Data and Information, which comprises a comprehensive tabulation of car-lighting data covering every important railroad in the United States and Canada. It is indicated that in so far as practice is concerned there has been practically no change, although the number of installations has increased and there has also been a marked increase in the number of gas-filled Mazda lamps used, and also in the use of the larger sizes of vacuum-type lamps.

The report of the Committee on Standard Rules for Car Wiring presents a complete set of specifications which are intended to cover the complete installation of an electric-wiring system for the lighting of passenger cars that will meet the requirements of the Fire Underwriters' rules.

The report of the Committee on Wire Specifications deals with specification forms suitable for use by railroads, general specifications for wire and cable, and a list of tables dealing with wire sizes, insulation, rubber tests, etc. The specifications are a modification of those presented by this committee in previous years.

The report of the Committee on Illumination is essentially a progress report, dealing specifically with the illumination of classification yards, with a brief résumé of the development in incandescent lamps.

The election of officers resulted as follows:

President, E. W. Jansen, Illinois Central Railway.

Senior vice-president, C. J. Causland, Pennsylvania Lines.

Junior vice-president, J. E. Gardner, Chicago, Burlington & Quincy Railway.

Secretary-treasurer, Joseph A. Andreucetti, Chicago & North Western Railway.

The members of the Executive Committee were elected as follows: E. Wanamaker, E. S. McNab, L. S. Billau, J. J. Hack, J. L. Minick and L. C. Hensel.

The customary comprehensive exhibit of manufacturers was conducted on the seventeenth floor of the Hotel La Salle, the latest equipment in the way of train-lighting appliances, signals, shop equipment, lamps and headlights being displayed. The following companies were among the exhibitors: Adams & Westlake Company, Albert & J. M. Anderson Manufacturing Company, American Pulley Company, Benjamin Electric Manufacturing Company, Central Electric Company, Consolidated Railway, Electric Lighting & Equipment Company, Crouse-Hinds Company, Ediston Storage Battery Company, Electric Storage Battery Company, General Electric Company, George Cutter Company, Gould Storage Battery Company, Harter Manufacturing Company, Hart & Hegeman, Kerite Insulated Wire & Cable Company, Krantz Manufacturing Company, National Lamp Works, National Metal Molding Company, Oneida Steel Pulley Company, Pyle National Electric Headlight Company, Safety Car Heating & Lighting Company, Sangamo Electric Company, Standard Underground Cable Company, U. S. Light & Heat Corporation, Western Electric Company, Westinghouse Lamp Company, Willard Storage Battery Company.

Digitized by Google

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Two-Day Meeting Held at St. Louis.

The 314th meeting of the American Institute of Electrical Engineers was held at St. Louis, Mo., on October 19 and 20. Headquarters were at the Planters Hotel. The meeting was held under the auspices of the St. Louis Section of the Institute, which made arrangements for the meeting.

S. N. Clarkson, chairman of the St. Louis Section, called the first session to order on Tuesday morning at the Planters Hotel. He introduced Mayor Keil, who made an address of welcome. Short addresses were also made by H. H. Humphrey, on behalf of the St. Louis Jovian League, and by J. W. Woermann, president of the Engineers Club and chairman of the Associated Engineering Societies of St. Louis. A telegram from President J. J. Carty was read, explaining that he had been kept away from the meeting by the necessity of appearing in court as a witness. Mr. Clarkson consequently called upon Vice-President N. W. Storer to occupy the chair and Mr. Storer made a brief reply to the addresses of welcome. Secretary F. L. Hutchinson was also called upon for a brief address.

The first paper presented was by J. L. Hamilton, entitled "The Repulsion-Start Induction Motor."

Repulsion-Start Induction Motor.

The repulsion-start induction motor for single-phase current has come into considerable prominence during the last 10 or 15 years as is fully attested by the large number of motors of this type now in operation, and by the increasing demand and production. While there is considerable literature available on the subject of repulsion motors both compensated and non-compensated and on induction motors, there is comparatively little information available on the repulsion-start induction motor, which is really a combination of two distinct types of motors. This paper sets forth the general characteristics of this type of motor and compares them with similar characteristics of direct-current motors and other alternating-current motors; outlines a definite and commercially practicable method of studying the electrical design of existing motors and of pre-determining the electrical design of new or proposed motors, and discusses the mechanical design and construction.

This paper was discussed by Hans Weichsel, L. T. Robinson, T. Spooner, F. J. Bullivant and Morgan Brooks. Mr. Weichsel pointed out that the methods of the author are valuable, but that shorter methods can be used without any sacrifice, and also more reliable methods can be used which do not require any greater time. The work can be shortened by using the tables which were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN October 15, 22 and 29, 1910. He also took exception to several points in the author's work. Mr. Spooner read a discussion prepared by C. A. M. Weber, which gave the methods of calculation used by him and illustrated these with curves.

The next paper was by Val A. Fynn, entitled "Single-Phase Squirrel-Cage Motor With Large Starting Torque and Phase Compensation." This paper described the unity-power-factor motor which is made by the Wagner Electric Manufacturing Company.

This paper was discussed by H. Weichsel, who said that the characteristics of this motor are similar to those of a synchronous motor. By changing the compensation the power-factor can be made either lagging or leading.

The last paper at the morning session was by George R. Dean and was entitled "Calculation of Long-Distance Transmission Lines Under Constant Alternating Voltage." This paper was entirely mathematical and derived from the fundamental differential equations useful expressions for the current and voltage and applied these to numerical examples.

Luncheon was served at the American Hotel Annex at a meeting of the St. Louis Chapter of the Jovian League. On calling the meeting to order the president exhibited the cup which had been won by the St. Louis Degree Team at the annual convention of the Jovian Order, and requested A. L. Le Masters, who won the individual first prize as Pluto, to stand up.

The chairman of the day was E. O. Chenery. He introduced N. W. Storer, who made an address upon the electrification of steam railroads, pointing out the rapid development of this branch of the industry and giving the advantages of electric operation. Others called upon for brief remarks were: P. J. Kealy, of Kansas City; L. T. Robinson, of Schenectady, N. Y.; M. G. Lloyd, of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN; Morgan Brooks, of the University of Illinois; and H. L. Brown, of the *Electrical World*.

The afternoon was devoted to an automobile trip through the residential section of the city and to the Sunset Inn, where refreshments were served.

Left Half of Group of Electrical Engineers at St. Louis Convention.

At the evening session the first paper to be presented was one by Philip J. Kealy, entitled "Municipal Co-Operation in Public-Utility Management."

Municipal Co-Operation in Public-Utility Management.

A brief review of the historical development of the public-utility franchise is given, and a comparison made between past conditions and those existing today, when the investment per dollar of gross earnings is greater than ever before. While earlier franchises were usually liberal to the utility corporation, they were generally considered unsatisfactory and at present greater restrictions are usually imposed upon the operating company, frequently involving municipal participation in the revenue. This may take one of four forms. (1) the company is permitted a fixed return upon an agreed valuation, all excess earnings going to the city; (2) company permitted a fixed return on agreed capitalization, with surplus divided between company and city; (3) percentage of gross earnings paid to city and city given supervision of service; (4) a sliding scale, in which the rate of return allowed the company is increased

Digitized by Google

as the price to consumers is reduced. The first case is represented by the Cleveland traction ordinance, the second by the Chicago traction settlement, the third by the Chicago electric light and telephone franchises, and the fourth by the Boston gas ordinance. The effect of such limitations as the above upon extensions is pointed out, and it is shown that congestion in the large cities is increased where extensions are delayed. In some cases extensions are provided by assessment of private land owners. The injustice of diverting gross earnings to municipal purposes is emphasized and the Kansas City plan explained. The latter city now has a street-railway ordinance under which the value of the property is fixed and a six-per-cent return permitted on this valuation, which includes a franchise value. Earnings in excess of six per cent are to be put back into the property until the intangible value is wiped out, after which surplus earnings will be divided between city and company.

This paper was discussed by C. A. Hobein, Jr., M. G. Lloyd and L. B. Cherry. Mr. Hobein pointed out that the electric railways had received more attention from the municipalities than any of the other privately owned utilities. Dr. Lloyd pointed out that the entire cost of the New York subways was represented by the increases in valuation of real estate created thereby, and that if these values had been taken by assessing benefits there would have been no necessity for issuing bonds. He also pointed out the advantages of co-operative franchises such as the Boston gas franchise, and the desirability of inserting in acts creating state regulating commissions a provision which permits operating companies to receive some advantage from efficient operation and management. At present such provisions exist in the laws of Pennsylvania and Idaho alone.

Mr. Cherry thought that at least a small part of the cost of extensions should be paid by the city as a whole and Mr. Kealy agreed with this point of view.

C. W. Place then presented a paper on the subject of "Automatic Control."

Automatic Control.

It is frequently a question how far it is advisable to go in the application of automatic control, and the writer discusses a number of typical examples from the standpoint of a field engineer of a manufacturing company. Any successful scheme of control must be such as can be produced by the manufacturer and used by the purchaser with profit to both. A review of many of the well-established systems of automatic control emphasizes the advantage of appreciating just what is to be accomplished, having the conditions of operation clearly defined, and knowing the economical limit to which special refinements should be carried. The elimination of the human element in routine operations is one of the most effective means of preventing accidents to life and property and herein lies an important function of automatic control.

The last paper at this session was by F. L. Rhodes and R. F. Hosford, entitled "Recent Results Obtained From Preservation Treatment of Telephone Poles." This paper was presented by Mr. Hosford.

Preservative Treatment of Poles.

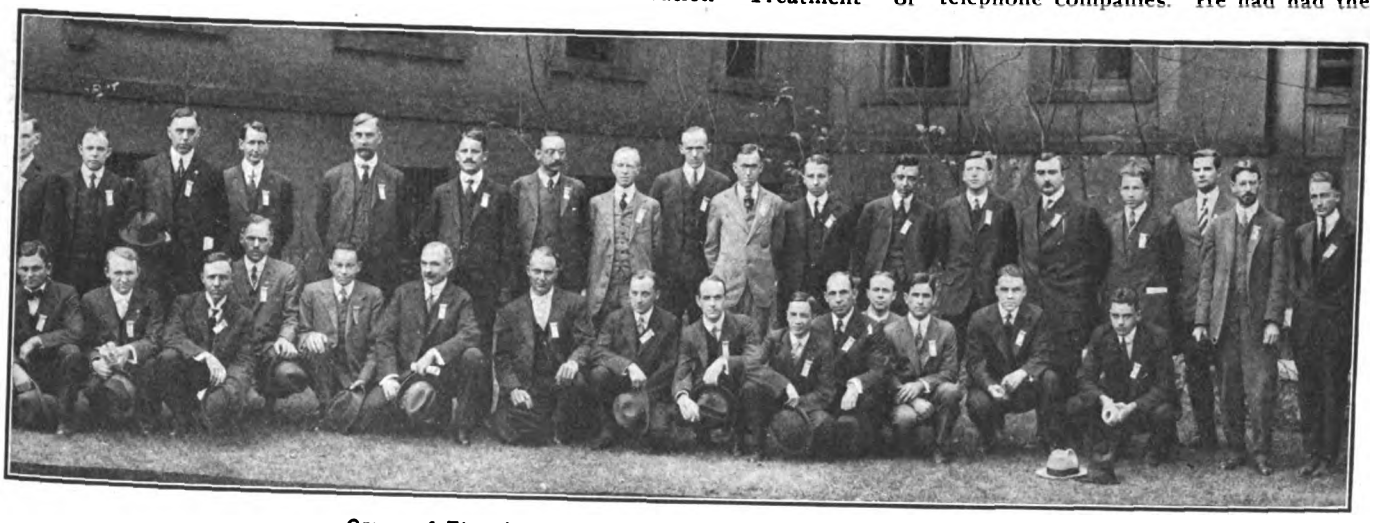
This paper gives the results of the experience of the American Telephone and Telegraph Company in the application of preservative treatment to wooden poles. Data are given for poles treated by the pressure, open-tank and brush methods. The condition of poles after periods of use with these treatments is tabluated. Analyses of the preservatives used are given. Experiments with untreated poles show that green juniper poles last as long as the seasoned poles, the average life being slightly over seven years. None of the seven preservatives used show consistently superior results to the others. Recently a systematic study of insect damage has been attempted. The application of preservatives high in antiseptic power and insoluble in water has been shown to result in increased life.

This paper was discussed by H. Von Schrenk, C. H. Teesdale, C. A. Hobein, Jr., L. B. Cherry and N. W. Storer. Dr. Von Schrenk said that piling had shown a similar result in that decay takes place in the layers underneath those to which the preservative has been applied. His observations in Germany showed similarly a maximum life of poles which had had the greatest amount of impregnation and retained the preservative best. He considered the butt treatment or full-cell treatment better than the brush treatment.

Mr. Teesdale said that the experience of the Forest Service showed that the brush treatment of non-durable wood did not pay. The brush treatment is not applicable at all to railroad ties, where the wear is far greater than with telephone poles. Neither the brush treatment nor the butt treatment is suitable to poles which decay above the ground line. The fact that treatment extends the life of poles and is therefore a good investment applies particularly to the electric light companies, which use poles of larger size and consequently higher cost than the telephone companies. He had had the same experience as the authors with green and seasoned untreated poles, ties and fence posts, the green material lasting as long as the seasoned, while extra long seasoning appears to cause deterioration.

In closing, Mr. Hosford stated that the more intense treatment gives the better results. He had found that the dead oil of coal tar gives as good results as any of the more expensive materials. In treating poles the aim should be to get as uniform a distribution of the preservative as possible. The objection to cypress poles is that even in the best varieties the sap wood decays throughout the full length of the pole.

At the session on Wednesday morning Mr. Clarkson presided. The first paper was by Ellery D. Paine, entitled "The Engineering Experiment Station of the University of Illinois." This paper described the organization for engineering research at the university and was accompanied by lantern slides



Group of Electrical Engineers at St. Louis Convention—Right Half.

Digitized by Google

showing the buildings and the apparatus which has been installed in them. The nature of the investigations undertaken was explained.

This paper was discussed by L. T. Robinson, J. D. Ball, A. C. Lanier and Morgan Brooks.

The next paper was by T. D. Yensen and was entitled "The Magnetic Properties of Some Iron Alloys Melted in Vacuo."

Magnetic Properties of Iron Alloys Melted in Vacuo.

This paper describes experiments on various alloys of the electrolytic iron melted in vacuo. The author deals briefly with the iron-boron and iron-carbon alloys, and presents results obtained with the iron-cobalt alloy Fe_2Co, but gives in greater detail the data in regard to iron-silicon alloys, from which the most remarkable results were obtained. The two best alloys were obtained with about 0.15 per cent and 3.40 per cent silicon, after annealing at 1,100 degrees centigrade. The values of maximum permeability for both of these alloys are above 50,000, and the values of hysteresis loss for $B_{max} = 10{,}000$ and 15,000 are about 300 and 1,000 ergs per cubic centimeter per cycle respectively. This hysteresis loss is one-eighth and one-third of the corresponding loss for commercial silicon-steel. While both alloys have similar magnetic properties, the 3.40-per-cent silicon-alloy has a specific electrical resistance nearly five times that of the 0.15-per-cent alloy, making it particularly desirable for use in electromagnetic machinery in places where a low eddy-current loss is a requirement, in addition to high permeability and low hysteresis loss.

This paper was discussed by Thomas Spooner, W. J. Wooldridge, J. D. Ball, Morgan Brooks, M. G. Lloyd, J. L. Hamilton, L. T. Robinson and N. W. Storer. Mr. Spooner stated that he had found the Burrows form of apparatus satisfactory for measuring permeability, but that the material was very sensitive to strain. Annealing in a vacuum had no particular effect upon ordinary material.

Mr. Wooldridge pointed out that while rods were used in this test, sheet material is used almost exclusively in commercial work and he should like to see some of Mr. Yensen's material rolled into sheets and then tested. Sheets are usually poorer in quality than cast ingots and are also more variable. Material of the highest quality is also the most sensitive to mechanical working. In practice eddy currents are not found to be in proportion to the values computed from measurements of conductivity of the material.

Mr. Ball presented a critical analysis of the result which indicated either some error or else the possession of remarkable properties in the material examined. The samples for which the highest permeability have been found were shown to depart most widely from an application of the Steinmetz law. A calculation of the saturation values gave a similar indication. A sample of Mr. Yensen's material was tested at Schenectady and also gave extremely high values for the permeability.

Dr. Lloyd and Mr. Robinson pointed out the importance of this work qualitatively and the relative unimportance of the exact numerical values, which were probably subject to considerable error.

In closing the discussion, which he did at the afternoon session, Mr. Yensen pointed out that there was no relation between crystal size and the extreme values of permeability and hysteresis. He gave the results which had been obtained with rings since writing the paper. Since the flux is not uniform over the cross-section of a ring the extreme maximum of permeability is not measured in this method. The material used was a three-per-cent silicon alloy. Since the Steinmetz law does not hold for these specimens, he did not consider Mr. Ball's analysis valid. The specimens have not shown any aging at ordinary temperatures. The material has not as yet been used in sheet form, but it is expected to do so in the future.

TEST RESULTS WITH RING SPECIMENS.

	Permeability Maximum	Hysteresis in Ergs per C.C. per Cycle 10,000 Gausses	15,000 Gausses
Before Annealing—			
Ingot	2,000	955	1,130
Forging	3,000	1,305	1,540
After Annealing—			
Ingot	32,000	340	577
Forging	36,200	337	757

Luncheon was served at the City Club, the members being guests of the St. Louis Section of the Institute. Brief speeches were made by C. C. Robinson, L. T. Robinson, Secretary Hutchinson and Vice-President Storer. The name of C. S. Ruffner was mentioned as a suitable representative upon the board of directors of the Institute and support was asked for him at the next election.

At the final session in the afternoon two papers were discussed together. These were "The Effect of Displaced Magnetic Pulsations on the Hysteresis Loss of Sheet Steel," by L. W. Chubb and T. Spooner, presented by Mr. Spooner, and "The Unsymmetrical Hysteresis Loop," by J. D. Ball.

Effect of Displaced Magnetic Pulsations on Hysteresis Loss.

Most modern revolving electrical apparatus has teeth on the rotor or stator, or both, which are subjected to constantly varying reluctance. This variation of reluctance causes high-frequency changes of flux superimposed on the working flux. The result is a series of displaced hysteresis loops. This investigation was undertaken to determine the magnitude and, if possible, some of the laws governing the change in hysteresis loss due to displacing a loop from its symmetrical position. Hysteresis loops are determined by the use of a volt-second meter or fluxmeter. The authors conclude that the hysteresis loss in sheet steel does not follow the Steinmetz law when the material is unsymmetrically magnetized. The coefficient of the Steinmetz equation is increased and the exponent is decreased with increase of displacement. The displacement factor for silicon-steel is greater than for ordinary steel.

The Unsymmetrical Hysteresis Loop.

The paper gives results of tests to determine losses in hysteresis loops wherein the magnetism is carried through cycles in which limiting values of flux are different in opposite directions. Such variations of magnetism occur in inductor generators, in teeth of induction machines and in materials magnetized from rectifier circuits, etc. The author finds that the losses in unsymmetrical loops are greater than in symmetrical loops of the same amplitude; for loops of the same amplitude, the losses increase as the 1.9 power of the mean flux-density. With any given value of mean density, the increased losses with increased range increases according to the Steinmetz law.

These papers were discussed by L. T. Robinson, M. G. Lloyd and T. D. Yensen.

The last paper to be presented was one by H. Weichsel, entitled "Decomposing Magnetic Fields Into Their Higher Harmonics." This paper was a mathematical one showing how the harmonics existing in magnetic waves of geometrical shapes may be easily determined. It was discussed by George R. Dean, J. L. Hamilton, M. G. Lloyd and L. W. Chubb.

A vote of thanks to the various hosts of the visiting members was then passed and the meeting adjourned. The Engineers Club of St. Louis entertained the members at dinner, which was followed by a theater party.

Hydroelectric Project for Ireland.

The American consul in Queenstown, Ireland, reports that a great hydroelectric power project is on foot in Ireland for the utilization of the tremendous head of the water constituted by the western loughs or lakes. The falls of the River Shannon, below Lough Derg and Lough Ree, are expected to develop not less than 60,000 horsepower even during summer, and the River Erne, below Lough Erne and Lough Oughter is calculated to be capable of nearly 40,000 horsepower. The idea is to provide electric light and power for all the cities of Ireland on the general plan of the plants at Niagara Falls and Keokuk in the United States.

While this project has been given some prominence in the Irish press, it appears to be still in the hypothetical stage. Newspaper reports state that a capital of $5,000,000 has been subscribed and that surveys are actually in progress.

Digitized by Google

Convention of Kansas Association.

The eighteenth annual convention of the Kansas Gas, Water, Electric Light & Street Railway Association was called to order in the Assembly room of the National Hotel, Topeka, Kans., October 21, by H. W. McGruder, president, of Liberal, Kans. Charles S. Elliott, president of the Commercial Club, gave the address of welcome. An address was made by T. F. Doran, an attorney of Topeka.

After the appointment of committees and the reports of the officers and executive committee, L. O. Ripley, vice-president and general maanger of the Kansas Gas & Electric Light Company, delivered an address on "Is Red Tape Good Business Insulation?" Mr. Ripley urged that red tape was essential; that one man spending time on the subject, could work out a plan whereby papers could be sent smoothly through a normal routine and avoid the hustling back and forth of boys which looks like business, but which is too often merely confusion. L. E. Northshield, of the General Electric Company gave a talk on steam flow meters.

One of the most impressive addresses of the session was by George C. Shaad, professor of electrical engineering in University of Kansas. Mr. Shaad's subject was a new utility law for Kansas. He said that while there was no effort to get a new law so far as he knew, many changes undoubtedly should be made in the direction of requiring compliance of municipal utilities with regulations now imposed on private utilities. All municipal utilities, he suggested, should have a uniform system of bookkeeping and making reports and such a plan would assist in determining whether the costs were fair and also assist in establishing a basis for regulating prices of similar utilities. He pointed out that under present conditions a private company cannot enter a town where there is a similar utility without permission of the board, but a city can go ahead and build a plant irrespective of the service given by an established utility. Prof. Shaad declared that in such a situation the city should be required to buy the private plant at a fair figure.

W. L. Gardner, agent of the National Fire Insurance Company, talked on "Concentric Wiring." He said there was not much prospect of approval of such wiring and suggested that the cost of installing would be found higher than estimated because of additional fittings required. While he did not say that fire-insurance inspectors would condemn the wiring, he said such wiring would be looked upon with some suspicion.

H. F. McRell, of the General Electric Company, gave a technical talk on "Transformers and Lightning Arresters," in which he took a stand in favor of the grounding of secondaries.

Rudolph Schlatter, of St. Louis, made an interesting talk on the construction and operating characteristics of the Diesel engine.

R. P. Tobin, of the Vacuum Oil Company, outlined the modern practice of general power-plant lubrication.

The second day's session brought some very important and pertinent subjects before the central-station men. One of the most stimulating addresses was by B. J. Long, commercial manager of Topeka Edison Company, on "Merchandising."

A striking address in view of the opportunities for central stations in the irrigation belts was that by C. A. Fees, of the Kansas Gas & Electric Company, Wichita. This company has been pioneering in the installation of plants for pumping and while much of this installation is necessarily experimental, and complete data are not available, it seems that very large opportunties are presented. The address was particularly interesting in view of the announcement made almost at the same time, in Topeka, that the State Irrigation Commissioner, W. J. Lough, is planning to demonstrate the best methods of developing land with an irrigation plant.

Another paper showing a very rapidly widening field for central-station output was by Charles A. Stanley, industrial engineer of the Kansas Gas & Electric Company. His talk was on "Electric Drive for Flour Mills," and was illustrated with slides of mills equipped for service from the central station.

A talk on "Excess Indicators" was made by C. L. Wells, of the Western Electric Company. He referred to the apparent necessity for a current-limiting service for securing small residential business. Among the persons who took part in the discussion was President McGruder, who declared that the business of central stations in Kansas could be increased 15 per cent by the use of such an instrument.

B. E. Jacks, busines maanger of the Salina Light, Power & Gas Company, in a talk on "Selling Electrical Advertising in Small Cities," suggested that almost any merchant could be sold an electric sign, but advised against selling a sign, less than a merchant could pay for, to him, and a sign that was larger than was commensurate with his volume of business, to another. P. F. Walker, dean of School of Engineering, University of Kansas, gave an interesting talk on "Standards in the Utility Plant's Boiler Room."

C. J. Carlson, of the Commonwealth Edison Company, showed where a big field for enterprise was waiting for Kansas, illustrating his talk on "Electrical Refrigeration" with stereopticon slides.

J. P. Morrison, chief inspector, Hartford Steam Boiler Inspection and Insurance Service, gave an instructive lecture on steam-boiler inspection methods.

The Association changed its name from the cumbersome one used for many years to the Kansas Public Service Association. It is possible that permanent headquarters of the Association will be established in Topeka, and Topeka will be made the permanent convention city.

The change of name was coincident with a limiting of the activities of the Association, the "water" and "gas" interests being eliminated. The Association has only one member representing a water utility, and but two or three representing gas utilities. Heretofore, as at the present session, the programs have been almost exclusively devoted to the interests of electric central stations, the electric railway interests gleaning their advantage from the discussions of power-plant subjects. Hereafter the entire attention of the Association will be devoted to electrical matters, including both central-station and electric-railway matters.

A committee was appointed to revise the constitution, the members to vote upon the revision by mail, in the course of about two months.

The committee on revision of the constitution is as follows: A. M. Patten, Topeka; J. D. Nicholson, Newton; L. O. Ripley, Wichita; W. R. Wagoner, Salina; and L. K. Green, Concordia.

The newly elected officers are: President, A. H. Purdy, manager of the Topeka Edison Company.

First vice-president, W. R. Wagoner, general superintendent of the Salina Light, Heat & Power Company.

Second vice-president, R. G. La Fite, proprietor of the Eureka Electric & Ice Company.

Third vice-president, W. J. Welfelt, Winfield, superintendent of the municipal electric plant.

Secretary, E. A. Wright, superintendent of the Manhattan Ice, Light & Power Company.

Treasurer, J. D. Nicholson, manager of the Kansas Gas & Electric Company at Newton.

The Executive Committee is constituted as follows: A. M. Patten, Topeka; L. O. Ripley, Wichita; C. L. Brown, Abilene; L. K. Green, Concordia, and M. T. Flynn, Kansas City, Kans.

A rejuvenation was held Friday night at which 18 candidates were initiated into the Jovian Order. L. O. Ripley, statesman for Kansas, was in charge.

Digitized by Google

Light and Illumination.

On the foregoing subject Charles P. Steinmetz lectured at the Art Institute, Chicago, on the evening of October 26 before a joint meeting of the Chicago Section, American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers. In opening his address he referred to the relative low efficiency of light production as yet attained; however, it must be acknowledged that a very great advance has been made in this direction within the memory of the present generation. He rapidly reviewed these developments and pointed out that it is easy to foresee further tremendous strides in the future to possibly an efficiency of twenty or more candlepower per watt.

Dr. Steinmetz discussed at length the vibration theory and compared the production of sound with that of light, showing that sound can be discerned through a vibration range of seven or eight octaves, whereas visible radiation falls entirely within a range of but three-fourths of an octave. He compared pure sound tones with pure or monochromatic light, showing the difficulty experienced in producing the latter. In fact, the entire problem of efficient light production hinges around the producing of radiant energy confined to the luminous spectrum. He discussed the temperatures and percentages of luminous to total energy emitted in the case of molten aluminum, iron and tungsten; the latter gives about five to six per cent of its radiant energy as luminous energy. If it were possible to obtain a temperature of 5,000 degrees centigrade the percentage of luminous energy would probably increase to some 10 or 12 per cent.

The advance in efficiency of light production has been almost entirely by raising the temperature of light sources, first by means of combustion and later by the electric current. He discussed the relative efficiencies and the reasons therefor of the carbon filament, arc, tantalum, osmium and tungsten lamps. The carbon-filament lamp gave about three-fourths per cent of its radiation in the visible range, while the vacuum tungsten lamp gives about two per cent. He then discussed the advantages obtained from gas-filling of incandescent lamps, showing that for the large lamps nitrogen is most suitable and for the small lamps argon.

Another great advance in light efficiency is obtained through selective radiation. This was first developed by Auer von Welsbach in his gas mantle, which increased the efficiency of gas lighting nearly ten times its former value; later the Nernst lamp improved the efficiency of electric lamps but not to as great an extent. Since that time the higher temperature of the tungsten lamp has permitted surpassing the efficiency of the Nernst lamp. At the present time it seems that mercury, calcium and titanium are the only elements whose use will produce high luminous efficiency through selective radiation. Through future developments it may be possible to obtain 25 per cent of the total radiation as luminous radiation. The ideal, in efficiency at least, is the nearly 100 per cent obtained by the firefly.

Annual Meeting and New York Section Meeting of Illuminating Engineering Society.

The annual meeting of the Illuminating Engineering Society held in New York on the evening of October 14 was very brief. Brief addresses were made by A. S. McAllister, retiring president, and Charles P. Steinmetz, the new president of the society. The latter urged more close co-operation by all interested in the development of illuminating engineering and good lighting in general. He also suggested that another course of lectures on the subject be given similar to the Johns Hopkins course in the fall of 1910.

Directly after the annual meeting, the New York Section held the first of the monthly meetings for the season. C. S. McDowell, of the Brooklyn Navy Yard, presented a paper on "Illumination in the Navy." This covered first the illumination of various spaces and quarters on shipboard, but was devoted mostly to searchlights and signaling by means of light. Interest centered around the high-efficiency carbon arc which has enormously increased the efficiency of searchlights. Lieut. McDowell gave credit for this to Henrick Beck, of Germany, and the latter's American representative, L. J. Auerbacher, opened the discussion.

A similar lamp developed by the Sperry Gyroscope Laboratories was exhibited and described by Mr. Sperry. Other exhibits shown in use, which had much to do with the success of the meeting, were an ardois, a blinker signal set, and a searchlight equipped with both hand-operated and rheostatic telegraph-key control, also portable searchlight with storage battery. In addition to the above working exhibits there were also shown other searchlights and lamps.

The discussion by Messrs. Steinmetz, Luckiesh and Porter on the effectiveness of various colored lenses indicates that yellow, amber and blue green all have special advantages but none can be applied generally as well as the clear glass at present in use.

British Government Committee Reports on Factory Lighting.

Between two and three years ago the British Government through the Home Office appointed a committee of experts to report exhaustively on the subject of lighting in factories and workshops. Dr. R. T. Glazebrook, director of the National Physical Laboratory, acted as chairman, and had associated with him men of eminence as government inspectors of factories or as medical, physiological, illuminating engineers, or other experts. The first report has just been issued and in its 68 closely printed pages brings together a vast quantity of matter based upon information furnished in reply to circulars issued to a large number of trade association, also concerning practice in various continental countries. In the period of its existence the committee has held 38 meetings for the purpose of inquiring and reporting (to use the terms of its appointment) "as to the conditions necessary for the adequate and suitable lighting (natural and artificial) of factories and workshops, having regard to the nature of the work carried on, the protection of the evesight of the persons employed, and the various forms of illumination." In view of the wide ground to be covered the committee decided in the first instance to limit its inquiry as far as possible to the textile, engineering, and clothing trades, certain general principles common to all trades, however, being also taken into consideration. These industries were chosen as being the largest from the point of view of the number of persons employed, and also as affording great diversity in character and requirements. The Illuminating Engineering Society, the Institution of Electrical Engineers, the Institution of Gas Engineers, and the leading societies of ophthalmologists, medical men, surgeons, architects, and surveyors, all gave their co-operation and nominated witnesses to give evidence before the committee. In all 50 witnesses gave evidence. Eighty-five factories in the various industrial centers were visited, and about 4,000 measurements of illumination were made in 163 rooms in 57 factories, the data, as a rule, being prepared previously to the visit. In this way the members were able to form a clear conception of the conditions represented by a certain numerical value for the working illumination and to compare this with the figures mentioned by various witnesses, and found in the existing literature on the subject. Certain experiments bearing on the standards of illumination required for various purposes were also carried out at the National Physical Laboratory. The inquiry showed that there had

Digitized by Google

been a great advance in methods of illumination but various defects which were met with are enumerated in the report. A statistical inquiry into the number of accidents during each month throughout the year pointed to the conclusion that inadequate lighting was a contributory cause of accidents. This was confirmed by the evidence of witnesses regarding accidents in foundries, shipbuilding yards and cotton mills, and by statements of the insurance companies interested in workmen's compensation matters. Complaints of eye-strain, headache, etc., attributed to insufficient lighting were common, and while an exhaustive medical inquiry would be necessary to establish the connection between these defects and inadequate lighting, there was a general impression that unsatisfying lighting was, in various ways, prejudicial to health. It was also recognized that insufficient light added to the difficulty of the proper supervision of work, and of the maintenance of cleanliness and sanitary conditions generally. Specific instances were described in evidence of the effect of improved lighting in increasing the output and improving the quality of work turned out.

The committee in its first report states that from the evidence it is apparent that there is a general consensus of opinion as to economic and hygienic advantages of adequate and suitable lighting. As a proof of this is cited the great improvement in lighting which has taken place during recent years, and is still continuing; in modern factories good lighting is now regarded as one of the most important factors contributing to industrial efficiency. Many employers in old factories have lagged behind in the general advance and any requirements tending to compel modernization would, it is considered, benefit both the operator (by improving his working conditions), and the employer (by increasing his output and by improving the quality of the work).

"Light is a cheap commodity and little or no hardship would result from such a requirement, if gradually and sympathetically enforced."

In view of the foregoing the committee recommend that there should be a statutory provision requiring adequate and suitable lighting in general terms in every part of a factory or workshop, and giving power to the Home Secretary to make orders defining adequate and suitable illumination for workshops and factories or for any parts thereof or for any processes carried on therein. The illumination may be said to be adequate and suitable provided that (1) it is sufficient for the proper carrying out of the work both as regards quality and output, and (2), there are no lighting conditions prejudicial to the health, comfort and safety of workers. In order to satisfy these requirements, the illumination should comply with the following requirements:

(a) Adequacy.

(b) A reasonable degree of constancy and uniformity of illumination over the necessary area of work.

(c) The placing or shading of lamps so that the light from them does not fall directly in the eyes of an operator when engaged on his work or when looking horizontally across the workroom.

(d) The placing of lights so as to avoid the casting of extraneous shadows on the work.

All of these factors are undoubtedly of great importance and the committee is of opinion that they should receive special attention in the designing of lighting installations. In the first place, however, attention must be directed to the adequacy of the illumination in factories and workshops and both the measurements taken and the recommendations made in the report are concerned almost entirely with this aspect of the matter.

In regard to the question of specifying the amount of illumination implied in the terms "adequate and suitable," owing to the great progress that has recently been made in the appliances for measuring illumination it is now practicable to specify numerical values in a manner that would hardly have been possible some years ago. It is, therefore, proposed to specify the minimum intensity of illumination desirable, from the standpoint of general convenience and safety in parts of the workshops where work is normally carried on, and in yards, passages and open spaces along which people are ordinarily liable to pass.

The following four recommendations are made under this head:

(a) Over the "working areas" of workrooms the illumination measured on a horizontal plane at floor level shall not be less than 0.25 foot-candle without prejudice to the illumination required for the work itself.

(b) In all parts of foundries in which work is carried on, or over which any person is ordinarily liable to pass, the illumination measured on a horizontal plane at floor level shall not be less than 0.4 foot-candle.

(c) In all parts of factories and workshops (not included under recommendation *a*) over which persons employed are liable to pass, the illumination measured on a horizontal plane at floor level shall not be less than 0.1 foot-candle.

(d) In all open places in which persons are employed during the period between one hour after sunset and one hour before sunrise and in any dangerous parts of the regular road or way over a yard or other space forming the approach to any place of work, the illumination on a horizontal plane at ground level shall not be less than 0.05 foot-candle.

These values are suggested without prejudice to the special illumination required for the carrying out of the work which naturally varies greatly according to the nature of the operations. At present the committee is not prepared to recommend standards of illumination for these purposes which require further investigation.

In conclusion the committee points out that the minimum values prescribed are considerably lower than those proposed by many witnesses, and are also lower than those found to exist in the majority of factories visited. In many cases manufacturers would naturally prefer to provide a substantially higher value than that indicated. The intention has been to propose values which can be adopted as a practical legal minimum without causing hardship, and would serve the purpose of raising the level of illumination in those factories which are behind modern practice in regard to methods of illumination. The committee did not feel justified in drawing any distinction between direct, indirect, and semi-indirect lighting nor between systems which differ in the color composition of the light. Similarly, the standards are intended to apply equally to natural and artificial lighting; that is to say, when the natural illumination falls below the prescribed limits, it must be supplemented or replaced by artificial illumination.

Just now when factories are working overtime on night work, in the dark period of the year, and when big output is a matter of overwhelming importance, adequate artificial illumination is a vital consideration.

Kansas City to Boost Electrical Prosperity Week.

One of the large meetings of the year of the Kansas City Electric-Jovian Club indorsed on October 19 the celebration of Electrical Prosperity Week, and told the committee to "go ahead." F. B. Uhrig, manager for the Western Electric Company, at Kansas City, Mo., is chairman of the committee, and plans are rapidly being outlined. The club held a jollification over the election of P. Lloyd Lewis as Jovian statesman, and heard the report he made of the convention in Chicago.

The annual convention of the Ohio Independent Telephone Association will be held at the Hartman Hotel, Columbus, O., on November 18 and 19.

Digitized by Google

BOOK REVIEWS.

"Electrical Instruments in Theory and Practice." By W. H. F. Murdoch and U. A. Oschwald. New York: Whittaker & Company. Cloth, 366 pages (4¾ by 7¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $2.75.

A reviewer who considers his work to be worth while, and who wishes to be fair both to the authors and to the public, is sometimes confronted with a perplexing problem. It is comparatively easy to glance over a book and say, "this is a book of very high merit and will be found useful by engineers or others desiring information on the subjects treated." Such a statement is perfectly safe, as a dissatisfied purchaser will not hold the reviewer responsible, but to adversely criticize a book often secures the resentment of the author, and sometimes of the publisher. Although it may be disagreeable to do a certain thing, nevertheless it may be one's duty to do it. With this introduction the reader will know what to expect.

In the preface the authors say: "It is hoped this book will meet with the approval of students in the higher classes, and of engineers." If the reviewer is any judge of the attitude students take towards a book written in the manner of this one, he is quite certain that the authors will be grievously disappointed. A more exasperating method of treatment than that used by the authors is difficult to imagine. The premises and conditions upon which certain equations are based are seldom given. For example the authors say on p. 235 that the driving torque of a motor meter is $T=ZFC/20\pi$. They do not say what Z and F signify, nor do they give the slightest hint as to how the equation is derived. A student that comprehends that kind of a statement does not need the book. He already understands the subject. The ability of the authors to pluck equations out of the void and set them down on the page is marvelous. It has its advantages, however; it makes it extremely difficult for any one to disprove their accuracy.

Not only the use of independent or disconnected equations, but the transformations of some of them, and the heedless use of symbols, seriously interfere with the purposes of the book. For example, on p. 48 the expression for quantity of electricity discharged through a ballistic galvanometer is given by

$$Q=(1/2\pi G)KT\Theta_1.$$

Then, on p. 81 the expression for Q is

$$Q=(1/\pi G)HT\sin \tfrac{1}{2}\Theta.$$

The student could easily conclude that $\sin\frac{1}{2}\Theta$ and $\Theta/2$ were approximately equal. But no hint is given as to how K becomes H.

In explaining how to calibrate a ballistic galvanometer by the discharge of a condenser charged to a known potential difference, the above equation is first given and then transformed to an expression for the integral of N. This expression involves R, the total resistance in the circuit.

Not the slightest hint is given as to how R gets into the circuit. Is it the resistance of the galvanometer and condenser in series, or is it the resistance of the secondary of a mutual-inductance coil? It is evident that the authors are attempting to derive an expression for the "flux" constant and not the "coulomb" constant. But such abbreviated instructions are useless to the average student.

As to the heedless use of symbols, it would be difficult to find a worse example. The letter I is used for current, moment of inertia, impedance and torque. The letter C is used for current, and also for a constant.

Several years ago the late Mark Twain in answering a letter of the chairman of the American Board of Foreign Missions said: "In a letter of 9 points of fact you have made 11½ errors." In 1911 Fitch and Huber published an excellent paper on "A Comparison of American Direct-Current Switchboard Voltmeters and Ammeters." The authors of this book quote extensively from this paper, but with such inaccuracy that Mark Twain's retort is quite apropos in this instance. The quotations contain some twenty more or less serious errors. Some of the errors are quite serious, as they make the results absolutely meaningless. Of the more humorous mistakes, are Western Electric Company, St. Louis, for Wagner Electric Manufacturing Company; the Ridler Smith Company, for the Roller-Smith Company.

Reviewers of technical books are usually reluctant to say anything about syntactical and other grammatical errors, but in this volume careless use of words is entirely too prevalent.

From the foregoing the reader must not infer that the book is wholly without merit. That would not be a correct conclusion. The chapter on damping is very good. What makes the book disappointing is the conviction that the authors know their subject and have made the beginning of a valuable work. A complete and careful revision will undoubtedly help in securing a fulfillment of the authors' expectations.

C. M. JANSKY.

"Electrical Measurements." By O. J. Bushnell and A. G. Turnbull. Chicago: American Technical Society. Cloth, 174 pages (5¼x8¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $1.00.

Logically, the word "Commercial" might have been prefixed to the title so as to distinguish this volume by its name from the treatises on laboratory measurements. Written by two of the men in charge of the meter department of the Commonwealth Edison Company at Chicago, this book shows at a glance that it is based on practical experience with the problems of measuring electrical energy as supplied by central stations. The first half of the volume is devoted to electrical measuring instruments, including brief but clear explanations of electrolytic meters, galvanometers of various types, static voltmeters, frequency indicators, and meggers. In each case, both the principle of operation and the method of use is clearly set forth, with apparently a minimum of mathematics, and with a special chapter of "Precautions in the Use of Instruments."

The latter half of the book relates to methods of distribution of energy and to the measurement of the distributed energy by watt-hour meters. Here also, both the operation and characteristics of the leading types of such meters and the methods of adjusting and testing them are recited in simple language, both recording and maximum-demand meters being included. Of the total of 139 illustrations, a score of those borrowed from the respective manufacturers fall far below the text in lucidity, but the many special diagrams are unusually clear and well chosen. As a book for occasional reference, the volume might be improved by extending the index to include many of these diagrams and more of the sub-headings. However, the general arrangement of the chapters is so orderly and logical that the reader will soon learn where to find some of the vaguely indexed contents and this shortcoming can easily be overlooked in view of the unusually practical and dependable text, which makes this a volume that every central station ought to buy for its meter and testing departments.

ALBERT SCHEIBLE.

"The Electrical Nature of Matter and Radioactivity." Third Edition. By Harry C. Jones, New York: D. Van Nostrand Company. Cloth, 212 pages (5x8 inches). Supplied by the Electrical Review Publishing Company, Inc., for $2.00.

The popularity of this presentation, in a style free from mathematical language, of the important facts and conclusions which modern science has brought forth in regard to the electrical nature of common matter, is shown by the necessity for a third edition of this work. The present edition has been entirely revised and the matter brought up to date, a procedure which has been rendered imperative by the rapidity with which new evidence is being developed by those whose lives are devoted to scientific research in this field. The volume is an excellent one for those who wish to become conversant with modern progress in this subject without the necessity of wading through mathematical demonstrations and developments of theory.

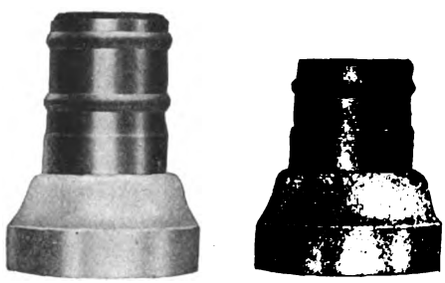
A recent proclamation of the Governor General of Australia prohibits the importation of electric or magnetic belts.

Digitized by Google

New Electrical and Mechanical Appliances

Brass Shells of New C-H Wall Sockets Made Interchangeable.

The line of C-H 600-watt push-button brass-shell sockets has been augmented by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., by the addition of three new wall-type sockets. The brass shells of these sockets and the C-H fixtures and pendent sockets are identical and therefore interchangeable. Of the three new sockets, No. 7550 is the push-button type, while Nos. 7551 and 7561 are plain sockets without operating mechanism, the latter being a short socket. Round porcelain bases for concealed work are provided on all, the supporting-screw holes in the bases being spaced on one-inch centers.



Long and Short-Shell Wall Sockets.

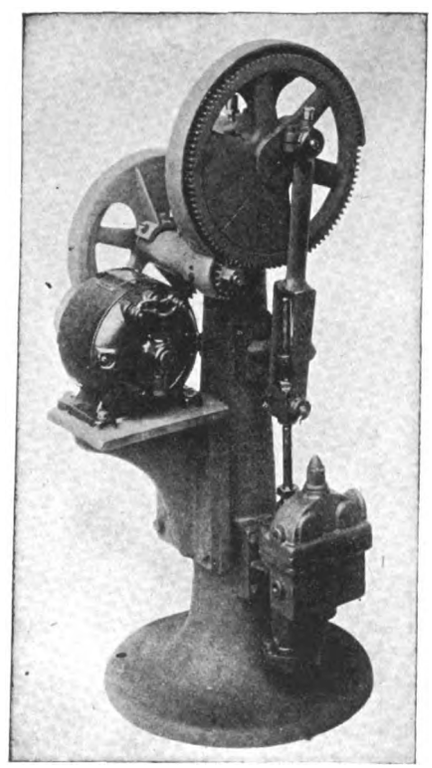
Push-Button Wall Socket.

These sockets are National Electrical Code standard with the approved rating of 660 watts, 250 volts. This high rating is particularly desirable today, not alone because greater durability is claimed thereby but also because many appliances besides lamps are now operated from sockets.

Motor-Driven House Pump.

One of the most compact and, at the same time, most sturdily constructed house pumps on the market is that shown in the accompanying illustration. It is designed to meet the needs of the moderate consumer of water and is admirably adapted for use on the farm and in country and suburban residences. It is capable of pumping water from wells, cisterns, springs and similar sources within suction limit and will force water to a height of 100 feet or against a pressure of 50 pounds. It can, therefore, be used in connection with either open attic tanks or basement pressure tanks.

The machine is carefully constructed in every detail. The gears are all machine cut, shielded, and of ample dimensions. Brass valves, cylinder and piston rod and large, well lubricated bearings insure long life. A cloth driving pinion minimizes noise.



Motor-Driven House Pump.

The motors used to drive these pumps, one of which is shown in the illustration mounted directly on the pump, are Westinghouse single-phase, clutch-type. They develop one-sixth horsepower at 1,700 revolutions per minute and will start the pump at full load.

The machine, being upright and wholly self-contained, occupies little space and requires no special foundation. The motor can be connected to any lighting or power circuit and necessitates no special wiring at all.

This pump is made by the Hill Machine Company, of Anderson, Ind.

New Mogul-Base Porcelain Socket.

In refrigerating plants, abattoirs, steamships, etc., where corroding vapors are constantly present, a socket with a porcelain covering is more desirable than one having the standard brass shell. With these requirements in mind, together with the increasing use of type C, or gas-filled tungsten lamps, the firm of Harvey Hubbell, Incorporated, has designed a new porcelain mogul-base socket, equipped with either three-eighth or one-half-inch aluminum caps as desired. A rubber gasket assures an absolutely tight joint between the upper and lower portions, making it thoroughly weatherproof and capable of withstanding the ravages of the elements. Long binding screws with generously proportioned heads greatly simplify the wiring, permitting ample room for the loop to mat and confining all stray wire ends.

Mogul Porcelain Socket.

Westinghouse Lamp Works Opened in Milwaukee.

Due to the general betterment in business conditions, the Westinghouse Lamp Company has considered it advisable to open its new Milwaukee plant for the manufacture of incandescent lamps. Large display advertisements have appeared in all of the Milwaukee papers, advertising for 500 girls, the employment of whom will be required in the manufacture of a half million Westinghouse Mazda lamps per month.

The Milwaukee Works of the West-

Digitized by Google

inghouse Lamp Company are located at 3100 Center Street and are composed of five large buildings, occupying about five acres of ground.

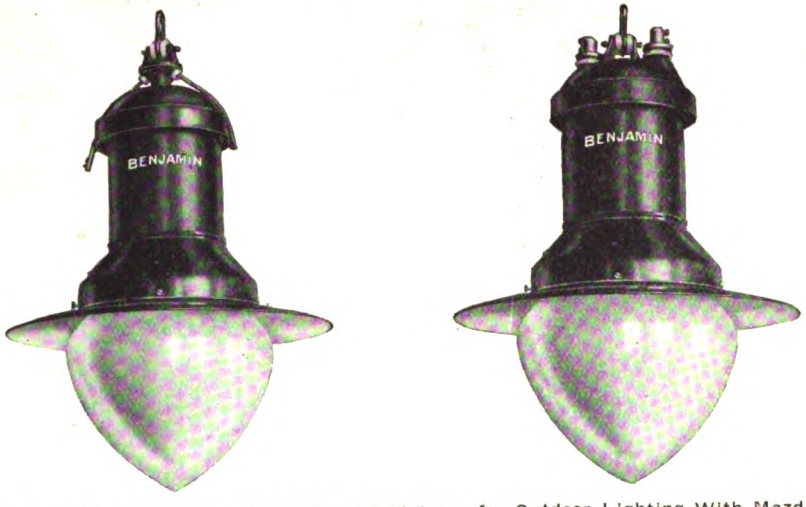
Walter Cary, vice-president and general manager and T. G. Whaling, assistant general manager and sales manager of the Westinghouse Lamp Company, are both natives of Milwaukee and are taking an active personal interest in the plant. Frank Wicks, who has been superintendent of the New York plant of the company, has assumed management of the Milwaukee Works.

An interesting feature of the opening of this new plant is that the incandescent-lamp industry is a new industry for the state of Wisconsin.

Benjamin Fixtures for Street Lighting with Gas-Filled Tungsten Lamps.

The very rapid increase in the use of gas-filled tungsten lamps for street lighting has brought about the development of special fixtures designed to meet the requirements for this particular type of unit. A new line of these fixtures has recently been developed by the Benjamin Electric Manufacturing Company, Chicago, Ill. In the accompanying illustrations are shown two of these units. These fixtures are designed particularly for use in series street lighting, or other outdoor lighting, although they are also built for multiple circuits as well. Where series circuits are employed, the fixtures are provided either with a compensator, which is an autotransformer that permits the use of 400, 600 or 1,000-candlepower lamps taking heavy currents to be connected to the standard series circuits of either 6.6 or 7.5 amperes. These series lamps can also be operated with a special film-cutout socket in place of the compensator, in which case they are suitable for use with lamps ranging from 250 to 600 candlepower that are operated directly in series with the circuit. When used on multiple circuits a multiple socket of the mogul type, suitable for lamps ranging from 300 to 1,000 watts is supplied.

The equipment includes a substantial copper case with reflector and globe-holder surmounted by a cast-iron cap with supporting fitting. This top part is made in two types, as shown by the two illustrations. The first is known as the lead-wire type, being provided with porcelain-lined bushings for the leading-in wires. The second type cap is provided with binding-post terminals. In other respects the two types are substantially identical. In each case an easily wired porcelain socket of the two-piece type is provided with lamp grip. The reflector is of enameled steel and 20 inches in diameter. A stalactite glass diffusing globe without bottom opening is supplied. The inclosing case is thoroughly ventilated. Its standard finish is black enamel. Several thousand fixtures of this type are in successful use for street lighting.



Lead-Wire and Binding-Post Types of Fixtures for Outdoor Lighting With Mazda "C" Lamps.

The Wallace Lamp Patents Sustained.

A decision has just been rendered in the United States Court, Southern District of New York, declaring United States patents Nos. 903,499 and 904,409 valid and infringed. The Wallace Novelty Company, Incorporated, of New York City, owner of these patents, brought suit against the World Syndicate Company, Incorporated, of New York, claiming the MacKinnon lamps marketed by the latter to be infringements of its patent rights.

These patents cover the spring clamping means, the rubber suction cup and the revoluble drum around which the cord is wound, which elements are found in a number of the portable electric lamp stands now on the market.

This decree of the United States Court upholding the validity of these patents and their infringement by the World Syndicate Company, is of importance to the trade, as the owners of the patents have expressed their decision to prosecute all infringers, and suits have already been instituted against several concerns which are said to be infringing not only these patents but additional ones of the Wallace Novelty Company, covering other features of its lamps and shades.

Switch and Cutout Cabinets.

The most approved practice regarding switch cabinets, which also include cutouts for the circuits controlled, is to isolate the cutout portion of the cabinet by itself and behind a locked door; then by using push-button flush switches the latter can be arranged in a readily accessible position without having any current-carrying parts exposed. Thus the fuses can be reached by the duly authorized electrician, who is provided with a key to the cutout section, and all liability to shock from contact with exposed live parts is eliminated.

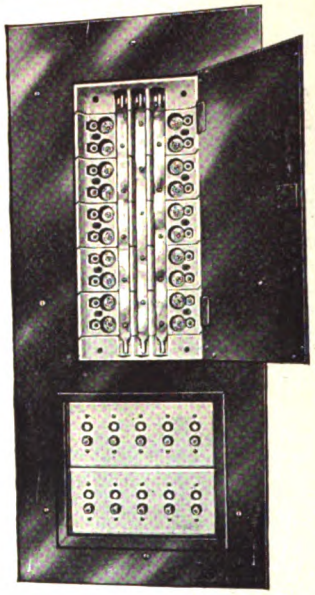


Fig. 1.—Switch Cabinet With Barrier Cutouts.

An improved form of cabinets of this type is shown in the accompanying illustrations. Fig. 1 shows a 10-circuit cabinet complete and Fig. 2 shows it with the face plate carrying the door, and also with one of the gang-switch face plates removed. The cutouts are of the "barrier" unit type, which was described in these columns in the last issue. This type gives a liberal wiring gutter around the assembled cutout panel and this gutter is continued to the switches, thus making it very easy to wire.

This type of cabinet has the advantage of placing the switches at the bot-

Digitized by Google

tom, where they can be most easily reached. This allows the cabinet to be made considerably narrower than where the switches are placed at the side, which permits installation of the cabinet in many narrow spaces, for instance, on a column, where an ordinary switch cabinet could not be used. The cabinets are furnished complete, except for the push-switch body, which may be of any desired type and installed when needed. The switch plates furnished are fitted with blank buttons that can be quickly removed to permit installing the switches as they are needed.

The cabinets are designated as type S and are manufactured by the C. & P. Electric Works, Springfield, Mass.

Electric Coffee Mill.

The coffee mill illustrated herewith is capable of granulating from one to two pounds and of pulverizing from one-quarter to one-half pound of coffee per minute, depending upon the condition of the coffee. The capacity of each hopper is about three pounds. The mill is furnished with a motor of such capacity as permits of coffee being granulated and pulverized both at the same time.

The mechanism of the mill is very simple, there being no complicated parts to get out of order. The mill, the hoppers and the receiving cans are all inclosed, preventing dirt from accumulating inside. A positive pin release is provided to prevent damage to the mill should a nail or other foreign matter get into the burrs.

A dial indicator is provided on the regulator on each end of the mill by which the degree of fineness of granulating or pulverizing can be regulated, even while the machine is running. The machine is self-cleaning, that is, for every pound of coffee placed in the hopper, a pound of granulated or pulverized coffee is delivered to the receiving cans, none remaining in the machine.

As a protection to curious persons, especially children, wire gauze is placed in the spouts which lead to the receiving cans; this prevents one from getting one's fingers into the working parts. The standard finish is national red with black and gold striping. The hoppers are made of brass, nickel plated.

The motor to which the coffee mill is direct-connected, is a one-sixth horsepower repulsion-induction-type single-phase motor manufactured by the Century Electric Company, St. Louis, Mo. The motor, starting under full load, accelerates so quickly and requires so little starting current that it can be connected to the lighting circuit without affecting the lighting service.

Each mill is complete with a 10-foot cord and attachment plug ready for connection to a lamp socket. It is made by the Steiner Manufacturing Company, 4100 North 21st Street, St. Louis, Mo.

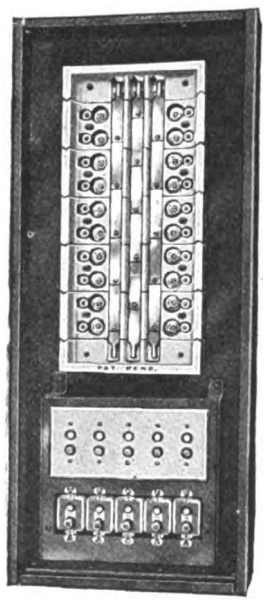
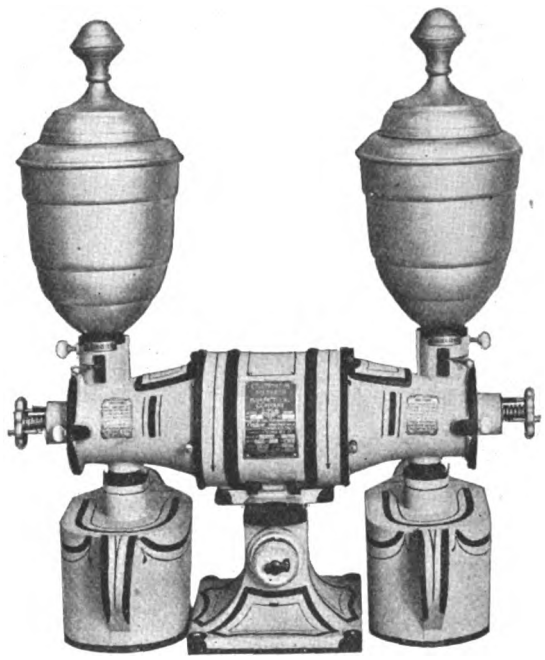


Fig. 2.—Interior of Cabinet.



New Motor-Driven Coffee Mill.

Mazda Olivette Lamp.

The use of the arc lamp for stage lighting purposes has always been open to the objection that it requires special precaution in handling and operation on account of fire hazard. In some localities the city regulations require that an operator be at all times stationed at each device used.

For the elimination of this precaution and reduction of operating expense, the Sprague Electric Works of General Electric Company has now placed on the market the Mazda Olivette lamp, which replaces the hand-feed arc lamp by the use of an incandescent bulb of high candlepower. The use of this lamp not only facilitates operation, but reduces operating expense to the cost only of sufficient operators for changing the colors when necessary and for striking, setting and plugging the device.

This new device consists of an aluminum parabolic reflector inclosed in a suitable casing in which the ventilating feature has been designed to take care of the extreme heat generated by the lamp. Grooves or color slides are provided to take care of the present standard-size color frames, which are 18 inches square.

The lamp is wired complete to the receptacle which is fastened to the ventilating hood. The arrangement permits the receptacle to be easily replaced if necessary. The lamp is furnished with 18 inches of stage cable projecting through the bottom of the hood, the cable being held in place, and strain-relieved from the connection within the casing, by an insulated bushing having a cable-grip attachment. This cable terminates in a 10-ampere plug connector, to which is fastened 25 feet of stage cable.

Mazda Olivette Lamp.

The stand furnished with this device consists of a five-foot telescopic stand of one-inch iron pipe with an inner section of one-half-inch pipe provided with set-screw collar and swing joint which permits adjustment of the hood.

These devices are suitable for the use of the type C Mazda lamps of 750 and 1,000-watt size in type PS-52 bulbs.

Digitized by Google

Winners of Western Electric Fan-Window-Display Contest.

Early this year the Western Electric Company announced a unique fan-window-display contest open to dealers of Western Electric fans. The company furnished a background and large wave cut-out that were required to be used in the display. A set of six prizes ranging from $50 to $5 was offered to the most attractive and effective displays. This contest closed on September 1 and the Committee on Awards has, after careful deliberation, now announced its awards.

This committee was composed of the following: Elmer E. Wood, eastern manager of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, chairman; John R. Galloway, president of the National Electrical Contractors' Association; A. J. Edgell, manager of Display Bureau, Society for Electrical Development; O. H. Caldwell, *Electrical World;* Algar Cook, *Electrical Record.*

The prize winners are as follows:

First prize—$50—New Orleans Railway & Light Co., New Orleans, La.

Second prize—$25—Home Electric Company, Escanaba, Mich.

Third prize—$10—Albuquerque Gas, Electric Light & Power Company, Albuquerque, N. M.

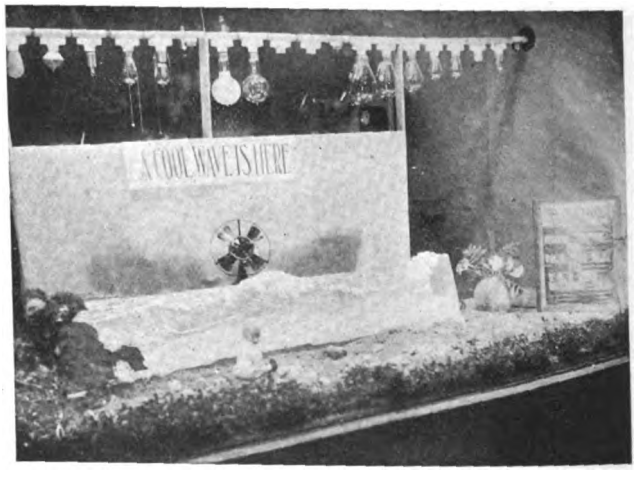
Fourth prize—$5—Clinton Electric Light & Power Company, Clinton, Ind.

Fifth prize—$5—Paducah Light & Power Company, Paducah, Ky.

Sixth prize—$5—Consumers Electric Light & Power Company, New Orleans, La.

Illustrations of the first and second prize windows are shown herewith.

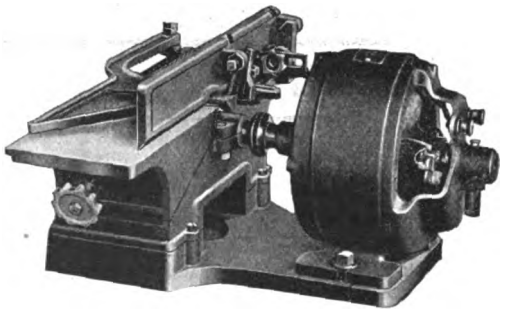
First Prize in Western Electric Fan-Window-Display Contest.



Second Prize in Window-Display Contest.

New Electric Bench Jointer.

The Crescent Machine Company, Leetonia, O., has developed a small four-inch electric jointer to do such jobs as are ordinarily done by hand with a plane and square. The machine is furnished with a round safety head, tilting fence for level work, automatic guard and rear table for rabbeting.



Motor-Driven Bench Jointer.

In one operation this machine will do the same work that requires a number of operations when done with a plane and square.

The jointer and motor are direct-connected and are mounted on a common subbase. The knives are four inches long and the overall dimensions of the machine are 20 by 18 by 9 inches high. The net weight is 90 pounds.

The driving motor has an output of one-quarter horsepower and is manufactured by the Robbins & Myers Company, Springfield, O.

Westinghouse Electric Takes Over Sale of Westinghouse Machine Product.

Announcement has been made by the Westinghouse Electric & Manufacturing Company that the sale of the standard product of the Westinghouse Machine Company has been taken over by the Prime Mover Department of the Electric Company. E. H. Sniffin, formerly vice-president and sales manager of the Westinghouse Machine Company, has been appointed manager of the Prime Mover Department, and as such will direct the sales of the product of this company as he has done in the past.

Mr. Sniffin became associated with Westinghouse, Church, Kerr & Company in 1888, first as salesman and afterwards as sales manager. In 1903, when the Machine Company organized a sales department, Mr. Sniffin was made sales manager. Subsequently in 1905 he was elected vice-president, which position he held at the time of the organization of the Prime Mover Department of the Electric Company.

A Marine Department of the Westinghouse Machine Company has also been established, with headquarters at East Pittsburgh, Pa., which will handle all matters pertaining to the sale of marine refrigeration and main propulsive machinery for vessels and auxiliaries used in connection with this class of apparatus. The Pacific Coast marine business is handled by Hunt, Mirk & Company, San Francisco, Cal.

Telephone Dispatching.

Telephone dispatching has been adopted on the Ohio division of the Baltimore & Ohio Southwestern Railroad on the main line between Cincinnati and Parkersburg. With the completion of the work there will be about 1,000 miles of Baltimore & Ohio lines over which trains are dispatched by telephone. The telephone system is in use in the southwestern district on the lines from Cincinnati to Seymour, Ind., and from Seymour to Louisville.

On the eastern lines the telephone is used from Cumberland to Brunswick, Johnstown to Rockwood, Connellsville to Fairmont, Fairmont to Clarksburg, Grafton to Parkersburg and Wheeling, Wheeling to Pittsburgh and Newark, and also on the Staten Island Railway.

Digitized by Google

Latest Approved Fittings

BRAKE SOLENOIDS.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Solenoids for operating mechanical brakes. Bulletin Nos. 10,340, 10,345.

Listed August 30, 1915.

CABINETS.—The Sanborn Electric Company, Indianapolis, Ind.

Metal cabinets.

Listed August 11, 1915.

CABLES, Armored.—Safety Armorite Conduit Company, Bailey-Farrell Building, Pittsburgh, Pa.

Sterling armored cable. Helical wire armor type.

Marking: Small letter "s" stamped on outer wire helix at intervals of six inches.

Listed September 8, 1915.

FLEXIBLE STEEL CONDUIT.—Safety Armorite Conduit Company, Bailey-Farrell Building, Pittsburgh, Pa.

Sterling flexible steel conduit. Helical wire type.

Marking: Small letter "s" stamped on outer wire helix at intervals of six inches.

Listed September 8, 1915.

FUSES, Cartridge Inclosed.—Chicago Fuse Manufacturing Company, 1014 West Congress Street, Chicago, Ill.

Union glass-tube inclosed fuses, 1, 2 and 3 amperes, 250 volts, catalog Nos. 5501-03 inclusive.

Standard for use in rosettes and attachment plugs and for protection of instruments and pilot lights on switchboards.

Present specifications do not admit the use of special fuses, such as above, as a substitute for standard designs, except as indicated in note preceding Rule 68*d* and in Rule 2*e* respectively.

Listed August 19, 1915.

HEATERS, Electric.—Simplex Electric Heating Company, Cambridge, Mass.

Simplex 100-250 volts.

Water boilers, stationary, 300-4,500 watts, catalog Nos. 430-433 inclusive, 435-438 inclusive, 440-443 inclusive, 445-448 inclusive.

Circulation on water heaters, 187-3,000 watts, catalog Nos. 422-426 inclusive.

Radiators, 200-8,000 watts, catalog Nos. 101-112 inclusive, 115-16-17-19-20-23-24-25-27-28, 1,110-12-13-14-16-17-19-20, 1,120G, 1,121, 1,121G, 1,122-1,125 inclusive, 1,128-1,133 inclusive.

Foot warmers, 50-400 watts, catalog Nos. 1,371, 1,375.

Fluting iron, 150 watts, catalog No. 1,536.

Curling-iron heaters, 60-120 watts, catalog No. 1,269 (for installation only in such walls of fireproof buildings as contain no combustible materials), 1,270-1,279 inclusive, 1,279A, 1,279B, 1,281, 1,281A, 1,282, 1,282A, 1,283, 1,283A.

Listed August 16, 1915.

The electrical fittings illustrated and described in thic department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

HEATERS, Electric.—Simplex Electric Heating Company, Cambridge, Mass.

Industrial and laboratory heaters.

Simplex, 100-250 volts.

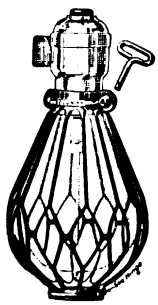
Dental sterilizers, 125-800 watts, catalog Nos. 1,431-32-34-42-44.

Laboratory and opticians' stoves, 40-750 watts, catalog Nos. 1,711-1,714 inclusive, 1,767-68.

Test-tube heater, 500 watts, catalog No. 1,449.

Flask heater, 500 watts, catalog No. 1,430.

Solder pots, 100-825 watts, catalog Nos. 1,718-19-20.



Lamp Guard.—Flexible Steel Lacing Company.

Pitch kettles, 330-1,600 watts, catalog Nos. 1,651-52.

Glue pots, 75-1,200 watts, catalog Nos. 1,722-1,725 inclusive.

Wax pots, 25-300 watts, catalog Nos. 1,715-16.

Milk-testing sets, 83-1,500 watts, catalog Nos. 1,721-27-28.

Listed August 17, 1915.

HEATERS, Electric.—Simplex Electric Heating Company, Cambridge, Mass.

Liquid-heating appliances, 100-125 volts, with fusible-nut devices designed to open circuit in event of abnormally high temperature resulting from absence of liquid. These appliances have wire heating elements embedded in enamel.

Coffee pots, percolators, tea kettles, and water cups, 400-550 watts, catalog Nos. 1,214-22-23-26, 1,229-1,232 inclusive, 1,234-35-36, 1,238-1,241 inclusive, 1,243-45-46-47-49, 1,322-23-29-30-35-46-47-49.

Tea-ball urns, 400 watts, catalog Nos. 1,210, 1,224, 1,324.

Egg boiler, 360 watts, catalog No. 1,237.

Tureen, 360 watts, catalog No. 1,225.

Under normal conditions while liquid remains in vessels these heaters are judged to be reasonably safeguarded against ignition of combustible material. In event of absence of liquid, protection against ignition of combustible material is furnished by fusible nuts, operation of which laboratory tests and field experience indicate to be positive and reliable.

Listed August 18, 1915.

HEATERS, Electric, Cord Suspension Device.—Simplex Electric Heating Company, Cambridge, Mass.

Gilbert suspension arms for flat-iron cords. Floor stands or wall brackets with swiveling arms for heater cord. With pilot lamp and provision for connecting snap switch.

Listed August 20, 1915.

LAMP GUARDS. — Flexible Steel Lacing Company, 522 South Clinton Street, Chicago, Ill.

Lamp guards made of tinned, expanded metal in plain and locking types.

Flexco and Security.

Listed September 23, 1915.

RECEPTACLES, Standard.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Keyless, porcelain shell.

Sign 660 watts, 250 volts, catalog No. 4,109, covered back.

Listed September 1, 1915.

RECEPTACLES, Standard.—Pass & Seymour, Incorporated, Solvay, N. Y.

Porcelain shell. P. & S.

Key, 250 watts, 250 volts, catalog Nos. 5, 46, 82, 61,087, 61,237, 62,247, 62,371, 100,136.

Keyless, 660 watts, 250 volts, catalog No. 900.

Listed September 9, 1915.

RECEPTACLES, Standard.—Union Electric Company, Trenton, N. J.

Porcelain shell, 660 watts, 250 volts.

Cleat type, catalog Nos. 756, 759, 760, 761.

Listed September 3, 1915.

RHEOSTATS. — Cutler - Hammer Manufacturing Company, Milwaukee, Wis.

Direct-current self-starters, bulletin Nos. 6,110, 6,190, 6,410, 6,415, 6,420, 6,425.

Alternating-current self-starters, bulletin No. 9,605.

Listed August 28, 1915.

RHEOSTATS. — Cutler - Hammer Manufacturing Company, Milwaukee, Wis.

Motor starters, direct-current. Bulletin No. 2,172.

Speed regulators, direct-current. Bulletin Nos. 3,290, 3,305. Alternating-current bulletin Nos. 9,310, 9,368.

Controllers, Bulletin Nos. 3,390, 3,605, 3,610, 3,615, 3,620, 9,382.

Digitized by Google

Field regulators, Bulletin Nos. 10,410, 11,110, 11,130, 11,140, 11,150.
Theater dimmers, Bulletin Nos. 11,310, 11,320.
Resistance plates, "Iron Clad," Bulletin No. 11,070.
Battery charging, Bulletin Nos. 11,405, 11,410, 11,430.
Listed August 30, 1915.

RHEOSTATS. — Cutler - Hammer Manufacturing Company, Milwaukee, Wis.
"C. H." self-starters for 110, 220, 440, 500 and 550-volt, alternating-current and direct-current elevator motors.
Bulletin Nos. 7,300, 7,305, 7,330, 7,350, 7,360, 7,370, 9,715, 9,770, 9,775, 9,830, 9,840, 9,870.
Listed August 31, 1915.

RHEOSTATS. — Cutler - Hammer Manufacturing Company, Milwaukee Wis.
Drum controllers of types, voltages and horsepower as described in manufacturer's bulletin Nos. 9410, 9450, 9460, 9465, 9470, 9475, 10101, 10105, 10120, 10121.
Listed September 2, 1915.

ROSETTES, Fuseless.—Union Electric Company, Trenton, N. J.
Three amperes, 250 volts, catalog No. 764.
Listed September 3, 1915.

SIGNAL APPLIANCES.—Terminal Electric Company, 37 East Thirty-eighth Street, New York, N. Y.
Type A-4 direct-current bell ringer.
A potentiometer device designed to take current at 120 volts, direct current from lighting circuits and supply current at about 17 volts to bell circuits.
The proper installation requires that supply circuit be fused with fuses of not over three amperes capacity, that device be connected only to normally grounded circuits (125 volts to ground) and a permanent and effective ground wire be run from proper terminal of device. One side of bell circuit must always be independently grounded.
When so installed, the fire hazards, both of this device itself and such as may be caused by the fact that it may be connected to poorly insulated bell circuits, are judged to be reduced to an acceptable degree.
Listed September 3, 1915.

SIGNS, Electric. — Chase Electric Company, 327 Wells Street, Chicago, Ill.
Sheet-metal inclosed box carrying insulated busbars held in faces of sign; sheet-metal letters carrying receptacles for incandescent lamps and provided with hooks of insulating material and conductors, so arranged that by hooking letters into groove between insulated strips electrical connections are made and lamps in letters are lighted.
Listed August 21, 1915.

SIGNS, Electric.—Charles E. Maier Company, 370 South Seventh Street, Newark, N. J.
Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.
Listed August 23, 1915.

SOCKETS, Standard.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.
Porcelain shell, Arrow E.
Key, 250 watts, 250 volts, catalog Nos. 4058-B, 4065-B, 5150, 5150-B, 9395-B, 34947-B, 50799-B.
Keyless, 660 watts, 250 volts, catalog No. 5151.
Keyless, 1500 watts, 600 volts, catalog Nos. 5021-5024, inclusive, 5026.
Pull, 250 watts, 250 volts, catalog No. 5152.
Also mogul types with lamp grip.
Standard for use only in places where they will not be exposed to hard usage.
Listed September 8, 1915.

SOCKETS, Standard.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.
Porcelain shell sockets, C. E. M. Co.
Key, 660 watts, 250 volts, catalog No. 11025.
Keyless, 660 watts, 250 volts, catalog No. 11026.
Standard for use only in places where they will not be exposed to hard usage.
Listed August 28, 1915.

SOCKETS, Weatherproof.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.
Porcelain shell, keyless, Arrow E.
660 watts, 600 volts, catalog Nos. 9366, 9448-49-50, 9496.
1500 watts, 600 volts, catalog Nos. 243, 455, 5013, 5028-5035 inclusive.
Also Mogul types with lamp grip.
Listed September 8, 1915.

SOCKET LININGS.—Elastoid Fibre Company, Waltham, Wass.
"H. T. Elastoid" linings for Mogul sockets and receptacles. These linings are largely composed of asbestos fiber and a special binder, and in process of manufacture are treated at a temperature of about 650 degrees Fahrenheit.
Laboratories' tests show that these linings are reasonably uniform in thickness and diameter; are chemically neutral; have good dielectric strength; are absorptive of moisture to about the same degree as ordinary fiber linings; and are practically non-combustible. Their properties are but little changed by exposure to temperatures below 300 degrees Fahrenheit.
These linings are judged suitable for use in Mogul sockets and receptacles, including those provided with shades, reflectors, fixtures or other inclosures above them and used with gas-filled incandescent lamps of about 100 watts capacity.
Listed September 23, 1915.

SOLENOID-OPERATED VALVES.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
A solenoid-operated valve designed for remote control, bulletin No. 11505.
This rating is to be understood as indicating that in the construction the electrical hazard has been reduced to an acceptable degree. It is not to be construed as approval of the device for use in connection with automatic sprinkler or other fire-protective equipments, for which services their merits have not been investigated.
Listed August 31, 1915.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
Float switches, bulletin Nos. 10020, 10025.
Pressure regulators, bulletin Nos. 10001, 10003, 10005, 10010-12 inclusive.
Listed August 30, 1915.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
Interrupted gear limit switch, bulletin No. 10115.
Solenoid switches, bulletin Nos. 6002, 6005.
Protective devices for battery-charging rheostats, bulletin No. 11425.
Push-button stations for use with automatic controllers, bulletin No. 10250.
Listed August 31, 1915.

SWITCHES, Automatic.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
Elevator control and safety devices.
Elevator car switches, bulletin Nos. 10305, 10325.
Limit switches, bulletin Nos. 10310, 10312, 10315, inclosed type only.
Slack-cable switches, bulletin No. 10320.
Elevator door switch, bulletin No. 10327.
Push-button switches, bulletin No. 10335.
Belt switch, bulletin No. 10301.
Reverse switches, bulletin No. 9705.
Floor stop device, bulletin No. 10330.
Listed September 1, 1915.

SWITCHES, Fixture.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.
C-H canopy switch supplied by manufacturer with rubber-covered fixture wire permanently secured to switch terminals.
Single-pole, 3 amperes, 125 volts, 1 ampere, 250 volts, catalog Nos. 7153, 7154.
Listed September 3, 1915.

SWITCHES, Miscellaneous.—Krantz Manufacturing Company, Incorporated, 166 Seventh Street, Brooklyn, N. Y.
Krantz safety brush switch.
A quick-break lever switch, with or without extension for link or N. E. C. cartridge inclosed fuses. Two types, one with switch parts mounted on front of a slate panel, with or without a protecting face plate; the other with switch parts mounted on back of panel and operated by a lever attached to a rod projecting through panel. 100 amperes, 125 volts.
Listed August 11, 1915.

SWITCHES, Oil-Break. — General Electric Company, Schenectady, N. Y.
Oil switches for alternating-current motors. Type F, form P-10, not over 600 volts, 30 amperes, three-phase.
The following ratings are assigned: 25 horsepower, 550 volts; 20-25 horsepower, 440 volts; 7.5-10 horsepower, 220 volts; 3-5 horsepower, 110 volts.
Listed August 25, 1915.

WIRE CONNECTORS.—Universal Electric Stage Lighting Company, 240 West Fiftieth Street, New York, N. Y.
Kliegl Solderless Terminal Lugs.
Stamped copper connectors for use with stage cable, catalog Nos. 450, 460, 461.
These connectors are suitable for use with rubber-covered or asbestos-covered stage cables, the conductors of which are composed of fine strands and are not larger than No. 4 B. & S. gauge.
Listed September 23, 1915.

Digitized by Google

Current Electrical News

NORTH CENTRAL STATES.

CANTON, O.—The question of municipal ownership of an electric power plant is one of the issues in the forthcoming election, to be held on November 2, one of the candidates for mayor announcing himself as favoring the construction of a municipal plant. L.

CINCINNATI, O.—The M. Marcus Building Company has secured through Architects Elsner & Anderson the contract for additions to the Children's Home, Madisonville, to cost about $100,000, including a power plant and other electrical work. Five buildings are included. L.

FT. WAYNE, IND.—The Board of Works has finally approved a resolution for the establishment of an ornamental lighting-system on Lincoln Avenue from Broadway to Indiana Avenue. Address Frank Dix, superintendent of the lighting department.

AURORA, ILL.—Additional street lights will be installed. Address James Sanders, Chairman of Board.

RUSHVILLE, ILL.—Plans for the improvement of the electric lighting system are being considered by the city council. Z.

AKRON, MICH.—J. A. Irwin will install an electric-lighting plant in this city and furnish current for lighting the streets for a period of 10 years. He will install a plant of sufficient capacity to supply current for the stores and dwellings as well.

BLOOMINGTON, WIS.—The stockholders of the electric light company voted to accept the proposition to put in an electric light plant for this village at a cost of about $12,000.

GILBERT, IOWA.—The business men and residents of the town of Gilbert are in the market for an electric light and power service but are not decided as yet as to the best means of securing the most satisfactory service. Address A. Matteson.

ASHLAND, MO.—An electric light plant that will operate 24 hours a day will be installed by W. T. Pauley.

ELGIN, N. D.—C. L. Rausch, of Holdingfort, Minn., has just been granted a 20-year franchise, and will immediately begin the work of installing an electric-lighting plant.

SENECA, KANS.—At an election recently held at Seneca, by an almost unanimous vote the people ratified the light franchise passed by the Board of Aldermen, granting to the Standard Engineering Company the right to construct and operate a light plant in Seneca. The company reports that it will begin the construction of the plant and will have it in operation within ninety days.

TYRON, KANS.—The Tyron Electric Light, Ice and Power Company has been incorporated by H. Gilmore, G. W. Riffe, W. Y. Cowden and W. J. Harville, capitalized at $10,000.

SOUTH CENTRAL STATES.

BEREA, KY.—The Isaacs & Baker Company was the purchaser, for $35, of the electric light and power franchise sold here by the town council. Work of construction of the distribution system is to be begun shortly. G.

WHITESBURG, KY.—Wiley W. Gibson & Son, of Mater, Ky., will establish electric light plant here.

OZARK, ARK.—W. C. Bill and Arthur DuPriest have purchased the local electric light plant from G. W. Brockman.

DECATUR, TEX.—The municipal electric light plant at this place will be improved and enlarged. Bonds have been issued for the purpose. D.

FORNEY, TEX.—The Forney Water, Light and Ice Company has increased its capital stock from $20,000 to $25,000, for the purpose of making improvements to its plant. D.

SILSBEE, TEX.—The Silsbee Ice Manufacturing Company, which has its principal office in Houston, has amended its charter, changing its name to the Silsbee Ice, Light and Power Company, and increasing its capital stock from $40,000 to $50,000. It will operate an electric light and power plant. D.

WESTERN STATES.

POLSON, MONT.—The Department of Interior has granted a power permit for the installation of a hydroelectric plant on Big Creek, in the Kalispell Land District, to J. H. Kline, of Polson. Kline purposes installing a plant to supply Polson and nearby territory with current for light and industrial needs. O.

BLACKFOOT, IDAHO.—James Young, a local civil engineer, has been employed by the City Council to investigate a site and report on the cost of constructing a municipal electric light and power plant on the Blackfoot River. According to reports, providing the engineer's recommendation is favorable, the Council will order construction after the first of the year. O.

LIBERTY, COLO.—Plans are under consideration for the installation of the People's Light Plant.

TUCSON, ARIZ.—City Manager Clark has recommended a bond issue of $50,000 for the installation of ornamental lights in the new paving districts.

LOS ANGELES, CAL.—The city council has authorized the sale of $1,026,000 municipal power bonds, including $234,000 bought by the city a few months ago with sinking fund money, and $792,000 of unsold bonds. The proceeds will be used for the completion of the city power plants and the construction of transmission lines.

SAN RAFAEL, CAL.—The special election held recently for the formation of the lighting district of Bolinas, carried.

LEBANON, ORE.—Scroggin & Washburn are making preparations for rebuilding their electric light and power plant which was destroyed by fire.

CENTRALIA, WASH. — The City Commission recently adopted resolution cancelling the contract entered into in June with H. G. Fleischhauer, and has entered into a contract with the Washington-Oregon Corporation, through its receiver, Elmer Hayden, whereby the latter will furnish current for street lighting at a rate much lower than its former figure, and is practically identical with the contract formerly held by Fleischhauer. The Washington-Oregon Corporation, therefore, has withdrawn its suit against Fleischhauer in the Federal courts, wherein it sought to break Fleischhauer's contract with the city.

MANSFIELD, WASH.—The Okanogan Power Company has been granted a franchise to extend its electric lines to Mansfield.

SEATTLE, WASH.—The City of Seattle has applied for an electric light franchise in the southern portion of King county. A hearing will be held on January 18, 1916, by the Board of County Commissioners.

SPOKANE, WASH.—The City Council has passed an ordinance calling for the installation of an electrolier curb-lighting system on Trent Avenue, from Lincoln to Division Streets. As the property owners in the section to be improved are making efforts to have the improvement made an emergency matter, the work will probably be completed by January 1, 1916. O.

VANCOUVER, WASH. — The Washington-Oregon Utilities Company, the reorganized Washington-Oregon Corporation, which went into the hands of a receiver some time ago, has filed articles of incorporation, naming this city as principal place of business. The capital stock of the new corporation is $1,750,000, divided into 17,500 shares, of $100 per share; 12,000 shares to be preferred stock and 5,500 shares common stock; the life of the corporation is to be 50 years. This corporation owns and operates power plants, lighting systems and street and interurban railways in southwestern Washington, namely Clark and Lewis Counties.

WANETA, B. C.—It is reported the Waneta Development Company will immediately begin the construction of a hydroelectric plant to develop 80,000 horsepower at the conflux of the Pend O-reille and Columbia River, in British Columbia, just across the international boundary line from Boundary, Wash. It is understood a sawmill is now being installed on the site, and that actual construction on the proposed power plant will be started at once. O.

Digitized by Google

FINANCIAL NOTES.

The New York Stock Exchange has admitted to list the Dayton Power and Light Company, $1,312,000 common stock and $1,044,100 preferred stock.

Reorganization plans for Kansas City Railway and Light Company, Metropolitan Street Railways of Kansas City and the Kansas City Electric Light Company, formulated under direction of Federal Judge Hook, have been declared operative.

The Standard Gas and Electric Company has extended until November 15 the time in which subscriptions from the preferred stockholders to $3,000,000 six-per-cent 20-year notes and from the common stockholders to $750,000 of these notes will be received. The notes were offered to the stockholders at 99 payable in cash or installments of 20 per cent down and 10 per cent a month thereafter. With the sale of these notes Standard Gas & Electric would clear away all its floating indebtedness, provide new working capital and resume cash dividends on the eight-per-cent preferred stock at the initial rate of one per cent quarterly.

Dividends.

	Term	Rate	Payable
Am. Dist. Tel., N. Y.	Q.	1 %	Nov. 20
Automatic Electric	Q.	1 %	Nov. 1
Bangor Ry. & Elec., com.	—	0.5 %	Nov. 1
Brazilian Trac	—	1 %	Dec. 1
Cape Breton Elec., Ltd., pf.	S.	$3.00	Nov. 1
Cape Breton Elec., Ltd.	—	$1.50	Nov. 1
E. St. Louis & Sub., pf.	Q.	1 %	Nov. 1
Kaministiquia Power	Q.	1.5 %	Nov. 15
Lewiston, Aug. & Waterville St. Ry., pf.	Q.	1.5 %	Nov. 1
Lowell Elec.	Q.	$2.00	Nov. 1
Montreal Power	Q.	2.5 %	Nov. 15
No. American	Q.	1.25%	Jan. 1
Pacific Pw. & Lt., pf.	Q.	1.75%	Nov. 1
So. Cal. Edison	Q.	$1.50	Nov. 15
Tampa Elec.	Q.	$2.50	Nov. 15
Texas Pw. & Lt., pf.	Q.	1.75%	Nov. 1

Reports of Earnings.

BROOKLYN EDISON.

The comparative combined earnings and expenses of the Edison Electric Illuminating Company of Brooklyn and the Kings County Electric Light & Power Company for the nine-month period ended September 30 are reported as follows:

	1915	1914
Gross operating revenue	$ 4,949,149.33	$ 4,550,391.93
Operating expenses excepting taxes and depreciation	2,160,915.17	2,080,799.83
Taxes	360,000.00	328,500.00
Depreciation	877,383.26	694,722.33
Total operating expenses	3,398,298.43	3,104,022.16
Net operating revenue	1,550,850.90	1,446,369.77
Net non-operating revenue	47,304.94	48,728.66
Net total revenue	1,598,155.84	1,495,098.43
Interest on funded debt	593,612.50	602,275.00
Interest on unfunded debt	39,262.52	27,462.48
Bond discount written off	15,201.63	15,201.63
Net income	950,079.19	850,159.32
Stock outstanding	$13,428,500.00	$13,306,000.00

MASSACHUSETTS LIGHTING COMPANIES.

	1915	1914
September net sales	$ 99,381	$ 92,004
Three months' net sales	270,044	258,825

CALIFORNIA RAILWAY & POWER COMPANY

The California Railway & Power Company reports as follows for the fiscal year ended June 30, 1915:

	1915	*1914
Gross income	$141,268	$829,901
Expenses	14,072	21,167
Net income	127,197	808,734
Dividends on prior preferred stock	199,500	314,705
Dividends on preferred stock	.....	378,092
Profit and loss surplus	43,633	115,936

*Covers period from December 18, 1912, to July 1, 1914.

DETROIT EDISON COMPANY.

	1915	% Gain over 1914
September gross	$ 601,631	20.10
Expenses and taxes	392,647	14.10
Net earnings	208,984	33.30
Interest charges	98,616	25.10
Surplus	110,368	41.70
Nine months' gross	5,427,526	18.40
Expenses and taxes	3,470,229	13.40
Net earnings	1,957,297	28.50
Interest charges	800,633	25.10
Surplus	1,156,664	30.90

UTAH SECURITIES CORPORATION.
(Combined Earnings of Subsidiaries.)

	1915	1914
September gross	$ 412,436	$ 380,926
Net after taxes	221,012	176,136
Nine months' gross	3,501,681	3,432,012
Net after taxes	1,812,537	1,668,818
Twelve months' gross	4,670,285	4,608,814
Net after taxes	2,384,194	2,304,498

MONTANA POWER.

The Montana Power Company reports for the quarter and nine months ended September 30, 1915, compared as follows:

	1915	1914
Three months:		
Gross	$1,082,319	$ 913,170
Net	784,624	631,645
Surplus after charges	487,350	383,520
Nine months:		
Gross	2,992,526	2,856,529
Net	2,129,819	2,016,863
Surplus after charges	1,276,628	1,200,890

PACIFIC GAS & ELECTRIC.

	1915	1914
September gross	$1,558,689	$1,421,634
Net after taxes	647,335	605,971
Other income	29,024	22,759
Total income	676,360	628,730
Balance after charges	346,759	273,055
Surplus after discount and expense charges	333,046	232,688
Nine months' gross	13,723,761	12,510,301
Net after taxes	5,894,599	5,127,468
Other income	263,518	220,110
Total income	6,158,117	5,347,578
Balance after interest charges	3,153,239	2,149,979
Surplus after discount and expense charges	3,034,003	1,802,579
Balance after preferred dividends	2,308,359	1,352,579
Twelve months' gross	18,126,148	16,745,303
Net after taxes	7,765,147	6,622,303
Other income	351,224	321,603
Total income	8,116,371	6,943,906
Balance after interest charges	4,117,690	2,750,304
Surplus after discount and expense charges	3,876,340	2,304,264
Balance after preferred dividends	2,985,712	1,704,264

BELL TELEPHONE COMPANY.

The Bell Telephone system in the United States report for the eight months ended August 31 compares as follows:

	1915	1914
Gross	$156,750,415	$149,669,237
Net	42,794,542	38,903,954
Interest	12,281,386	12,547,139
Dividends	21,568,279	20,277,995
Surplus	8,944,877	6,078,820

CITIES SERVICE COMPANY.

	1915	1914
September gross	$ 349,456	$ 279,412
Net earnings	335,155	268,836
Surplus after charges	294,321	228,903
Balance after preferred dividends	163,488	91,169
Twelve months' gross	4,121,622	3,803,196
Net earnings	3,962,051	3,701,772
Surplus after charges	3,472,051	3,330,110
Balance after preferred dividends	*1,890,055	1,761,411

*Equivalent to 12.84 per cent on the common stock as compared with 11.55 per cent for the twelve months ended September 30, 1914.

NEW INCORPORATIONS.

TUCKERMAN, ARK.—The Citizens Light and Power Company has been chartered with a capital of $10,000. L. D. Smith is president.

POULSBO, WASH.—The Poulsbo Light and Power Company has been incorporated by J. C. Moe, Einar Nilsen and A. S. Ryland.

MILNOR, N. D.—The City Electric Company has been incorporated with a capital of $20,000, by J. K. Taylor, Anton Berger and others.

NEW YORK, N. Y.—Sunshine Battery Company, Incorporated. Electrical goods. Capital, $5,000. Incorporators: E. R. Crespi, John R. Crespi and Jack Cohen.

CHATTANOOGA, TENN.—The Central Power Company is the name of the new incorporation recently chartered with a capital of $50,000, by G. B. Adams and others.

FLORESVILLE, TEX.—The Floresville Light and Power Company has been incorporated with a capital stock of $25,000, by B. J. Carrico, B. H. Martin and W. T. Pittman.

NEW YORK, N. Y.—The B. B. T. Machine Works, Incorporated. Electrical and mechanical engineering, electrical appliances, etc. Capital, $2,000. Incorporators. Harry W. Biggs, Thomas Black and Frederic Timmerman.

NEW YORK, N. Y.—Elevator Door Contact Company, Incorporated. To manufacture electric door contacts for elevators, etc. Capital, $5,000. Incorporators: Walter F. Hopper, Morris P. Altman and George B. Hopper.

GOWANDA, N. Y.—The Gowanda Light and Power Company has been established to manufacture electricity for light, heat and power. The company is capitalized at $100,000, and the incorporators are G. M. Gest, Edmund Wisnewski and George A. Larkin.

NEW YORK, N. Y.—The Marine Oil Engine Company has been incorporated by W. R. Haynie, L. P. Chittenden and A. V. Dugan, of this city. Capital stock is $200,000. The company will act in an advisory and consulting engineering capacity to any parties that can use economical oil engines to advantage for generating plants, marine propulsion, etc. The active head of the company is W. R. Haynie, of 30 Church Street, who is the American manager of the Bolinders Company, of Stockholm, Sweden, one of the oldest and largest builders of oil engines in the world.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Oct. 25	Oct. 18
American Tel. & Tel. (New York)	124½	124
Commonwealth Edison (Chicago)	134	136
Edison Electric Illuminating (Boston)	239	239
Electric Storage Battery, common (Philadelphia)	73	73
Electric Storage Battery, preferred (Philadelphia)	73	73
General Electric (New York)	176½	178¾
Kings County Electric (New York)	120	120
Massachusetts Electric, common (Boston)	7	6⅜
Massachusetts Electric, preferred stamped (Boston)	42	39
National Carbon, common (Chicago)	155	150
National Carbon, preferred (Chicago)	120½	120
New England Telephone (Boston)	134¾	133
Philadelphia Electric (Philadelphia)	26	26
Postal Telegraph and Cables, common (New York)	78	78
Postal Telegraph and Cables, preferred (New York)	65¼	65⅛
Western Union (New York)	79⅝	78½
Westinghouse, common (New York)	72¾	76
Westinghouse, preferred (New York)	140	142¼

Digitized by Google

PROPOSALS.

LIGHTING FIXTURES.—Sealed proposals will be received November 15 for the furnishing and installing of lighting fixtures in the United States Post Office, in accordance with drawings and specifications. Address James A. Wetmore, Acting Supervising Architect, Washington, D. C.

PANAMA CANAL SUPPLIES.—Sealed proposals will be received at the office of the General Purchasing Officer of the Panama Canal, Washington, D. C., until November 5, for furnishing, by steamer, free of all charges, on dock at either Colon (Atlantic port) or Balboa, Canal Zone (Pacific port), Isthmus of Panama, copper cable and wire, steel wire, street lamps, water-gauge lamps. Circular No. 979.

NAVY DEPARTMENT SUPPLIES.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until November 9, for furnishing the following materials. Firms interested therein should make application to the Bureau, giving the schedule numbers desired: Schedule 8917, portable electric drills, and electric bench grinders; schedule 8923, single-conductor wire; schedule 8925, insulating varnish. Bids will also be received until November 16, for the following: Schedule 8908, radio motor-generator.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,807. INSULATED CABLE AND WIRE.—The Bureau has been informed by a business man in this country that a correspondent in Greece desires quotations on insulated switchboard cable for telephone apparatus and single insulated wire, specifications of which may be examined upon application to the Bureau's informant.

NO. 18.815. ELECTRIC-LIGHT CARBONS.—The commercial attaché of the Department of Commerce in France states that an electrical supply firm in that country desires to communicate with American manufacturers or exporters of electric-light carbons for street lighting.

NO. 18.870. ELECTRICAL MACHINERY AND APPLIANCES.—The Bureau is informed by an American consular officer in Paraguay that a firm desires to receive prices on machinery and appliances desired for the installation of an electric lighting plant. A list of the articles desired, together with additional information, may be obtained upon application to the Bureau or its branch offices.

NO. 18,881. ELECTRIC WIRES, MACHINERY, ETC.—A commission house in Uruguay has informed an American consular officer that it desires to represent American manufacturers of artisans' tools; electric cables and wires, lamps, meters, and transformers; machines and stationary and semi-stationary boilers of from 50 to 500 horsepower for electric plants; and internal combustion petroleum engines. Correspondence may be in English, but Spanish is preferred.

NO. 18,899. RUBBER-COVERED CABLE.—A business man in Norway has informed an American consular officer that he desires to communicate with American manufacturers or exporters of vulcanized (stranded) cable. The quality must conform to the 1911 edition of the National Electrical Code in the United States. Correspondence may be in English. Reference is given.

NO. 18,892. VACUUM SWEEPERS.—An American consular officer in Canada reports the desire of a firm in his district to receive catalogs and price lists of vacuum sweepers.

NEW PUBLICATIONS.

PASADENA REPORT.—The eighth annual report of Pasadena (Cal.) Municipal Lighting Works Department for the year 1914-15 has been published. C. W. Koiner is general manager. The report indicates a return of over nine per cent on the value of the property.

HEATING BULLETIN.—The National District Heating Association has begun the publication of a quartely *Bulletin*, the first issue of which is dated October 20, 1915. D. L. Gaskill, Greenville, O., is editor. This issue contains 48 reading pages and several advertisements. The subscription price is 50 cents per year.

ELECTROPLATING WITH COBALT.—The Canadian Department of Mines has issued Part 3 of a research entitled "Electroplating with Cobalt," by H. T. Kalmas. This is a pamphlet of 70 pages describing various experiments, which lead to the conclusion that commercial plating can be done with a solution of cobalt—ammonium sulphate upon a variety of metals under the general conditions of nickel-plating practice. Such deposits are firm, adherent, hard and uniform, and take a polish. The speed is greater than for nickel-plating and less weight of metal is required. The cost is less than for nickel-plating.

PERSONAL MENTION.

MR. J. H. RISSER has been appointed manager of the Central Station Department of The Globe Stove & Range Company, of Kokomo, Ind. Mr. Risser's headquarters are 731 Edison Building, Chicago.

MR. JOHN T. URQUHART, manager of the Pacific Power & Light Company, at Vancouver, Wash., and Miss Dorothy Eichenlaub, of that city, were married in Vancouver on October 15.

MR. F. W. HILD has resigned as general manager of the Portland Railway, Light & Power Company and has been chosen vice-president and general manager of the Denver Railways Company, succeeding Mr. John A. Beeler.

MR. JOHN OSBORNE BLAND was recently married to Miss Ethel Swann Bacon at the Warren Memorial Presbyterian church, Louisville, Ky. Mr. Bland is head of the Bland Electric Company, of Louisville.

MR. F. C. FITZGERALD, manager of the Hardin, (Mont.) Electric Light and Power Company, has resigned his position and retired to his farm near Forsyth, Mont. Mr. Fitzgerald has been manager of the Hardin plant since it was established two years ago. He is succeeded by Mr. E. B. Goldsberry, of Forsyth.

MR. CHARLES R. UNDERHILL, chief electrical engineer, Acme Wire Company, New Haven, Conn., lectured on "Electromagnets," at the University of Michigan on October 14; University of Minnesota, October 18; Iowa State College, October 20, and University of Wisconsin, October 22. During November, Mr. Underhill will lecture on the same subject before the engineering students of several other colleges in the middle west.

MR. H. A. KINNY has accepted the position of manager of the Lansing Storage Battery Company, Lansing, Mich., and is engaged in the installation of isolated electric lighting plants. Mr. Kinny is a pioneer in the electrical industry and it is interesting to note that in the issue of the WESTERN ELECTRICIAN for October 12, 1889, the following item appeared: "Harry A. Kinny, of Omaha, has installed an Edison electric light plant at Tarkio, Mo. Pumpelly storage batteries are used in connection, thus giving the consumers light at all hours without running the dynamos constantly." Mr. Kinny has during the intervening years been continuously engaged in this work and has witnessed the wonderful development that has taken place in the industry. He was one of the early members of the American Institute of Electrical Engineers, his application being endorsed by Alexander Graham Bell.

MR. LUCIEN BARNES, manager of the Export Sales Department of the Westinghouse Lamp Company, New York City, is going to make an unusual trip to South America to investigate conditions there as affecting the electrical industry in general and particularly the lamp business. Mr. Barnes' trip will cover about 17,600 miles; he will visit the following cities and countries: Rio Janeiro and Sao Paulo, Brazil; Buenos Aires, Argentina; Montevideo, Uruguay; Valparaiso and Iquique, Chile; La Paz, Bolivia; Lima and Callao, Peru; Guayaquil, Ecuador; Panama City, Panama; San Jose, Costa Rica; Santa Ana and Sosonate, Salvador; Guatemala City, Guatemala; Puerto Colombia, Barranquilla and Bogota, Colombia; Caracas, Venezuela; Kingston, Jamaica; Santiago and Havana, Cuba. Mr. Barnes has been in charge of the Westinghouse Lamp Company's Export Department since February, 1914. Prior to that he was connected with an electrical concern in Havana, Cuba, and before that was with the Export Department of the Westinghouse Electric & Manufacturing Company for eight years. During his absence Mr. Irving B. Cary will have charge of the Export Sales Department.

MR. ROBERT W. KIPLE, assistant manager and purchasing agent of the Pennsylvania Utilities Company, Easton, Pa., has resigned this position to become commercial manager of the United Gas & Electric Corporation, at Harrisburg, Pa., the change being effective November 1. Mr. Kiple has been engaged in the electrical industry in New York and Eastern Pennsylvania since 1893, when he was employed in a minor capacity by the Suburban Electric Light Company, of Scranton, Pa. He remained with this company eight years, working up through the different departments. In 1901 he became connected with Meikleham & Dinsmore, who formerly controlled properties at Easton and Savre, Pa., and Binghamton, N. Y. In 1904 he became manager of the Wayne County Electric Company, with headquarters at Lyons, N. Y., which position he filled successfully for seven years. He then returned to Meikleham & Dinsmore in charge of

Digitized by Google

the commercial department of the Sayre Electric Company, serving several towns in the vicinity of Sayre, Pa. He was afterwards promoted to the position of general manager of the Pennsylvania Utilities Company, operating from Easton, Pa., in which capacity he remained until June, 1915, when the properties were acquired by W. S. Barstow & Company, and William D. Ray succeeded him as general manager.

MR. D. A. HEGARTY, general manager of the Houston Lighting & Power Company 1905, of Houston, Tex., has resigned as of date November 1 and will become president of the Texas Southern Electric Company, which operates a large number of electric, gas and ice plants in the state and also has headquarters in Houston. Mr. Hegarty was born in Philadelphia and educated at the University of Pennsylvania, leaving the University to become affiliated with the Engineering Department of the Pennsylvania Railroad, where he passed through the various grades of service until he became assistant engineer of construction. He resigned from that position to become associated with A. Langstaff Johnston, pioneer electrical engineer in the railway field, in charge of the work of electrifying the street railways in Philadelphia. Mr. Hegarty was engineer in charge of construction and become general manager and chief engineer of the Hestonville, Mantua & Fairmount Passenger Railway, known as the Arch Street Line. When the companies in Philadelphia were merged Mr. Hegarty resigned and accepted a position with the Norfolk-Virginia Railway Company. Resigning from this company, he became manager of the Railway Companies General, having railways, electric light and gas plants in Michigan, New York and Pennsylvania. The company made a large number of reports and carried on construction work on public-utility properties all over the United States, South America and Cuba. Resigning from this position, Mr. Hegarty became vice-president, treasurer and general manager of the Little Rock Railway and Electric Company, and was transferred from there to the Railway and Lighting Department of the New Orleans Railway & Light Compny; from there he was transferred to the general managership of the Houston Lighting and Power Company 1905. He was formerly president of the Traffic and Transportation Branch of the American Electric Railway Association. He is a member of the National Electric Light Association and a committeeman on the Wiring Committee of that body. He is chairman of the Illumination Committee of the No-Tsu-Oh Association of Houston and is also a member of various clubs and civic bodies of that city.

OBITUARY.

MR. ROMAINE MACE, an electrical engineer on the staff of the Okonite Company, of New York, died on Saturday, October 23, from a complication of diseases. Mr. Mace has been connected with the selling and engineering departments of the Okonite Company for the past 20 years. His father, the late Theodore Mace, was also an electrical inventor, well known to the industry 25 years ago. Mr. Mace is survived by a widow and daughter.

MR. E. S. MARLOW, manager of the commercial department of the Potomac Electric Power Company, Washington, D. C., died on October 25, after an illness of nine months. Mr. Marlow was one of the pioneers in the electrical field in Washington, having served continuously for the past 30 years in various capacities with the local central station. As executive of the new-business department of the Washington company, Mr. Marlow was instrumental in building up the business of the company to a point previously thought impossible and gained national prominence by his progressive policies and methods. He was active in civic and social affairs locally and was a member of many technical and engineering societies. He organized the Washington Section of the Electric Vehicle Association and served as its first chairman. Mr. Marlow's untimely death is a distinct loss to the industry that will be as keenly felt throughout the country as in the community in which he resided.

DATES AHEAD.

American Physical Society. Columbia University, New York City, October 30. Secretary, A. D. Cole, Columbus, O.

Electric Power Club. Homestead Hotel, Hot Springs, Pa., November 8-10. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 12-13. Secretary, H. F. Wheeler, Hattiesburg, Miss.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Association of Engineers. First annual convention, Hotel La Salle, Chicago, Ill., December 10-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olsen, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

Hotpoint Electric Heating Company, Ontario, Cal., is sending out to dealers circulars calling attention to another campaign of national advertising which will come to a climax about the time of Electrical Prosperity Week. Of the Hotpoint electrical appliances to be featured, particularly prominent will be the new boudoir combination set.

Majestic Electric Development Company, 428 O'Farrell Street, San Francisco, Cal., has been awarded the gold medal for the various types of Majestic electric heaters it is exhibiting at the Panama-Pacific International Exposition. This is the highest award given on electric heaters. These appliances were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of September 4, 1915.

Mesta Machine Company, Pittsburgh, Pa., has issued Bulletin R on the Mesta barometric condenser. This type of condenser is described and illustrated. Among the advantages pointed out for it are simplicity and reliability, low power consumption of auxiliaries, high vacuum under regular operating conditions, etc. The Mesta dry-air pump is also described.

Central Electric Company, 320-326 South Fifth Avenue, Chicago, Ill., has ready for distribution a new bulletin (No. 56) devoted to the extensive line of electric portable lamps which it handles. Among the designs illustrated and described are some very artistic and attractive types, both as to the standard and shade. These include table, floor, desk and piano lamps of metal, mahogany or wicker ware and provided with art glass or silk shades. Some of the designs include the adjustable feature.

Hughes Electric Heating Company, 211-233 West Schiller Street, Chicago, Ill., has recently supplied nearly 75 Hughes electric ranges for the new Tudor Arms apartment building in Portland, Ore. This is one of the finest apartments on the Pacific Coast. All cooking will be done electrically. The order for these ranges was placed through the Electric Store of the Portland Railway, Light & Power Company, and was the largest order for electric cooking devices ever placed in Portland.

Santo Manufacturing Company, Philadelphia, Pa., maker of the Santo electric vacuum cleaners, made an interesting exhibit and demonstration of its new type of cleaners at the recent New York Electrical Show. This exhibit was made in co-operation with that of the C. C. Bohn Electric Company, of New York City. Through an oversight, these firms were omitted from the report giving the list of exhibitors at the New York Show published in our issue of October 16.

Carbo Steel Post Company, Rand-McNally Building, Chicago, Ill., has changed its name to **The Carbo Corporation.** No change in the personnel of the organization has been made. Expansion of the company's business from its primary trade in the manufacture of steel fence posts into

Digitized by Google

the manufacture of complete fence-supporting systems, poles for power and lighting systems, and various types of utilities made of steel for use in the construction of small buildings, has been the cause of the change of the name of the company.

William Dubilier, 160 Duane Street, New York City, the well known electrical engineer and manufacturer of wireless, high-frequency and high-potential apparatus, has been appointed American purchasing agent for ten of the largest electrical supply and manufacturing companies in France. He will be glad to receive catalogs and price lists of manufacturers of electrical machinery and supplies, including generators, motors, transformers, insulating materials, storage-battery parts, such as wood separators, ebonite jars, etc. Mr. Dubilier has a large number of inquiries on hand from the French firms for whom he is acting and will be glad to get into communication with electrical manufacturers and jobbers.

Benjamin Electric Mfg. Co., Chicago, Ill., has ready its new catalog No. B-21. This covers its extensive lines of illuminating and wiring devices and specialties, which has been steadily added to so that now it requires a 96-page catalog for the condensed listing. The devices are conveniently classified, both by general schedule and subgroups. Each type of device or specialty is illustrated and accompanied with description and data. Valuable illumination data and suggestions are also given. An innovation in this catalog is the convenient form of the index, which covers seven pages; each device is listed here by catalog number, page where illustrated and described, list price, discount schedule, number in carton, standard package, and weight in pounds. Copies of the catalog can be obtained by those interested on request to the Benjamin Company.

Bolinders Company, 60 Church Street, New York City, has ready for those interested in economical oil engines some fine publications of its parent company, J. & C. G. Bolinders, Limited, of Stockholm, Sweden. One of these shows several hundred illustrations of the large Swedish works (which were opened in 1848 and since many times enlarged) and of the varied products manufactured and installations in which they are employed. Among these products are the famous Bolinder crude-oil engines for use in electric generating and other power plants, and in marine propulsion service; other products are: Steam engines, steam turbines, boilers, sawmill machinery, woodworking machinery, etc. Another fine publication is devoted to an illustrated description of the construction, operation and advantages of the Bolinder crude-oil engine as an auxiliary power for propelling sailing vessels.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued leaflets Nos. 2389 and 2390 dealing with belt-driven and engine-driven alternating-current generators, respectively. The capacities of these generators range from 25 to 1,750 kilovolt-amperes; they are thoroughly described and illustrated in these publications. A number of installation views of each type are also shown. Large squirrel-cage induction motors, type CS, are fully described and illustrated in leaflet No. 3787. These motors have been especially designed for heavy-duty, constant-speed, continuous service. The construction is shown in some detail in the leaflet. "The Installation of Electric Drive in Steel Mills" has been rather interestingly described in leaflet No. 3811, in which is shown the curve indicating the growth of this form of power in steel mills throughout the country.

Record of Electrical Patents

Issued by the United States Patent Office, October 19, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,156,874. Suction Cleaner. E. M. Barner, assignor to Advance Mfg. Co., Hastings, Mich. Arrangement of electric motor.

1,156,885. Outlet-Box Bracket. J. C. Caine, assignor to New England Electric Co., Denver, Colo. Adjustable to secure boxes in openings of different sizes. (See cut.)

1,156,887. Electrical Switch, Fuse and Protector Therefor. E. Charpier, Chicago, Ill. Structure of rotating device for bringing several fuses successively into action.

1,156,893. Stop Watch. F. A. DeLay, Aurora, Ill. Connections between hand and driving mechanism are stem controlled and also electromagnetically controlled by an external circuit-closer.

1,156,901. Fan Motor. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Fan and motor inclosed in spherical shell with blast-directing nozzle.

1,156,906. Radiation Shield. E. W. Kelly, Philadelphia, Pa. For X-ray tubes.

1,156,947. Apparatus for Sterilization of Fluids by Ultra-Violet Rays. M. von Recklinghausen, assignor to R. U. V. Co., New York, N. Y. Structure for exposing thin film of fluid to the action of rays from quartz lamp.

1,156,948. Sterilizing Apparatus. M. von Recklinghausen, New York, N. Y. Sectionalized structure of treating chambers for sterilizing by ultra-violet rays.

1,156,956. Automatic Player-Piano. J. A. Weser, New York, N. Y. Travel of sheet and circuit of electric driving motor simultaneously controlled by perforation in sheet.

1,156,964. Electricity Meter. R. Ziegenberg, assignor to J. Elster, Berlin, Germany. Commutator for multiple-pole direct-current meter.

1,156,967. Electric Incandescent Lamp. A. E. Appleyard, Ashland, Wis. Has separate filament members outlining characters connected by non-incandescent conductors.

1,156,976. Apparatus for Recording and Reproducing Sounds or Signals. E. E. Clement, Washington, D. C. Phonograph record having magnetic lines on disk operates member communicating with sound box.

1,156,987. Automatic Elevator Control. E. L. Dunn, assignor to Standard Plunger Elevator Co., Worcester, Mass. Automatic push-button control and indicator.

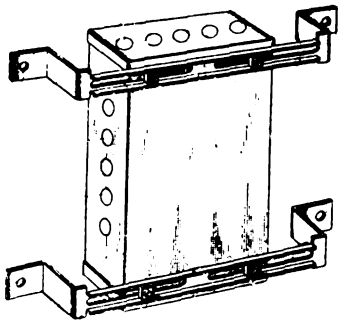
1,157,011. Electric Apparatus for Motor Vehicles. H. W. Leonard, assignor to H. Ward Leonard, Inc., Bronxville, N. Y. Automatic battery-charging apparatus including vibratory-contact voltage control.

1,157,012. Circuit-Controlling Device. M. Levison, assignor to Chicago Signal Co., Chicago, Ill. For indicating maintenance of uniform circuit conditions for a predetermined time.

1,157,014. Dynamo-Electric Machine. H. Lippelt, New York, N. Y. Combination of electrolytic cells with open-coil armature to improve commutation.

1,157,018. Telephone Exchange System. F. R. McBerty, assignor to Western Electric Co., New York, N. Y. Key-operated sender with register for semi-automatic systems.

1,157,020. Means for and Process of Adjusting Incandescent Lamps. D. J. McCarthy, assignor to Union Switch & Signal Co., Swissvale, Pa. Optical device for determining proper position of incandescent lamp in signal reflector.



No. 1,156,885.—Outlet-Box Bracket.

1,157,024. Dynamo-Electric Machine. H. McQuillin, assignor of one-half to W. H. Duggan, Chicago, Ill. Connection of generator with storage battery controlled by axial movement of armature.

1,157,026. Plug Switch. W. F. Meschenmoser, New Dorp, N. Y. Structure of plug receptacle for cable connector.

1,157,028. Mechanism for Regulating the Charging Rate of Storage Batteries. W. Noble, assignor to Sangamo Electric Co., Springfield, Ill. Particular structure of resistance-varying device.

1,157,036. Insulator-Supporting Fixture. C. L. Peirce, Jr., assignor of one-half to Hubbard & Co., Pittsburgh, Pa. Bracket for supporting superposed insulating spools.

1,157,037. Insulator Supporting Structure. C. L. Peirce, Jr., assignor of one-half to Hubbard & Co. For single-insulator thimble; is U-shaped and stamped from sheet metal and is wound with wire to form thread-receiving thimble. (See cut on next page.)

1,157,040. Telegraph Transmitter. E. H. Piersen, Topeka, Kans. Each character sent by placing in position of member having indents corresponding to and operating circuit-closer to send a character.

1,157,051. Device for Protecting Induction Motors and the Like. E. O. Schweitzer, Chicago, Ill. Reverse-phase relay.

1,157,057. Metal Cap for Electric Incandescent Lamps. E. Strehler, Stein, Switzerland. Contact cap has insulating ring into which rim of bulb-receiving cap is sprung.

1,157,066. Reactor. P. Torchio, New York, N. Y. Comprises co-axial, helical, superposed coils with an interior air space.

1,157,075. Electric Lamp Socket. C. D. Blackburn, Lime, Colo. For hanging upon and contacting with electric wires through their insulation.

1,157,076. Electrical Switch-Actuating Mechanism. W. J. Bohan, St. Paul, Minn. Track-switch operating motor controlled through terminal trolley lines independent of the rails.

1,157,079. Electrocalculograph. J. Bricken, assignor of two-thirds to R. Marks, Des Moines, Iowa. Key-operated, electrically controlled computing machine.

1,157,094. Transmitting and Receiving Signals. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Method of simultaneously sending and receiving wireless signals.

1,157,100. Electric Heating Device. W. S. Hadaway, Jr., New York, N. Y. Chocolate warmer.

1,157,102. Signal. C. O. Harrington, assignor to Union Switch & Signal Co. Signal lamp for day and night has different intensities regulated by change from daylight to darkness.

1,157,104. Block Signal System. L. A. Hawkins, assignor to Union Switch & Signal Co. Combination of alternating signaling currents of different frequencies permitting both rails to be conductively continuous for all currents.

1,157,105. Lighting System for Motor Vehicles. R. Head, assignor to J. T. Outerson, New York, N. Y. Electric spark lighter operated by gas valve in acetylene headlight.

1,157,111. Electric Cooking Range. W. J.

Digitized by Google

Keep, assignor to Michigan Stove Co., Detroit, Mich. A unitary removable terminal box comprising indicators is operatively related to heating elements of stove top.

1,157,112. Thermoelectric Heat Regulating System. L. A. Larson, Minneapolis, Minn. Operating motor controlled by thermostat.

1,157,134. Liquid Rheostat. D. Welge, South Porcupine, Ont., Canada. Structure and arrangement of plates in single-tank type.

1,157,137. Dynamo-Electric Machine. R. B. Williamson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has structure to reduce noise of air circulation through core and windings.

1,157,179. Centrifugal Circuit-Changing Device for Electric Motors. E. S. Pillsbury, assignor to Century Electric Co., St. Louis, Mo. Particular structure of short-circuiting device mounted on motor shaft of commutator-started induction motor.

1,157,180. Lamp Standard and Shade-Holder. J. Rose, assignor of one-half to D. Rose, Lancaster, Pa. Umbrella-like arrangement for supporting lamps and shade.

1,157,181. Electric Socket. F. M. Rosenfield, assignor to Import Sales Co., New York, N. Y. Contact structure pushed in open end of insulating casing and secured by spring clips snapped into casing recesses.

1,157,201. Shade Support. F. Barr, Woodhaven, N. Y. Shade secured directly to socket by screws above bead on socket.

1,157,203. Control System for Electric Motors. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. For accelerating motors, comprising variation of generating voltage in response to current and variation of motor field above predetermined generator voltage.

1,157,204. Apparatus for Controlling the Thickness of Paper. H. Brown, Springfield, Mass. Thickness of paper electrically controls feed of stock.

1,157,208. Electric Cable. J. L. Conrad, assignor of one-third each to T. D. Wright and A. D. Halstrom, Durham, N. C. Moisture in cable is attracted and absorbed by insulation of detector conductor, completing a detector circuit.

1,157,214. Insulation Cutter. L. Genin, Chicago, Ill. For stripping insulation from wires.

1,157,233. Water-Purifying Device. L. C. Lashmet, Jacksonville, Ill. Electrolizer has stationary electrodes between which are sandwiched rotating electrodes.

1,157,239. Cutout Pulley. A. C. McWilliams, South Bend, Ind. For supporting lamps; convertible for series or multiple circuits.

1,157,270. Blasting Cartridge. W. Weber, Hayingen, Germany. Arrangement of primer in liquid-air cartridge.

1,157,275. Clutch and Regulating Mechanism. E. W. Woolley, Jersey City, N. J. Driving clutch for compressor electrically controlled in response to fluid pressure.

1,157,277. Motor Controller. C. W. Yerger, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Electromagnetically operated resistance with means for varying the different steps to accommodate varying loads.

1,157,280. Drawn Electrode. W. G. Abbott, Jr., assignor to General Electric Co., Schenectady, N. Y. Flexible arc-light electrode comprising sheath of mild steel containing a magnetite mixture.

1,157,281. Apparatus for Producing Directive Forces by Induction in Alternating-Current Circuits. H. Abraham, assignor to H. Abraham et J. Carpentier, Paris, France. Alternating-current meter.

1,157,288. Manufacture of Fine Refractory-Metal Wires. F. Blau, assignor to General Electric Co. Method of producing very fine tungsten wires of uniform surface and cross-section.

1,157,292. Automobile Horn. H. A. Bretz, assignor to Minerallic Electric Co., Chicago, Ill. Particular structure of electromagnetically operated diaphragm.

1,157,293. Apparatus for the Manufacture of Chemical Compounds. C. J. Brockbank, assignor to Carborundum Co., Niagara Falls, N. Y. For manufacture of chemicals by catalytic process; a converter formed of compacted carborundum is heated by passing current through it and contains porous diaphragm carrying catalytic material.

1,157,294. Electric Lighting Fixture. C. A. Brown, assignor to General Electric Co. Fixture-bowl support.

1,157,296. Electric Signal Device. A. H. Caven, Youngwood, Pa. Structure of electromagnetically operated, step-by-step rotary switch.

1,157,300. Electric Timing Device. J. T. Dempster, assignor to General Electric Co. Time-actuated, electrically controlled device for timing demand meter.

1,157,307. Driving Mechanism. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co. Driving connection between motor and driven member is released when movement of driven member is obstructed.

1,157,310. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Structure of flush switch.

1,157,313. Electric Motor Control. M. C. A. Latour, assignor to General Electric Co. Alternating-current motor operated interchangeably as repulsion or series repulsion motor.

1,157,325. Dynamo-Electric Machine. M. Osnos, assignor to General Electric Co. Alternating-current generator stator having 2p-polar winding, rotor having p-polar winding; magnetic circuit is normally saturated and direct exciting current supplied to both windings.

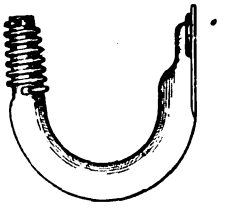
1,157,336. High-Potential Switching System. C. P. Steinmetz, assignor to General Electric Co. In connecting transmission line with power source, circuit is first closed through low-potential shunt about main switch connected with the two sides of the switch by transformers; in disconnection shunt is opened last.

1,157,342. Target-Placing and Shifting Apparatus. W. I. Thompson, assignor of one-third each to A. M. Lux and W. J. Lux, Woburn, Mass. Electrical mechanism controlled from firing station places new target and removes used target to firing station.

1,157,343. Electrically Heated Tool. W. L. Thompson, assignor of one-third each to A. M. Lux and W. J. Lux. Hammering and burnishing tool.

1,157,344. Means for Preventing Corona Loss. E. Thomson, assignor to General Electric Co. High-potential conductor has conducting core and nonmetallic sheath having sufficient radial conductivity to transmit without resistance loss sufficient current to change sheath exterior to potential of core.

1,157,392, 1,157,393 and 1,157,394. Trolley Conductor. W. Hoopes and T. Varney, Pittsburgh, Pa. Three patents on details of catenary trolley.



No. 1,157,037.—Insulator Bracket.

1,157,395. Portable Electric Light. C. Hubert, Chatham Borough, N. J. Arrangement of socket and reflector in tubular flashlight.

1,157,396. Selective Signaling System. J. A. Hulit, assignor to Automatic Electric Co., Chicago, Ill. For automatic telephone system; employs reversal of polarity and pause between impulses to operate selectors on a line.

1,157,414. Dynamo-Electric Machine. A. H. Neuland, Bergenfield, N. J. Generator for maintaining constant potential has magnetic shunt to armature responsive to armature current and potential.

1,157,418. Electric-Iron-Cord Take-Up. N. E. Polson and H. R. Paulson, Le Grange, Ill. For securing to ironing board.

1,157,463. Catenary Structure. T. Varney, Pittsburgh, Pa. Double catenary structure for supporting a trolley wire.

1,157,464. Incandescent Electric Lamp. C. A. Vetter, Pittsburgh, Pa. Lamp socket has screw shell turning with lamp except when held against rotation by an inserted key.

1,157,477. Shoe Heating and Vulcanizing Apparatus. T. F. Whelan, assignor to Savoday Rack Co., St. Louis, Mo. Electrically heated cabinet for treating toe tip of patent-leather shoe.

1,157,479. Apparatus for Treating Unfinished Shoes. T. F. Whelan, assignor to Savoday Rack Co. Modification of above.

1,157,497. Hand-Hole Cover for Generators. W. L. Bliss, assignor to U. S. Light & Heat Corporation, Niagara Falls, N. Y. Comprises a band extending about casing and covering inspection openings.

1,157,500. Apparatus for Making Cables. F. Bräckerbohm, Wilhelmsruh, Germany. Wire spacing and placing device for cables comprising parallel wires.

1,157,504. Illuminated Sign. J. Butenschon, Anniston, Ala. Is provided with receptacle for cleansing fluid which is conducted to lamp bulbs to keep them clear.

1,157,505. Take-Up Device for Electric Lamp Cords and the Like. N. S. Cameron, Weed, Cal. Spring drum device.

1,157,508. Signal Bell. J. Charland and R. A. O'Connor, Copper Cliff, Ont., Canada. Gong has striking hammer operated by electromagnet.

1,157,519. Adjustable Electric Lamp and Mirror Fixture. O. B. Fagan, Georgetown, O. Lamp socket, mirror and reflector arranged on standard.

1,157,531. Manufacture of Dry Batteries for Flashlights and Other Purposes. F. D. Harper, Everett, Mass. Arrangement of carbon electrode, absorbent, depolarizer, etc., in zinc container.

1,157,533. Starter for Engines. M. A. Harris, assignor of one-third to L. A. Clark, Westfield, N. J. Electric starter for automobile engines.

1,157,543. Magnetic Ore-Separator. A. F. Jobke, assignor of one-half to J. G. Burns, D. Bingham, K. Crumay, T. Higgins and H. P. Gazzam, Pittsburgh, Pa. Material conveyed to separating gap by inclined conveyor and agitated by shaking the belt up and down by magnetic attraction.

1,157,592. Electrical Machines. J. E. Seeley, Los Angeles, Cal. Arrangement of circuits and devices in X-ray apparatus.

1,157,601. Burglar-Alarm System. S. D. Tomaso, assignor of one-half to R. E. Hulsman, Chicago, Ill. Electrically operated talking machine controlled by protective circuit talks into telephone.

1,157,603. Rail Bond. C. P. Vaill, assignor to American Steel & Wire Co., Hoboken, N. J. Has laminations welded together at end to form terminals, the laminations making edgewise contact with rails.

1,157,608. Trolley. C. W. Arial, Colerain, Mass. Has special lubricating provision.

1,157,612. Die for Insulators. C. V. D. Bennett, assignor to Locke Insulator Mfg. Co., Victor, N. Y. For making suspension insulators.

1,157,617. Means for Attaching and Detaching Light Globes. E. H. Conrad, Trevorton, Pa. Attachment for pole end to detachably grip lamp bulbs.

1,157,625. Accounting System. F. O. Heuser, assignor to W. R. Heath, Buffalo, N. Y. Electrical system of control of electromagnetically actuated wage registers.

1,157,630. Automatic Retrieving Trolley. S. E. McFarland, assignor to Automatic Retrieving Trolley Corporation, Long Beach, Cal. Sudden upward movement of pole bends toggle and permits pole to fall.

Reissue 13,994. Means for Insulating Rail Joints. B. G. Braine, assignor to Rail-Joint Co., New York, N. Y. Particular manner of insulating rails from joint bars.

Reissue 13,998. System of Control. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Arrangement of and operation of liquid rheostats on alternating-current locomotive.

Patents Expired.

The following United States electrical patents expired on October 25, 1915:

612,880. Electric Contact Box. J. N. Thomas and W. M. Brown, Johnstown, Pa.

612,885. Annunciator. O. Wiederhold, Summit, N. J.

612,929. Insulator and Hanger for Electric Railways. W. C. Keithly, San Francisco, Cal.

612,943. Electric Furnace. L. Bresson, Lyons, France.

612,977. Armature Winding. A. L. Riker, New York, N. Y.

612,999. Electric-Lamp Guard. H. M. Underwood, Chicago, Ill.

613,036. Telephone-Exchange System. C. C. Heilman, Philadelphia, Pa.

613,046. Automatic Leak or Ground Cutout. W. L. Pratt, Adams, N. Y.

613,054. Electric Fan. D. L. Bates and R. H. Bates, Dayton, O.

613,116. Dynamo-Electric Machine or Motor. S. G. Brown, London, England.

613,128. Electric Switch. W. Ely, Providence, R. I.

613,129. Electric Switch. W. E. Ely and W. B. Bernerdini, Lakewood, R. I.

613,135. Alternating-Current Electric Motor. A. S. Frazer, Tynemouth, England.

613,175. Underground Electric-Railway System. F. D. Robb, Hot Springs, Ark.

613,181. Trolley Pole. J. Walsh, Elyria, Ohio.

613,203. Alternating-Current Motor System and Method of Operating Same. M. Hutin and M. Leblanc, Paris, France.

613,204. Alternating-Current Asynchronous Machine. M. Hutin and M. Leblanc.

613,205. Electric-Current Leveler. M. Hutin and M. Leblanc.

613,206. Method of and Means for Synchronizing. M. Hutin and M. Leblanc.

613,209. Alternating-Current Dynamo-Electric Machine. M. Leblanc, Paris, France.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII. No. 19. CHICAGO, SATURDAY, NOVEMBER 6, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Rural Extensions 825
Electrical Prosperity Week..... 826
Growth of Electric-Vehicle Business..... 826
Organizing for Co-operation..... 826
The Utilization of Water Power..... 827
Selecting a Vocation..... 827
DEPARTMENTS:
Commercial Practice 837
Electrical Construction 841
National Association of Electrical Inspectors..... 845
Public Service Commissions..... 848
New Electrical and Mechanical Appliances..... 856
Latest Approved Fittings..... 864
Current Electrical News..... 866
Record of Electrical Patents..... 869
Electric Vehicle Section..... 871
LEADING ARTICLES:
Electrical Prosperity Week—Its Mission—How You Can Profit 829
The Development and Operation of Outdoor Substations.—By F. L. Hunt..... 845
The Future of Water-Power Development in Alabama.—By Thomas W. Martin..... 850
BOOK REVIEWS..... 855
MISCELLANEOUS:
Conference on Valuation..... 828
Annual Meeting of Mechanical Engineers..... 828
Columbus Jovians Hear of Experiences in War Zone..... 828
Convention of Alabama Association..... 828
Electrical Prosperity Week Plans in Different Cities..... 834
The Future of California Electric Railways..... 836
Unique Brooklyn Central-Station Exhibit..... 837
Giving of Premiums Stimulates House-Wiring Orders..... 837
City Officials Praise Utility for Good Service..... 837
Intensive Business Cultivation at Kansas City..... 838
Unique Type of Central-Station Newspaper Advertising..... 838
House-Wiring Campaign Successful in Lynn..... 839
Kansas City Company Sells Many Appliances During Ten-Day Show..... 839
United Company Holds Annual Booster Sales Meeting..... 839
By-Laws of California Association..... 841
Among the Contractors..... 844
Electrical Exports for August..... 849
New Electrification Work on London Suburban Railroads..... 852
Electric Taxicabs in Detroit Reduce Operating Costs 40 Per Cent..... 871
Operating Costs of Industrial Electric Trucks..... 872
Comparisons Between Horse, Gasoline and Electric Delivery Costs..... 874
Comparative Development of the Commercial-Power and Electric-Vehicle Loads 876

Copyright, 1915, by Electrical Review Publishing Company, Inc.

RURAL EXTENSIONS.

Steadily increasing prosperity among the farmers of our country is responsible for liberal purchases by them of equipment that makes for better living and working conditions on the farm. One of the lines in which money is being put into circulation is the purchase of electric lighting plants and miscellaneous electrical equipment. The growing use of such isolated country lighting plants is causing central stations to realize that unless they are enabled to put up rural lines to serve the farmers, the latter will put in their own plants and to that extent render future rural extensions less profitable by the restricted number of customers served.

The problem of financing rural extensions, although successfully solved in quite a few instances, has on the whole been a vexatious one. Many central stations have contended that the farmers must bear the entire cost of the extensions and their necessary equipment of transformers, lightning arresters, etc. A few companies have borne this entire cost themselves, this being true, however, only where both the number of customers served per mile of line and their average load was high. To anyone who has given the matter careful consideration it has become apparent that the distribution of the cost of extensions depends on the density of load. Above a certain density of load the central-station company can well afford to bear the entire cost of the extension. In these days of commission regulation, however, it was inevitable that the matter would have to be passed on sooner or later by one or more of the state utility commissions.

The Wisconsin Railroad Commission has just rendered a decision in a case of this kind. As reported in the department of Public Service Commissions in this issue, the commission has decided that the cost of the line construction, including poles, wires, insulators, etc., should be borne by the customers, since no other equitable way is open in view of the greatly variable length of the required extension. The cost of the transformer, lightning arrester, meter and other individual service equipment must be borne by the central station, since this is only somewhat greater than that necessary to serve urban customers and the increased investment is relatively standard for all the rural customers and can be taken care of by an adequate demand charge or sufficiently high monthly minimum bill. This rule has much to commend it. It is not only fair and equitable, but should serve to stimulate the farmers to co-operate more heartily with the central station.

Digitized by Google

By helping the latter to secure every farmer along the line as a customer, the amount that must be paid out by each farmer for the line extension is correspondingly reduced. It is to be hoped that the results of this practice in Wisconsin will bear out the expectations.

ELECTRICAL PROSPERITY WEEK.

On other pages of this issue there is published a comprehensive account of the plans of the Society for Electrical Development with respect to the holding of Electrical Prosperity Week, November 29 to December 4. In every part of the country enthusiasm is rampant, and we find every element of the electrical industry busily engaged in arranging for a record-breaking achievement in popularizing the utilization of electrical energy and electrical apparatus. Many of the larger central stations have thrown the entire weight of their organizations into the plan for the celebration of the week, and co-operating with manufacturers, jobbers, contractors and dealers, will expend a generous amount of money in bringing to the attention of the public the advantages of electrical service.

The staff of the Society had carried out in the most creditable manner the plans of the general committee under whose auspices the idea of Electrical Prosperity Week was inaugurated. Only those who have come into intimate contact with the central office of the Society can appreciate the tremendous amount of material which has been involved in the propaganda. It is confidently expected that so apparent will the message of usefulness be made during Electrical Prosperity Week that a great part of the resistance to entire conversion even upon the part of those to whom the least benefit might accrue, will be swept away. Another and very important effect of the celebration will be in the heartening of all those interested in the business. To many the matter of the manifold advantages of electrical service has become so familiar that the imagination is just a little bit jaded. To these Electrical Prosperity Week will speak a special message. Altogether it seems as if there might have been some element of foreordination in selecting the date for the celebration. Surely in the history of the country it does not appear as if there had been available a more favorable arrangement of circumstances for cashing in to the maximum extent upon a campaign of nation-wide publicity.

GROWTH OF THE ELECTRIC-VEHICLE BUSINESS.

When the utilization of electric vehicles is compared with the present application made of gasoline automobiles, it would seem that very little use has so far been made of the electric vehicle for either passenger or freight service.

The electric vehicle had its birth about the same time as the gasoline car. Its development, however, was not at the first nearly so rapid. In judging the growth of the electric-vehicle industry the more reasonable basis of comparison is with other electrical development, as was pointed out by Messrs. H. H. Holding and Stephen G. Thompson in a paper presented at the recent annual convention of the Electric Vehicle Association of America and reproduced in this issue. The authors of this paper have compared the consumption of electric energy by electric vehicles in a certain territory with the consumption of electrical energy for commercial power uses during the same period. The diagrams given in this article make the relative development very evident. The application of electricity for commercial power shows on the whole a constant and steady growth, three years having sufficed to increase the consumption about 2.6 times. During the same period the use of electric energy for driving vehicles has increased about four times, showing a development which, while not so steady, is proportionally greater in the aggregate.

It is also shown by the authors that the percentage increase in the use of electric vehicles in three years is greater than the percentage increase in the use of electric power drive in 10 years. These figures are a clear indication that the electric-vehicle industry is developing as rapidly as could have been expected, and that it only requires the recognition on the part of central-station men of the possibilities along this line, and the establishment of adequate charging facilities in their respective territories, to make the development one of even greater rapidity. In the midst of all the boosting for electrical things, which is being done in connection with Electrical Prosperity Week, the electric vehicle should not be forgotten.

ORGANIZING FOR CO-OPERATION.

Organization of each branch of the industry is a prerequisite to co-operation between the different branches. As this has become more and more realized, closer organization has been accomplished. Real results are beginning to be achieved. While contractors have had national and local organizations for some years, these have not always been so comprehensive as might be wished, nor has their work been always pushed with the vigor and confident enthusiasm which bring the desired results.

Attention has been focussed during the present year on the California Association of Electrical Contractors and Dealers on account of the practical and telling progress which is being accomplished in that state through organization and the use of association machinery in handling the problems which crop up in the relations between the contractor-dealers and the other branches of the industry, notably the jobbers and the central stations. As other organizations may wish to follow the lead of California in forming an instrument of government, the by-laws of the California association are printed in this issue.

Digitized by Google

THE UTILIZATION OF WATER POWER.

Statistics presented in a paper at the International Engineering Congress by Mr. Charles H. Mitchell showed that the United States is utilizing about one-quarter of the power available within its limits from falling water. In percentage of utilization we are surpassed by only two foreign countries, Switzerland and Germany. The latter shows a high percentage because its resources of this type are very scanty, the developed horsepower per capita being among the lowest of the countries considered. The actual horsepower already developed in this country is far greater than in any other, but the per-capita development is exceeded by Norway, Canada, Switzerland and Sweden. As none of the latter are thickly populated, the United States may fairly be said to lead the world in hydroelectric development. Its resources are larger, its developed power larger than any country which has been carefully surveyed, and its percentage of utilization is among the highest.

Evidence presented before the Senate Committee on Water Power last year showed that there is available in the United States, excluding Alaska, over 28,000,000 horsepower, of which about 7,000,000 horsepower has been developed. The percentage of development is higher in the East than in the West. A large part of the available power is located in the region west of the Rocky Mountains, and especially in the northern portion of that section. These states include vast areas of the public domain, control of which rests with the United States Government. Since access to public land is necessary for the development of the water power in many cases, control of the latter indirectly is in the hands of the Federal Government. Since the Federal Government has control of all navigable streams, available water power on such streams is also under the hand of the Government.

The future development of water power in this country awaits action by the Congress. A large proportion of the undeveloped water powers are under federal control, and use of them can only be undertaken under some general law or under special enabling acts. The latter form of dispensation has become unpopular. A general law permitting development at any suitable location under proper restrictions is now and has been for some years, urgently demanded. The need for such a law is well stated in a paper by Mr. Thomas W. Martin which was read at the recent convention of the Alabama Light and Traction Association, held at Montgomery, and is printed in this issue.

Development of water power can only come through government agencies or private persons. If private sources of capital are to be depended upon for development, conditions must be created which will make investment appear safe and likely to yield returns as great as are secured in other avenues of investment. Short or uncertain tenures of franchises or permits do not meet these conditions, nor does uncertainty as to the disposition of the property at the end of the tenure. If these two requirements are fairly met in federal legislation on the subject any safeguards which may be provided to protect public interest in the perpetual use of these natural resources will not prove unsurmountable obstacles to progress in the utilization of our "white coal."

SELECTING A VOCATION.

The ranks of successful electrical contractors probably display as great a variety of types of men, as judged by their preparation for the work, as any occupation that can be named. Some are electrical engineers, some have stepped up from former service as linemen or electrical workers, some have turned to this from some other business, and some have had their introduction to electrical work as an inspector or central-station employee. Out of the multitude of schools of all sorts in this broad country, few make a special point of preparing men for this work. They must prepare themselves for it, or be prepared by the previous experience which fortune leads them into.

Of the many qualities which are desirable in the man who takes up electrical contracting work, two are absolutely essential to success. One is a familiarity with the work to be done; the other is a knowledge of how to conduct a business. The contractor is not likely to essay a venture into the field unless he deems himself fitted in the first particular, yet many cases exist where an impartial critic might not agree with him. It is in the second particular, however, that a lack more frequently becomes evident. Electrical contracting is a business as well as a vocation, and business sagacity is quite as essential on the part of the contractor as is familiarity with the technical features of the work.

Many men do not discover their own abilities until late in life, with the result of selecting the wrong vocation. There has been many a mediocre professional man who might have been successful as a merchant or as a mechanic. Many undertake to do business who are better fitted to remain on a pay roll. Not a few men who as electricians or station engineers could be successful, attempt to carry on a contractor's or dealer's business which their natural aptitude and abilities prevent them from ever carrying to a sucessful conclusion.

Proficiency in business methods may often be acquired through study and experience by those who have talents in this direction. But men without these talents would better turn their energies in other directions where greater success will be their reward. Some are so constituted that their judgment in business matters is usually wrong, and the tedious detail of business routine is so objectionable to them that it is frequently neglected. Their best feeding ground lies in other pastures.

Digitized by Google

Conference on Valuation.

The Utilities Bureau has arranged for a conference on valuation, to be held at the Hotel Adelphia, in Philadelphia, Pa., on November 10, 11 and 12.

The first session will be held on Wednesday evening, November 10, at 8 o'clock, and will be devoted to the reproduction theory of valuation. The mayor of Philadelphia will preside, and an opening address made by Morris L. Cooke, acting director of the Utilities Bureau. Papers will be presented by John M. Eshleman, formerly president of the California Railroad Commission, on "Criticism of Reproduction Theory of Valuation," and by H. Findlay French on "Reproduction Value Versus Fair Value."

The session on Thursday morning will be devoted to "Original Cost." Addresses will be made by George W. Anderson, of Boston, on "Actual Cost as a Basis for Fair Value;" by Edward W. Bemis, of Chicago, on "Original Cost as the Chief Basis for Fair Value" and by Charles L. Pillsbury, engineer for the Public Utilities Commission of the District of Columbia, on "The Making and Maintenance of Priced Inventories."

The session on Thursday afternoon will be devoted to franchise values. Addresses will be made by John G. Morse, of Boston, on "Valuation by Approximation," and by D. F. Wilcox, of New York, on "Franchise Values."

At the session on Thursday evening land values will be discussed, the principal address being made by Hammond V. Hayes, of Boston.

The session on Friday morning will be devoted to depreciation. Addresses will be made by J. H. Goetz, of New York, on "Court Decisions on Depreciation," and by Halford Erickson, of the Wisconsin Railroad Commission, on "Depreciation as a Factor in Fair Value." The session on Friday afternoon will be devoted to "Going Value," the chief address being made by Clifford Thorne, of the Iowa Railroad Commission.

A subscription dinner will be held on Friday evening to close the conference. The discussion at this dinner will deal with the subject of "Valuation and the Future in Public Utilities." Addresses will be made by Charles A. Prouty, of the Interstate Commerce Commission, on "The Meaning of the Constitutional Protection in Valuation;" by William D. Kerr, of Chicago, on "Constitutional Protection in Valuation;" by John H. Gray, of the University of Minnesota, on "Opinion Testimony," and by M. R. Maltbie, of New York, on "Valuation and the Future in Public Utilities."

All the meetings, as well as the dinner, will be open to the public, and a number of prominent men have agreed to take part in the discussion following the principal addresses upon the various subjects mentioned. The headquarters of the Utilities Bureau is at 1009 Finance Building, Philadelphia.

Annual Meeting of Mechanical Engineers.

The annual meeting of the American Society of Mechanical Engineers is to be held in the Engineering Societies Building, New York City, on December 7 to 10, inclusive. The first session will be held Tuesday evening at which there will be an address by the retiring president, John A. Brashear, followed by a reception to the president-elect and other officers. On the following three days there will be nine business and technical sessions at which a large number of papers and reports will be presented and discussed. Among the papers of considerable electrical interest will be the following:

"Modern Electric Elevator and Elevator Problems," by David Lindquist. "Turbines vs. Engines in Units of Small Capacities," by J. S. Barstow. "The Connors Creek Plant of the Detroit Edison Company," by C. F. Hirshfeld. "Electric Operation and Automatic Electric Control for Machine Tools," by L. C. Brooks.

Among the social features arranged for is a smoker to be held on the evening of December 8, and the annual reunion, dinner and dance on the evening of December 9.

Columbus Jovians Hear of Experiences in War Zone.

The Jovian season at Columbus, O., was inaugurated on Friday, October 29, by a noonday luncheon at the Virginia Hotel with 60 members present. By prearrangement Dr. E. A. Hamilton, of Columbus, lately returned from Red Cross service at the front in Germany, was the speaker. He described the large use being made of the X-ray in military surgery, and gave other interesting facts regarding his experiences on the battlefields.

Through First Tribune Jaquith the Jovians have addressed a letter to the local Chamber of Commerce volunteering the co-operation of the 250 members of the Columbus chapter in the effort to induce Thomas A. Edison to stop off in that city on his homeward trip from San Francisco.

Gas-Producer Plants.

At the meeting of the American Society of Mechanical Engineers, to be held at the Engineering Societies Building, New York City, on the evening of November 9, a paper will be presented by C. M. Ripley entitled "Gas-Producer Power Plants in New York City and Vicinity."

Convention of Alabama Association.

The Alabama Light and Traction Association held a convention at the Gay-Teague Hotel, Montgomery, Ala., on October 20 and 21. The program included the following papers:

"Light Cars and One-Man Operation," by A. L. Kenyon.

"Merchandising Gas and Electricity," by Frank Hammond.

"The Relation of the Company to Its Employees," by J. T. Hury.

"The Relation of Accounts to Public-Utility Operation," by V. B. Day.

"High-Tension Outdoor Substations," by H. W. Young.

"Taxation of Public-Service Corporations," by T. K. Jackson.

"Gas-Meter Testing," by A. F. Kersting.

"Water-Power Development in Alabama," by T. W. Martin.

The paper by T. W. Martin on "Water-Power Development in Alabama" is presented in full in this issue.

The following officers were elected:

President, F. H. Chamberlain, Alabama Power Company, Birmingham, Ala.

Vice-president, C. C. Henderson, Henderson Light & Power Company, Greenville, Ala.

Secretary and treasurer, J. P. Ross, Birmingham Railway, Light & Power Company, Birmingham, Ala.

Directors: T. K. Jackson, Mobile Electric Company, Mobile, Ala.; R. L. Ellis, Selma Lighting Company, Selma, Ala.; A. R. Smith, Demopolis Light & Power Company, Demopolis, Ala.; B. C. Adams, Montgomery Light & Water Power Company, Montgomery, Ala.; J. H. P. DeWindt, Birmingham Railway, Light & Power Company, Birmingham, Ala.

Apparatus for Transcontinental Telephony.

Some details of the equipment used in the experiments in radiotelephony between Arlington and San Francisco have been published in the London *Electrician*.

At the transmitter a bank of large bulbs very similar in construction to, and embodying the elements and circuits of, the de Forest oscillion was used. These were energized from a common generator, their circuits acting in unison on the common radiating antenna. Other auxiliary audion paths, which were in their turn voice-controlled from a master microphone, controlled this high-frequency energy as generated.

At the receiving station the de Forest audion detector and amplifier were used, connected so as first to amplify the high-frequency currents to approximately 100 times their original intensity, and then to transform these into low-frequency telephone currents.

Digitized by Google

ELECTRICAL PROSPERITY WEEK—ITS MISSION—AND HOW YOU CAN PROFIT

"Electrical Prosperity Week" commands the admiration of men who think and do things. It is a challenge to the pessimist. It is a warning to the drones and buzzards of life that the electrical era has nothing in stock for the man who consumes and never produces. It is a "gloom dispeller" of most impressive magnitude—nothing in industrial history ever measured its scope or equalled its response. It brings light not merely as illumination but floods the nation with understanding—compelling men and women to stop and to think.

In five years we saw your electrical business double, the investment going from a half billion to a billion, and then in the next five years, we saw it more than double again and the investment exceeded two billion dollars. Such figures bring a forcible realization that you are working in a field of constructive development, that cannot be matched in industry.—Frank A. Vanderlip, president, National City Bank, New York City.

In spite of what our greatest minds know of it, in spite of present day wonderful accomplishments, electricity, as Mr. Vanderlip indicates, is just in its infancy.

The infant prodigy has grown so rapidly that not many people realize how safely, clearly, efficiently and economically electricity can eliminate nearly all human toil.

For instance, how many people know that $80,000,000 was spent last year in spreading the doctrine of "Do It Electrically"? How many people know that the industry without counting electric railways, etc., represents investments of more than $3,000,000,000, enough to build seven Panama Canals or feed all the men and horses in the European war for eight years. Last year the industry did a business of $2,265,000,000. About $100,000,000 will be spent for Christmas gifts this year. Why shouldn't the electrical industry "cash in" on this big expenditure?

Day by day electricity is bettering life in all its complexities, reducing toil, raising men and women to the sphere of engineers compared with their previous destiny, making the world brighter, more joyous and a happier abode for mankind. Figures and popularity of electrical uses prove it.

Photograph by R. E. Mayhall.

Special Prosperity Sign and Illumination in Boston.

These are the thoughts "Electrical Prosperity Week" seeks to definitely impress on the face of the nation. It aims to make people see with the souls and minds as well as with the two eyes in their heads. It fixes a week of country-wide brilliancy during which a nation of 100,000,000 souls will have cause to ponder over what electricity is able to do for each. It has already achieved, as it well deserved, boundless support. It will be a week of electrical exhibitions, illuminations, demonstrations. It will prove that in the brief space of less than two generations electricity has come to be an indispensable help in our daily lives. Already 75 per cent of the nation's people come in contact with electricity in some form every day. Ten per cent make their living from electricity or its ramifications.

The celebration will be novel, unprecedented, unparalleled. It was instituted to create a stronger spirit of confidence in the stability of the nation and its resources, to show how much better the world has become since electricity became a factor of progress. It is a gigantic educational and sales campaign designed to promote better business and more sales of electricity and electrical products. The name "Electrical Prosperity Week" was given to the movement because electricity and prosperity go hand in hand.

The date was set for November 29 to December 4, because that time is really the beginning of the "Shop-early" Christmas campaign. If there were no other incentive, the fact that dealers and central stations can participate in a "shop-early" movement should induce electrical companies to co-operate for the success of the week.

The newspapers, magazines, motion-picture films have heralded the approaching of this big event throughout the country. The trade journals are telling the industry how they can benefit from the big week, also regarding its progress. The Society for Electrical Development is sending out to members, non-members, electric leagues, chambers of commerce, department stores, specialty shops, and electrical men everywhere, interesting information regarding the campaign and how they can profit by it. Before the week comes around the *Saturday Evening Post*,

Digitized by Google

Collier's, Scientific American, and many other national mediums will publish special electrical announcements. Collier's, with its million circulation, will have a regular issue devoted to electrical subjects.

National advertisers will participate in this and other similar issues. The campaign is being advertised as no other trade movement ever before in history. It only takes co-operative and individual sales work to tie this national publicity to individual business.

Co-operative Plans.

The Society is sending out booklets descriptive of the following subjects: "What the Central Station Can Do;" "What the Contractor and Dealer Can Do to Cash in;" "How to Put on a Slogan-Sign Campaign;" "How to Put on an Electrical Show or Demonstration;" "How to Put on an Electric-Vehicle Parade or Sociability Run." Also booklets to the employees of companies showing how they can participate.

First Things to Do.

Here are some suggestions which local committees and important men in other communities are doing in the Electrical Prosperity Week campaign.

One of the first and immediate steps is for the central-station managers, leading jobbers, dealers and contractors to meet and formulate primary plans for the campaign. Decide generally upon what you will do after reading the campaign literature, then go to the secretary of the Board of Trade, to the editors of the local newspapers, to the leading city officials and presidents of the Merchants Association, get them together and explain the value of a local celebration in this nation-wide campaign. Other cities are celebrating. They should do likewise. Explain how they can install holiday illumination, and why, even if they have no other incentive, they should begin their "Shop-early" movement bright and early before December is well begun.

Central Station.

Among those who will benefit most from the celebration are the central stations. They will furnish most of the current used for illumination and various other features of the week. After the celebration, they will supply service for the appliances and apparatus sold during the week by the dealers. Great numbers of these interests realizing the importance of the celebration to them, are extending their support and engaging actively in the work on the plans.

How the central station can co-operate toward making the week a success is outlined as follows:

Impress the various mercantile interests with the importance of the celebration as a trade stimulator. Show them how they can profit by conducting Electrical Prosperity Week sales of any goods they sell during the campaign and on until Christmas. They can feature their sales as Electrical Prosperity Week sales, or just prosperity sales. Possibly some of the merchants would not care to boost electricity too much.

Urge them to advertise in their local newspapers, and others. Advertise the fact that they use electricity for light, cash carrier systems, delivery, elevators and many other purposes.

Urge the merchants to light up during the celebration. Show them how unusual lighting of their stores at this time of year will help them to "cash-in" on their Christmas trade. The effect of the exterior illumination can be demonstrated by taking photographs of the store fronts, perforating them with pin pricks at the points where lights are to be installed and holding them up to the light.

One big city will install arches at each downtown corner. Advertisements for electric signs will be placed upon them.

If you have been contemplating starting a slogan sign or whiteway movement, Electrical Prosperity Week presents an opportune time when everybody will be thinking, talking and reading of electricity.

You should by all means light up the front end of your buildings with festoons, or other illuminating features, also some of the streets, if possible, and get the people awakened to what it is all about and why they should buy electrical goods for Christmas.

Bring out a special edition of your house organ, for the week, and induce other publications to do the same. The Society for Electrical Development is prepared to furnish a special matrix of the Electrical Prosperity Week design for the entire full page, or any section. It is also prepared to furnish interesting reading material regarding electricity and what it will do in different lines of business, in the homes and for the general pursuits of mankind. It will furnish long articles and short articles and make the whole thing of interest to the readers. This will be matter regarding your business which is bound to aid you in your sales campaign.

The advertising the papers will receive from not only electrical interests but other interests, will assure them a profit. Possibly only one paper should be used for an Electrical Prosperity Week edition. This rests with the local interests.

In Louisville, Ky., and Cincinnati, the newspapers will run a so-called "streamer head" across their first page reading "Electrical Prosperity Week, November 29 to December 4." You can impress the newspaper men with this fact, that here is a good chance for them to print an Electrical Prosperity Week edition or section of their paper, about November 28, which is the Sunday before the week begins. If your week begins on Saturday they might print it the Sunday before or in the middle of the week.

Do your part toward the holding of an electrical show in your town. Whether large or small, this feature cannot fail to interest the public and to make enthusiastic prospects out of many people who were formerly indifferent to electricity and its advantages.

Establish a "House Electrical" somewhere in your town. Secure the use of a vacant house on a good street. Put out some banners reading "Call at the House Electrical." Advertise it in the newspapers. Install some home electrical equipment. Furniture for two or three of the rooms or the entire house if necessary, could probably be borrowed from the local electric stores providing proper credit were given to them.

The affair could be in charge of two or three ladies and gentlemen representing the electrical interests. Demonstrations of electrical goods could be given and cards passed out showing where they could be purchased, if not on sale at the house. Banners could be put on the street cars reading "This car to the House Electrical." Some of the week's lithographs could be placed about the house to tie up the advertising campaign. A visitors' register could be maintained, so that each visitor who registered his or her name opposite a number in a book would be given a chance on some useful electric appliance. This is always a good stunt for such a campaign.

Another profitable feature which can be inaugurated during Electrical Prosperity Week will be the holding of a prize essay contest for the participation of the school children. These essays should be written upon "Electricity, the Builder of Efficiency" or a similar subject. This feature will arouse wide-spread interest in the event among all classes.

Induce the sign manufacturers and other electrical interests to co-operate with you in conducting a campaign for a slogan sign to be paid for by popular subscription. You will benefit by furnishing current for the sign. A good electric slogan sign gives any town individuality and advertising, the equal of which can not be obtained with a like expenditure in any other direction.

Electrical Prosperity Week will give an unprecedented opportunity to institute a wiring campaign that cannot fail to greatly increase the present and future business. Some cities will conduct wiring campaigns in which spe-

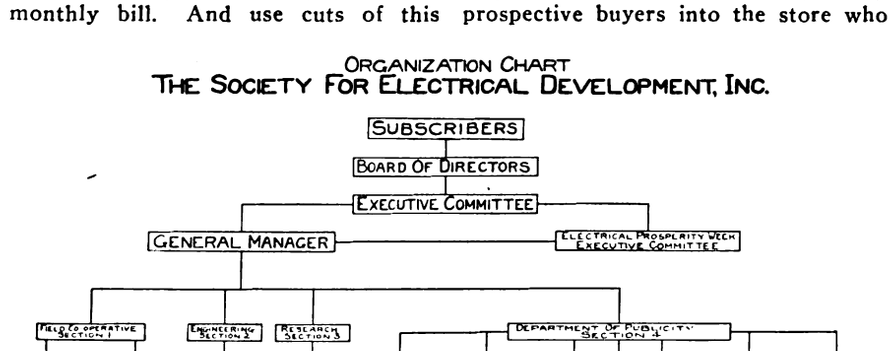
Digitized by Google

cial prices will be offered during the week as an inducement for the public to issue their orders at that time. Dealers and contractors can be induced to co-operate in the movement on a commission basis or by other satisfactory arrangements. That this feature is likely to pay, is shown by the fact that a number of representative central-station companies have already developed plans to carry out this feature.

Make liberal use of all the Electrical Prosperity Week co-operative helps provided by the Society for Electrical Development.

Do not hesitate to employ every form of advertising to spread the news of the week, and to give the week and its purposes the widest publicity. Make sure that the design for the week is present on every piece of printed matter you put out, whether it be a letterhead, envelope, billhead, or your monthly bill. And use cuts of this design in all your newspaper advertising.

ORGANIZATION CHART
THE SOCIETY FOR ELECTRICAL DEVELOPMENT, INC.



Organization Chart of Society for Electrical Development.

Hold an informal dinner and invite the architects, builders, contractors, and real estate men of the community. Provide good speakers to show them how they will profit by extending the use of electrical service in their locality.

A splendid feature for Electrical Prosperity Week would be an electrical parade, which can best be conducted under your auspices, or at least with your help. A "How-to" booklet has been issued on this subject.

If you have any window space available, make a display of electrical appliances suitable for Christmas gifts. If you sell appliances, conduct some kind of a special sale; a sale that means real benefit to all purchasers—but not necessarily a cut-price sale. If you do not sell appliances, make a display with comparative charts showing the way in which the cost of electricity has fallen, while the cost of other necessities has increased.

Electrical Dealers.

Display and demonstrate, during the week as never before. Outdo anything you have ever before attempted in your window-displays. The show window is a silent salesman. Its effectiveness is determined, as in the personal representative, by appearance, punch, arguments, and appeal. It has been unquestionably proved that quicker results can be obtained from window displays than from any other form of advertising. The articles shown in the windows are the material embodiment of the descriptions set forth in the advertising.

The show window is constantly on the watch with its never-tiring appeal. It is as efficient and attractive late at night as it is in the morning. It is a worker always on duty.

At night during Electrical Prosperity Week all windows should be brightly illuminated. Light of an unusual character attracts the eye. This feature may be the means of drawing many prospective buyers into the store who otherwise would pass it by. Color effects can be used to advantage in this connection. They will make it possible to cause various windows to stand out from those of neighboring establishments by contrast.

Use the lithographs and muslin signs, containing the announcement of the week, plentifully about your store and on your delivery vans. Stamp your packages with the poster stamps made especially for the event. Print the "Goddess Electra" emblem on your stationery. All of this material including electrotypes for printing can be had from the Society for Electrical Development at New York.

Co-operate with the central station in establishing a "House Electrical" and in putting on an electrical parade. It all means publicity and increased business for you.

Illuminate your store front. Prove to the public that you are thoroughly abreast of the times. People prefer to patronize the live merchants. Attention will be drawn to an attractive store front for a considerable distance away.

Offer to loan to a hotel or restaurant, various electrical cooking appliances, such as percolators, chafing-dishes, etc., which could be used on the table. These appliances would interest the guests and cause favorable comment. Get permission to hang a couple of lithographs or window cards in the lobby or hall. Have your name printed on every piece of advertising matter used.

Call up people you think would be interested in visiting your store during the week, and invite them to a special electrical luncheon. Try to find out in advance what they are particularly interested in, and have them come the day on which you are going to demonstrate these articles. Give an electric toy, a flashlight or something to the children, if a purchase of a certain amount is made. Advertise this boldly. It will bring the mothers into your store.

Have plenty of manufacturers' literature on hand for distribution during the week. A good way would be to distribute the literature according to daily demonstrations made, or in combination with the window-display.

Stamp on the inside cover of each booklet, a number, duplicating this number in a register, with space where name and address can be written. Run these numbers from zero to any number you wish. Advertise in advance of the week, by having circulars distributed by hand, that a number will be given out to all visitors at your store, which will entitle the holder to a chance on several prizes, exhibited in your store's display-window. The recipient of the booklet writes his name in the register opposite his number. The prize should not be given for several weeks after the event, the chief requirement to receive the prize being that the booklet containing the number be surrendered to the store at the time when the prize is given.

This expedient will not only prove highly valuable from the added attention the booklet will receive, but you will derive considerable free publicity not obtainable in any other way.

Have an "Odds and Ends" sale Saturday night. Many thrifty housewives will take advantage of this sale. All will be future customers.

Electrical Contractors.

Make the week a period of special efforts for contracts, preferably on a regular basis of prices. Some contractors will, however, advertise in the local papers both before and during the celebration that all contracts entered during the week will receive the benefit of a liberal discount.

Secure the names of the various manufacturers, large and small, in your vicinity, who are not using electric power. Send them a circular letter, or better still, a personal repre-

Digitized by Google

sentative, stating your reduced prices and giving them strong reasons why they should use motors.

The suggestion which has already been given to the central station upon the conducting of a wiring campaign applies with equal force to the contractor. If the central station puts on such a campaign, co-operate with them. If they do not engage in this feature, institute it yourself. Make a note of all the unwired buildings in town and then by letter, or personal call, let the owners know of your special rates for the week. Also make the project known to the builders and architects. Let everyone in town know that you are giving bargains during Electrical Prosperity Week that cannot be secured at any other time.

It has been found that with one or two rooms wired first, the owner wants the entire house wired in a very short time. A canvass should be made simultaneously with the newspaper advertising. Districts should be mapped out for the canvassers which should be covered in detail, until every section of the city has been covered. In some cities a premium has been offered to those who responded—a percolator, an electric iron or something of the kind. This special premium offer brings into line that class of people who are always looking for a "bargain."

Send your men to give illustrated lectures before various organizations. Show them the best methods of wiring homes and other buildings—where to locate the outlets to obtain the best results—the proper types and sizes of lamps to use for various purposes. Give illustrations of model installations. Distribute booklets on the subject. Show to the public most conclusively that electricity is not a luxury, but a willing, reliable and efficient 24-hour servant every day in the year.

Manufacturers and Jobbers.

Much of what has been said of co-operative plans for the central station and dealer will apply to the manufacturer and jobber.

Send forth your sales force to impress active co-operation in the event upon all with whom they come in contact.

Get out special bulletins, placards, banners and other advertising material which will feature the week, and send it to your dealers.

If you make appliances or fixtures for home use, induce women's clubs to hold meetings during the week. Have your representative there to give illustrated lectures and practical demonstrations. An electrically-prepared luncheon will go far toward interesting the housewives in electrical appliances and in attracting their good will toward your products.

General Co-Operation.

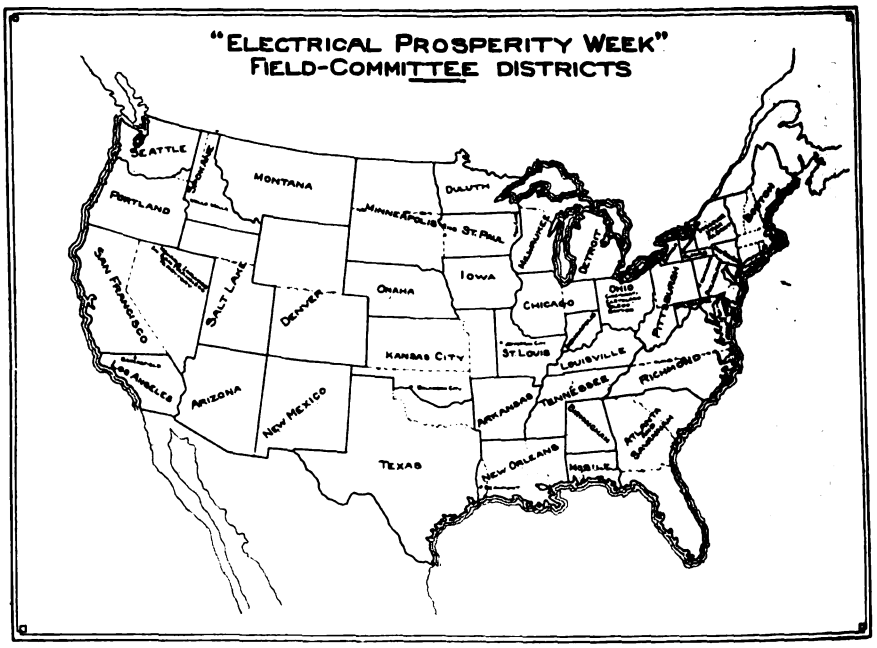
This campaign can be made profitable for every person in the country. It is the first time in history that an industry has got behind such a wonderful trade movement. The publicity that has been given to Electrical Prosperity Week will, in any event, awaken interest in electricity as never before. Every electrical man should assist in extending the scope of the campaign to take in the entire country and the people outside of the industry.

The public should be shown that electricity is safe, that it caused less than 1 per cent of the fires in Louisville, Cincinnati, and other cities last year, and only 3 per cent in New York City. They should learn how electricity is really "safety first" in the home, and that the home that "does it electrically" is better, more modern and more comfortable.

The Society for Electrical Development and the state committees are willing to do their share to help everyone to "cash-in" on Electrical Prosperity Week.

The billboard campaign that the society is putting on should be particularly effective in every city. The posters provided are eight-sheets (8 feet, 10 inches high by 6 feet, 8 inches wide) that can be used singly or be made up into 16 or 24 sheets. They present the "Goddess Electra" emblem of the big celebration, attractively lithographed in six colors. At the bottom is left a space for the name of the electrical firms making use of the posters. The posters will be placed on the most prominent billboards and will be displayed during the time when numerous other means are being used to promote electricity, and Electrical Prosperity Week. The use of these broadsides will therefore be of timely advantage to every central station and merchant.

The rallying of the electrical interests, in ever increasing numbers, in every branch of the industry, all over the country, makes it more and more apparent that this celebration will not only be unprecedented in the history of sales movements, but will be the most successful. A story of Electrical Prosperity Week, however brief, would be incomplete without tribute being paid to the Society for Electrical Development, Inc. The annals of industry offer no illustration of such amazing, co-operative effort on behalf of every branch and every individual within its field. A model association of leading representatives of various branches, the society has inspired the entire industry with new ambitions, new zeal, new ideas and a determination to make the twentieth century an electrical era to the minutest phase of daily doing.



Division of Country into Field Districts for Efficient Handling of Work.

To show to the public the possibilities of electricity, the Society for Electrical Development, Inc., was formed. Its name is significant of its object. It was born of the industry and to its welfare it is dedicated.

Its object is to diffuse knowledge of electrical matters among the people so that they may appreciate the numerous advantages of complete electric service—and use it.

Its mission is to develop the industry as a whole. It is maintained, governed and operated by the interests it represents—the central stations, dealers, contractors, jobbers and manufacturers.

Its headquarters are in New York.

Digitized by Google

but this does not make it an eastern institution. Its directors reside and do business in all parts of the United States and Canada. Its staff of employees know America in its entirety. They are at home in San Diego, Cal., and in Eastport, Me., in Key West and in Seattle. They have studied at first hand the sales problems of each state and are giving the members the benefit.

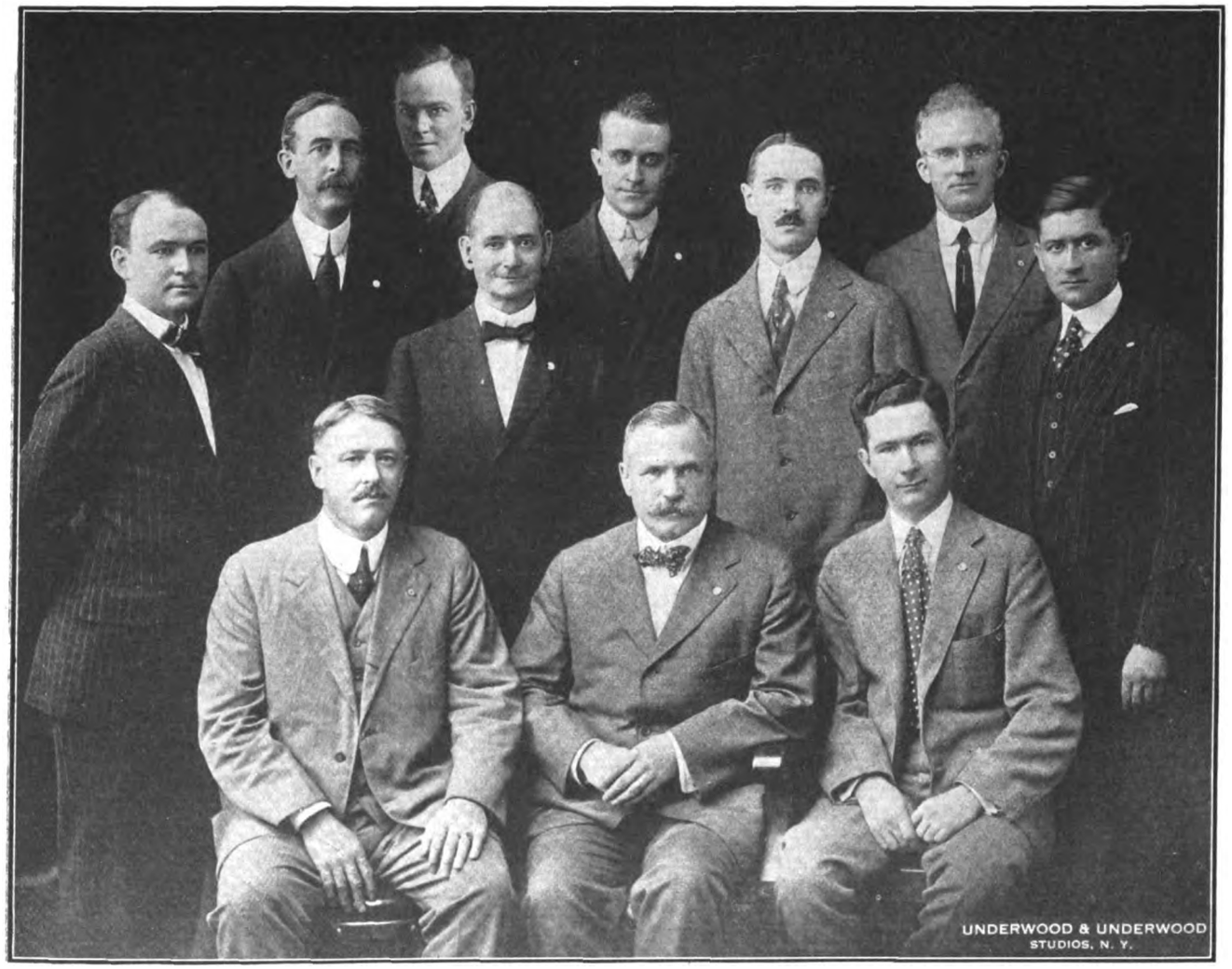
Electrical Prosperity Week was conceived and is being directed by the society.

material for over forty of these pages. They contain news of electrical progress, household hints and anecdotes well illustrated and written in a style to be understood by the lay reader. Catchy cartoons add to the interest of the page. Advertising furnished by the electrical interests, pays the publishers for carrying the page.

Motion pictures constitute another medium that the society has employed to good advantage in spreading its gospel. It is estimated that over 35,000,000 people have witnessed film

problems. People from all walks of life thus see electricity at work and receive the appeal.

Merchandising constitutes a strong arm of the society's work. An extensive display bureau is maintained which supplies to members a regular service, consisting of illustrated designs for window displays, instructions in sign lettering, methods of selling, suggestions for electrical show exhibits and answers to all inquiries by the members on general merchandising. Its book entitled "101 Successful Sell-



A Portion of the Staff of the Society for Electrical Development.
Left to right, upper row: John Tyrone Kelly, Theodore Dwight, A. J. Edgell, James Smieton, Jr., William W. Ayres, John A. Randolph, C. Ridderhof, John J. Reardon.
Left to right, lower row: James P. Mallett, James M. Wakeman, H. W. Alexander.

Activities That Have Brought Results.

Publicity is the spice of merchandising. The society through its many mediums for bringing electricity and its advantages before the public, has directly or indirectly been influential in effecting the sale and use of many electrical appliances. Through its electrical page mat service, it has reached millions of people, with an appeal for increased efficiency and economy through electrical service. It is now supplying reading matter and dramas produced with the aid of the society. One department of its organization is devoted exclusively to this feature. Five films are now appearing in hundreds of theaters throughout the country. They are respectively entitled: "Let There Be Light," "This Is The Life," "The Tightwad," "The Modern Rip Van Winkle," and "The Newer Way."

They depict stories of intense dramatic interest woven around scenes and incidents wherein electrical appliances are made to solve crucial

ing Suggestions," has become popular with salesmen wherever it has been sent. It contains the best of hundreds of plans which have been tried out by actual service and found successful. The suggestions were sent in from all over the country by commercial men, in response to a general request.

The society maintains a field staff of representatives who devote a large part of their time to lecturing before various leagues, clubs and organizations upon the advantages of electricity.

Digitized by Google

The society's household economy department has furnished upon request many illustrated electrical articles for the women's pages in popular magazines. It has aided housewives' leagues in the preparation of demonstrations on electrical cookery and general domestic uses of electrical appliances.

The trade-press bureau has reached the manufacturers and tradesmen through articles setting forth the advantages of electric power and light in commercial and industrial establishments.

Advertising as a help for the industry has not been overlooked by the society. An advertising bureau is maintained where members can secure free advice on the preparation of their advertising copy—how best to conduct the publicity for sales campaigns, to prepare booklets, price lists, and circular letters. This department has rendered much valuable assistance in this direction.

The foregoing are only a few of the many services which the society is rendering to the electrical industry, in its continuous work of instruction and publicity.

Organization.

The society had its inception in October, 1912, when a number of the foremost men of the industry—live wires with records of achievemnt—met in New York and decided to form an organization by which the many units of the electrical industry could join hands in a co-operative propaganda of electrical publicity and instruction which would bring electricity more closely to the lay public. They gave the slogan "Do It Electrically" to the society and set it up in business at the Engineering Socities Building in New York City.

Although it has not been long in existence, the excellence of its organization and the competence of its staff are winning it a place as one of the most potential business welfare factors the electrical industry has ever known.

Officers and Staff.

The official personnel is composed of the following well known men:

Henry L. Doherty, president.
W. H. Johnson, vice-president.
A. W. Burchard, vice-president.
W. E. Robertson, vice-president.
J. Robert Crouse, vice-president.
Ernest Freeman, vice-president.
J. M. Wakeman, general manager.
J. Smieton, secretary-treasurer.

In addition to the officers, the society has on its staff some of the foremost sales, publicity and engineering experts in the country.

J. M. Wakeman, the general manager, is one of the best known men in the electrical industry. Some of the many positions which have formed a part of his broad experience are: former president of American Trade Press Association; former vice-president and general manager, McGraw Publishing Company. He has taken a leading part in practically every movement for the welfare of the electrical industry for years.

H. W. Alexander, the director of publicity, was formerly the general sales manager of the Federal Light & Traction Company. He has also been prominently identified at various times with leading newspapers, having been at one time on the editorial staff of the *Chicago Inter Ocean.* He is a specialist in national business getting campaigns and a writer of note on public-utility problems.

George B. Muldaur, manager, Field Co-Operation Bureau, is an experienced electrical engineer and lecturer. Mr. Muldaur and his assistants have visited every city of 100,000 population or over in the United States and many smaller cities, addressing public meetings on the work of this society.

Theodore Dwight who has charge of the Commercial Section was former assistant to vice-president and general manager of General Electric Company; former assistant secretary and treasurer of American Institute of Mining Engineers and later director of the Institute for several terms; trustee, United Engineering Society; member, leading electric, mining and engineering societies.

J. P. Mallett, of the Engineering Division, was former chief engineer, Northern Electrical Manufacturing Company; former engineering chief, Diehl Manufacturing Company; six years in the engineering department of the Westinghouse Electric & Manufacturing Company. He is a leading engineer in industrial investigation and research work.

J. T. Kelly, who has charge of the News Bureau, was prior to his present position, the eastern publicity manager of the Panama-Pacific International Exposition. He has had 15 years of successful experience at newspaper work, some of his former connections having been with the *New York Evening World*, the *Buffalo Courier*, *St. Louis Republic* and the *Washington Post.*

C. Ridderhof, manager of the Advertising Department was formerly manager, Advertising Department, Hotpoint Electric Heating Company; former assistant manager, Western Gas Engine Corporation; former manager, Wilmarth & Morman Company. He has conducted many profitable advertising campaigns and is a widely recognized sales specialist.

A. J. Edgell, manager, Display Service Bureau, is president of the International Association of Display Men; president, Greater New York Display Men's Association. He was the winner of the first prize of $1,000 offered by the Rice Leaders of World Association in a competition on a best sales program. He is an authority and writer on window displays.

John A. Randolph, trade press editor, was formerly power engineer of the New York Edison Company. He is a widely recognized authority on technical electrical articles.

Miss Grace T. Hadley is in charge of the Household Efficiency Department. She was formerly connected with the editorial staff of *Popular Electricity.* She has made a careful study of the application of electrical appliances to the home. The many articles, which she has contributed to various women's magazines throughout the country, have given her a reputation as an expert in her line.

John J. Reardon, assistant news bureau, was former assistant Sunday editor *New York Herald.* He is a newspaper writer of wide note.

William W. Ayers, advertising department, was former assistant, Agricultural Promotion Department, Long Island Railroad.

George W. Hill, assistant field cooperator, was formerly one of the Sales Division Heads of the Westinghouse Lamp Company. He is well known in lamp circles.

H. W. Matthew, Pacific Coast representative of the society, is the Coast representative of the McGraw publications. He is widely known among central-station men, manufacturers and dealers.

Electrical Prosperity Week Plans In Different Cities.

In all parts of the country, plans for cashing-in on Electrical Prosperity Week have been developed. Armies of workmen throughout the nation are actively engaged upon the construction features, while hundreds of committees and executives are giving the final touch to arrangements which will enable the event to measure up to expectations.

Brooklyn, N. Y., is to have an electrical show. Another feature will be a far-reaching house-wiring campaign conducted by the Edison Electric Illuminating Company of Brooklyn in conjunction with the contractors, a special discount in prices being given on all contracts written up during the week. Electrical dealers will co-operate by window displays designed especially for the week. The public interest in the celebration will be further intensified by illumination of prominent buildings and arches.

In Philadelphia, the electrical interests will conduct a wiring campaign in which a discount of $1.00 per outlet will

Digitized by Google

be allowed on the wiring of all ready-built dwellings and stores. The Philadelphia Electric Company will hold special appliance exhibit and demonstrations including special window displays and exterior decorations. Special advertising giving publicity to Electrical Prosperity Week and to electricity in general will be conducted in the street cars. The newspaper advertising of the electrical interests will also be greatly increased.

Plans are also under way in Philadelphia to construct four allegorical, electrically lighted floats to parade in various sections of the city on different nights during the week. One float will be devoted to general lamp illumination, another will depict allegorically electric power, a third will be devoted to a general figurative display of illumination. The fourth float, with the assistance of a trailer, will give moving picture demonstrations of domestic applications of electricity.

Big plans for participation in the celebration are now under active consideration by the electrical men of Buffalo. The intense enthusiasm which has been shown in the various meetings held to discuss the proposition, would seem to indicate that this enterprising city will be on the cash-in line when the week transpires.

Milwaukee is to have various demonstration and display features of a highly interesting and instructive nature. The celebration will be extensively featured in newspaper and bill-board advertising. One of the many features will comprise a large construction car of the railway company which will be specially decorated and kept on the streets every day during the week. Another feature will consist of special film exhibitions which will be conducted at the motion picture houses.

In Cincinnati it is planned to light all the large office buildings from 7:30 to 9:30 every night of Electrical Prosperity Week. An electrical show will also be held in which most of the electrical interests of that locality will participate.

It is announced by the Denver Gas & Electric Company that a grand celebration will be held in Denver, the climax being a prosperity show to be held on the last four days of the week, under the auspices of the Colorado Electric Club. An electric automobile parade is also contemplated. Various spectacular features are under construction which are likely to draw crowds to the electrical show and the features offered in the vicinity thereof. Some of the features planned consist of: the operation on a miniature scale, by wireless, of the maneuvers of a battleship; a facsimile of a submarine; an aerial or Zeppelin battle; and various high-frequency electrical discharge features.

Among the foremost boosters for Electrical Prosperity Week are the electrical interests of Salt Lake City. Flood lighting of the Capitol in Salt Lake City is the feature of a series of novel illuminations arranged by Utah's committee. During the week searchlights will play about the city and mountains. In its comprehensive program reported by Secretary A. R. Loughborough, of the Western Electric Company, the committee includes an Electric Show; lighting of all office buildings; an electric vehicle endurance run; guessing contests on the amount of candlepower in some unusual lighting display; demonstrations in the University of Utah and in Domestic Science Department of the Agricultural College of Utah.

Even the corner stone of Salt Lake City's new "White Way" will be laid during the week. It has arranged for motion-picture reels for all Utah's theaters for the week. It has decided its "drive" will be: "Make your Christmas present an electrical one." Utah aims to get people on the street at night at well as during the day.

The Louisville Gas & Electric Company reports that an amusement company has been formed to hold a festival at the armory in that city, under the auspices of the Jovians. The electrical interests will cash-in on the festival by maintaining attractive exhibits, these, featuring things electrical. An electrical parade will also be held of which a large number of electric vehicles of various types will form a prominent part. The local organization of boy scouts will march in the parade, each boy carrying an electric lantern.

Thus far definite plans have been formulated for holding electrical shows in over 22 leading cities of the United States. Many others have this feature under serious consideration.

Mayors of numerous cities together with many civic organizations have enthusiastically endorsed the week and are actively engaged upon carrying out various plans for its support.

Electrical interests throughout the entire nation are very enthusiastic over the celebration. It therefore seems certain that the event will surpass all trade movements ever conducted heretofore and that it will prove highly creditable to the electrical industry.

Prosperity Week In Louisville.

An electrical festival and bazaar at the Armory in Louisville, Ky., will be the center of Electrical Prosperity Week in Louisville. Here will be a complete display of all manner of electrical appliances, etc., and an amusement feature which will be designed to carry out the idea of prosperity. This will be on the order of a carnival which will work out the detailed plans of the Louisville Jovians. Electrical features will be made as much of as possible. Admission to the "Midway" section, where a professional company will have some 30 separate shows, will be by way of a box office where for $1 the visitor will be issued $100,000 in phoney money. A nickel in real money will be represented by $5,000 in the paper currency and it will take $10,000 to get into any concession. The idea is that people who attend will talk in terms of great wealth, "I spent $200,000 at the Armory last night," for instance. On one night a robbery of the midway bank will be staged and the robbers will get some $15,000,000. Admission to the Armory will be 10 cents. The Louisville Gas & Electric Company will distribute tickets to all its customers, the contractors and appliance dealers, etc. Friday night of this week will see the electrical parade in which every electrically propelled vehicle in the city will be pressed into service, as far as possible. The local Jovian League has named some ten committees, one to supervise the amusements at the Armory, one the appliance display, one to prepare for the parade, one to supervise decoration of the city, festoon lights being already provided for, one to induce the local merchants and commercial interests to put electrical matters to the front, one to work with the motion-picture theaters to emphasize prosperity and electricity and to use special slides.

Prosperity Week Committeemen Meet at Boston.

Plans for the observance of Electrical Prosperity Week in New England were discussed at a meeting of about 50 members of committees for as many cities at the Engineers' Club, Boston, October 21. The meeting was called by W. H. Atkins, of the Boston Edison Company, in the absence of Chairman Charles L. Edgar, of the New England Committee-at-Large.

Mr. Atkinson presided and outlined the method of organization. There are 60 committees actively working for the success of the Week, in their respective centers.

J. M. Wakeman, general manager of the Society for Electrical Development, presented some new projects in connection with the celebration. The flood lighting of public buildings in various New England cities will be a feature. Authorities are being induced to have temporary white way lighting installed, and local merchants will make special efforts to bring the electric idea to the front.

The word "Prosperity" has caught on, said Mr. Wakeman, especially with the newspapers, who see in it a good omen for industrial activity in general. Up to the present time more than $300,-

Digitized by Google

000 worth of reading notice has been given freely by the daily press. This is more publicity than has been given to any campaign except a presidential election.

The speaker held that the central station is the most important single factor in the upbuilding of every city, especially where there is a diversity of industries. It is in a peculiarly advantageous position to boost community growth. Opportunity is at hand to organize and reap large returns from stimulated uses of electricity.

L. D. Gibbs, superintendent of advertising for the Edison Company, of Boston, said that that company would fully utilize the punch and pull of the national movement. About 4,000 placards have been put in street cars, 500 7-by-10-foot posters have been displayed on billboards, 100,000 leaflets are to be distributed with lamp renewals, and 150 contractors in the 42 cities and towns of Edison territory will be supplied with the leaflets, through the company.

Each town and city will probably floodlight some public building or block. An exhibition by the Rotary Club at Horticultural Hall, Boston, November 16-20, will include booths of the Edison Company and of prominent jobbers. Half-page advertisements featuring the two-cent cooking rate put in force October 1, are being displayed in theater programs.

Mr. Gibbs pointed out the advantage of having advertising of a uniform appearance, thus making trip-hammer blows on the public mind.

Preceding the meeting the committee members were guests of the Boston Edison Company at luncheon.

Dayton Jovians Celebrate Opening of New Hotel.

The recent opening of Dayton's official Jovian hotel, the "Miami," was celebrated in a proper manner on Monday evening, October 25, when 150 Dayton Jovians sat down to a banquet in the ball room of this new million-dollar hotel.

Following the dinner there was a very interesting program, in which S. G. McMeen, the president of the Chio State Telephone Company, of Columbus, Ohio, was the principal speaker, his subject being "Telephones." Thomas A. Wynne, the vice-president and general manager of the Indianapolis Light & Heat Company, and the new Reigning Jupiter of the Jovian Order, also spoke, his subject being "Organization." This was Reigning Jupiter Wynne's first public appearance since being elected the fourteenth Jupiter of the Jovian Order. Mr. Wynne was followed by Thomas J. Ryan, the president of the Cincinnati Electric Club.

Electrical Exhibit Company Formed in Cincinnati.

Electrical men interested in the coming celebration of Electrical Prosperity Week in Cincinnati have organized a company to handle the exhibits and take care of other details connected with the proposed display at Music Hall. The company is to be known as the Cincinnati Electrical Show Company, and while the initial capital stock is fixed at only $1,000, it is contemplated that it may be expanded to meet requirements. Stock will be sold to the manufacturing and other concerns taking space for exhibits. The company will be a permanent organization, maintained for the purpose of handling future shows of the sort which is planned for the week of November 29. The incorporators are W. W. Freeman, of the Union Gas & Electric Company; J. A. Brett, T. J. Ryan, W. G. Reuter, C. T. Milnor and H. Serkowich.

Prosperity Week Show in Sandusky.

A special committee, with members representing all of the leading electric, public service and civic bodies of Sandusky, O., has been formed to arrange the details of the elaborate electrical display which will be held in connection with the celebration of "Electrical Prosperity Week" in that city. H. H. Squires, representing the electrical contractors, is chairman of the committee. A special trip to Milan, O., the birthplace of Thomas Edison, is planned as an interesting feature of the Sandusky celebration, as the village is only a few miles away.

The Future of California Electric Railways.

At the meeting of the Jovian Electrical League of Southern California, held at Los Angeles on October 21, a paper was read by Paul Shoup, president of the Pacific Electric Railway Company, on the conditions confronting the electric railways of the state.

Mr. Shoup pointed out that the electric railways of the state are not doing well, and gave statements of the operating revenue and expenses for the past three years for 22 electric railways of the state. The net revenue, out of which interest and other fixed charges must be paid, was shown to be greatly diminished in every case, and in several cases there was actually a net deficit. There were only a few roads in the state not included in his synopsis, and figures for these were not available. Many operating expenses have increased, and the railroads have been powerless to prevent such increases. This statement applies to paving maintenance, the operation of safety devices, reconstruction expenses required by local government boards, and taxes. It is also true that most of the interurban lines were not earning all of their fixed charges three years ago, and in the meantime have had to make increased investments in paving and track reconstruction. Many of the railways have not earned sufficient to pay interest on their outstanding debts. In some cases they are in the hands of their creditors, while in others the stockholders are carrying the road along.

The situation is at the present time very serious, and it is as important for the communities served and for those desiring to have service extended to them, as it is to the stockholders and employees of the companies. The causes may be summarized as business depression, the development of the automobile and good roads, franchises which require maintenance of street paving, increased taxes, increased safety precautions, jitneys, etc. Mr. Shoup said there had been no increase in earnings sufficient to justify the increased cost of paving which is frequently required, especially as it is done under a limited-term franchise. He showed that the tendency of taxes was to increase, and at the present they are over five per cent of the gross revenue.

Of the causes that can be controlled by the public the competition of the jitney is the most important. These conveyances take part of the business without taking any of the obligations and responsibilities to the public. Interurban jitneys are not regulated at all. They develop no new territory, but ply only where there is profitable business in single and round trips without taking care of the commuters. It is idle to prove that a jitney is not an economic possibility. It is here just the same.

What is to be done about it? This depends upon the understanding, cooperation and good judgment of the public. If the situation is not changed extensions will cease, service will be curtailed and the weakest branches abandoned. Reductions will be made wherever possible, involving a curtailment of employment on cars, in shops and in new construction. Commutation rates will have to be readjusted.

In conclusion he said that the electric railways have a right to ask that competition by jitneys be asked to take on equal responsibilities and obligations with the railways; that paralleling of existing lines be avoided; that increases in taxation be discontinued; that modifications in paving requirements be made, and that rates be permitted which will provide adequate revenue.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Unique Brooklyn Central-Station Exhibit.

One of the interesting exhibits at the recent New York Electrical Show, at Grand Central Palace, was that of the Edison Electric Illuminating Company, of Brooklyn, where a 100-foot panorama of "Industrial Brooklyn in 1915" was shown. The accompanying illustration gives an idea of the completeness of this exhibit, the models

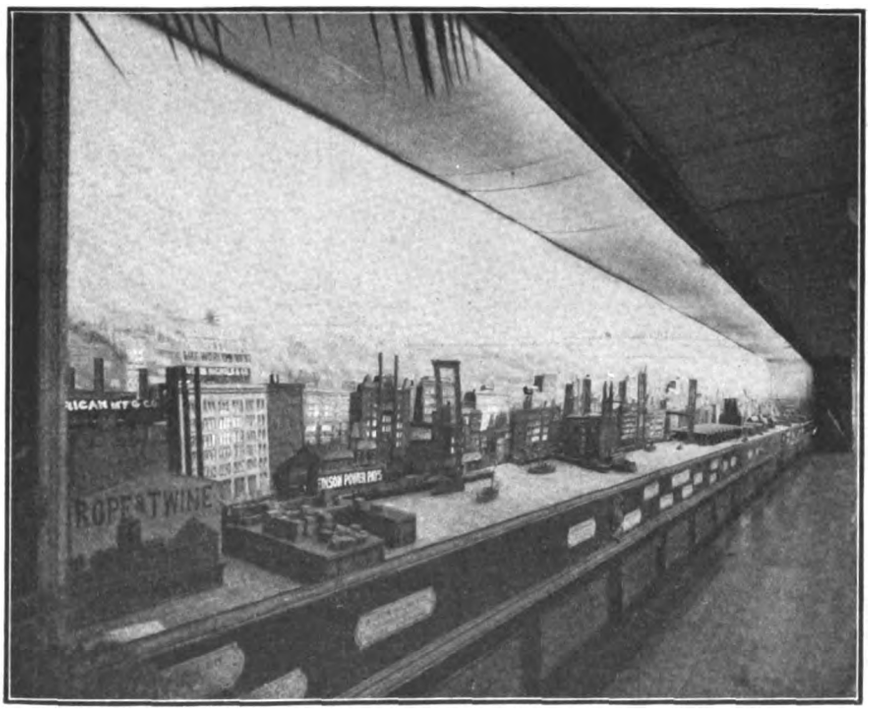


Exhibit of Brooklyn Edison Company.

in the foreground being exact reproductions of the buildings represented. Elaborate electrical and mechanical effects were used, including 900 miniature incandescent lamps used for illuminating the piers, docks, ferry-slips and boats. The lamps are said to be the smallest ever manufactured.

The exhibit attracted much attention and by means of explanatory placards indicated the wide use of central-station service in the important industrial plants of the city.

Giving of Premiums Stimulates House-Wiring Orders.

The increased number of already-built residences wired for electric service during the first ten months of 1915 at Minneapolis indicates the degree of prosperity prevailing in that city. The sales department of the Minneapolis General Electric Company, up to October 1 had taken orders for wiring 1,421 residences, while the independent efforts of the electrical contractors probably produced several times this amount of business. These figures take no account of new residences built during the year, practically all of which are wired, and apartment buildings are classified as single houses. The number of orders taken by the company was a 28 per cent increase over the first ten months of 1914, and double the number of contracts taken in the corresponding period of 1913. Much of the success of this season's efforts is attributed to the giving of electrical appliance premiums to customers of the company who submitted the names of prospects for house wiring and the advertising in connection with the plan. If the company's salesmen were successful in closing orders the customer giving the name of the prospect received a choice of a list of electrical devices, such as flat irons, toasters, table stoves, coffee percolators, etc.

The number of new lighting customers gained by the Minneapolis General Electric Company for the month of October will approximate 1,000, this probably representing a high-water mark in the history of the organization. On October 22 all records for a single day's electrical output were broken by the disposition of 475,100 kilowatt-hours of energy.

City Officials Praise Utility for Good Service.

Under present conditions in the public utility field, with practically all companies earnestly striving to live up to the slogan of "service first," it is not uncommon for customers to write letters of praise regarding the service being rendered. It is, however, rather a rare occurrence for a city official to so express himself.

The Dayton (O.) Power & Light Company is, therefore, particularly proud of two letters recently received from city officials, one from Mayor G. W. Shroyer and one from City Manager H. M. Waite, complimenting the company on the service rendered in two emergencies. The letter from Mayor Schroyer is as follows:

"I wish to thank you very much for the prompt action that you gave on my request, with reference to one of the lamps on the corner of Potomac and McLain Streets, which was complained of by a neighbor, with reference to its not being lighted. In less than an hour after I called the light was burning. This I consider extremely good service."

Mr. Waite wrote in reference to service rendered him as a private customer, as follows:

"May I take this opportunity of congratulating you upon your service, as last night shortly after the storm they called up the house and asked about the lights and when told that they were out a man was on the job and had them in again in ten minutes."

Central-Station Exhibit of Rural Applications.

The Oregon Power Company, in conjunction with the Portland Railway, Light & Power Company and the Pacific Light & Power Company, held an exhibit at the Oregon State Fair at Salem, known as "Electricity on the Farm."

Digitized by Google

Intensive Business Cultivation at Kansas City.

The experience of the Kansas City Electric Light Company, gained in an intensive business campaign, suggests some very interesting possibilities for increasing the use of electricity in homes, as well as increasing the number of users. The company has had three census takers covering the city this summer, calling at each house and ascertaining whether or not electricity is used and if so to what extent. The reports of these men are turned into the sales department, and show the possibilities for wiring houses, selling equipment, and stimulating the use of electricity.

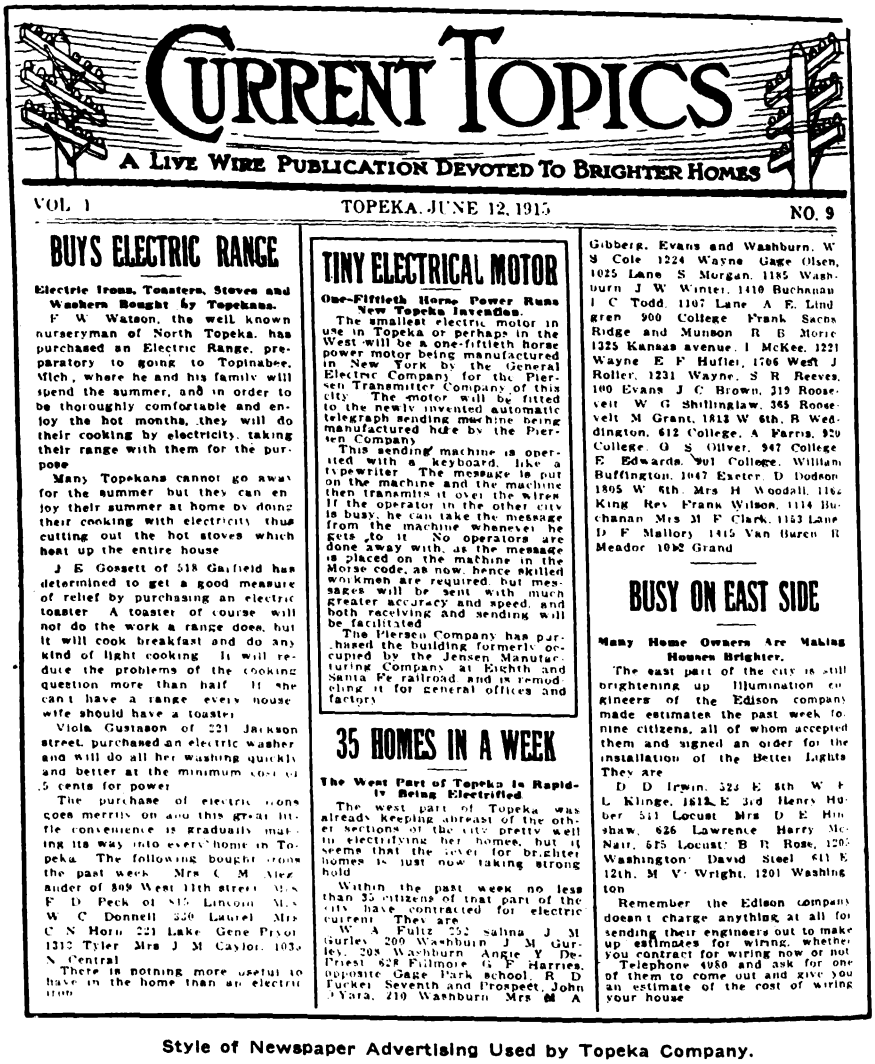
One interesting phase of this work is the possibility opening up for putting the equipment of wired houses into complete use. In many houses one small thing or another is out of order, which interferes with the use of one or more pieces of equipment. In one house, for instance, there may be a switch not working. In another house a part of a fixture may be out of order, which prevents the use of one or more sockets or devices. While the census taker in the Kansas City plan discovers these defects the meter men also are available for making reports on these conditions. The agents of the company who observe defects or learn of them on inquiry, suggest to the customer the name of a repair man in the neighborhood who can replace or repair the equipment. In a few blocks there are usually a dozen or more cases of such repairs, and the names of the householders are given to the men of a shop in the neighborhood. The repair man can visit all these houses on one trip, making the necessary correction at a comparatively small cost to him and to the householder. In most cases it is merely negligence that prevents the repair of the equipment and the greater use of current. By facilitating the making of such repairs or adjustments as are necessary, not only is the use of electricity increased in that house, even though slightly, but the satisfaction of the customer with the service is enhanced.

Galena Plant Makes New Record.

The largest day's output of electrical energy in the history of the Interstate Light & Power Company, Galena, Ill., occurred during the week ending October 15. The disposition for that day was 77,400 kilowatt-hours, and the station load-factor was 65.6 per cent. Manager Rickeman says: "Indications are that the output and load will steadily increase during the next three or four months."

Unique Type of Central-Station Newspaper Advertising.

The Topeka (Kans.) Edison Company has for several months been using its Sunday display space in the newspapers for the publication of a miniature weekly newspaper entitled "Current Topics." In this space, which is three columns wide and 10 inches high, the company has published in the form of news notes and stories the progress in the use of electricity in Topeka, giving explicit notes of new installations, both in homes and factories, and presenting subjects for the further use of electricity by persons not already enjoying the full benefit of their opportunities. The items and articles are brightly written and the generous use of names gives a personal and human-interest touch to the columns that undoubtedly is helping very materially to popularize the public service corporation. Such small items are printed, for instance, as the names of persons who have bought devices, the addresses being published, also the larger installations in the factories. Interesting stories are included on novel electrical installations. In the course of a few months a very large part of the field has been covered. While no direct returns, it is said, are traced to this form of advertising, it is believed by the officers of the company and by other observers, that the method has been of very great service in a general way.



CURRENT TOPICS

A LIVE WIRE PUBLICATION DEVOTED TO BRIGHTER HOMES

VOL. 1 TOPEKA, JUNE 12, 1915 NO. 9

BUYS ELECTRIC RANGE

Electric Irons, Toasters, Stoves and Washers Bought by Topekans.

F W Watson, the well known nurseryman of North Topeka, has purchased an Electric Range, preparatory to going to Topinabee, Mich., where he and his family will spend the summer, and in order to be thoroughly comfortable and enjoy the hot months, they will do their cooking by electricity, taking their range with them for the purpose.

Many Topekans cannot go away for the summer but they can enjoy their summer at home by doing their cooking with electricity, thus cutting out the hot stoves which heat up the entire house.

J E Gossett of 518 Garfield has determined to get a good measure of relief by purchasing an electric toaster. A toaster of course will not do the work a range does, but it will cook breakfast and do any kind of light cooking. It will reduce the problems of the cooking question more than half. If she can't have a range every house wife should have a toaster.

Viola Gustason of 221 Jackson street, purchased an electric washer and will do all her washing quickly and better at the minimum cost of 5 cents for power.

The purchase of electric irons goes merrily on and this great little convenience is gradually making its way into every home in Topeka. The following bought irons the past week: Mrs C M Alexander of 809 West 11th street; Mrs F D Peck of 515 Lincoln; Mrs W C Donnell 550 Laurel; Mrs C N Horn 221 Lake; Gene Pryor 1312 Tyler; Mrs J M Caylor, 1035 N Central.

There is nothing more useful to have in the home than an electric iron.

TINY ELECTRICAL MOTOR

One-Fiftieth Horse Power Runs New Topeka Invention.

The smallest electric motor in use in Topeka or perhaps in the West will be a one-fiftieth horse power motor being manufactured in New York by the General Electric Company for the Pierson Transmitter Company of this city. The motor will be fitted to the newly invented automatic telegraph sending machine being manufactured here by the Pierson Company.

This sending machine is operated with a keyboard, like a typewriter. The message is put on the machine and the machine then transmits it over the wires. If the operator in the other city is busy, he can take the message from the machine whenever he gets to it. No operators are done away with, as the message is placed on the machine in the Morse code, as now, hence skilled workmen are required, but messages will be sent with much greater accuracy and speed, and both receiving and sending will be facilitated.

The Pierson Company has purchased the building formerly occupied by the Jensen Manufacturing Company at Eighth and Santa Fe railroad, and is remodeling it for general offices and factory.

35 HOMES IN A WEEK

The West Part of Topeka Is Rapidly Being Electrified

The west part of Topeka was already keeping abreast of the other sections of the city pretty well in electrifying her homes, but it seems that the fever for brighter homes is just now taking strong hold.

Within the past week no less than 35 citizens of that part of the city have contracted for electric current. They are:

W A Fultz 552 salina; J M Gurley, 200 Washburn; J M Gurley, 208 Washburn; Angie Y Depriest 828 Fillmore; G F Harries, opposite Gage Park school; R D Tucker, Seventh and Prospect; John O'Yara, 210 Washburn; Mrs M A Gibberg, Evans and Washburn; W S Cole 1224 Wayne; Gage Olsen, 1025 Lane; S Morgan, 1185 Washburn; J W Winter, 1410 Buchanan; I C Todd, 1107 Lane; A E Lindgren 900 College; Frank Sachs Ridge and Munson; R B Morris 1225 Kansas avenue; I McKee, 1221 Wayne; E F Hufler, 1706 West J; Roller, 1231 Wayne; S R Reeves, 100 Evans; J C Brown, 319 Roosevelt; W G Shillinglaw, 365 Roosevelt; M Grant, 1813 W 6th; B Weddington, 612 College; A Farris, 920 College; O S Oliver, 947 College; E Edwards, 901 College; William Buffington, 1047 Exeter; D Dodson 1805 W 6th; Mrs H Woodall, 1164 King; Rev Frank Wilson, 1114 Buchanan; Mrs M F Clark, 1153 Lane; D F Mallory 1415 Van Buren; R Meador 1052 Grand.

BUSY ON EAST SIDE

Many Home Owners Are Making Houses Brighter.

The east part of the city is still brightening up. Illumination engineers of the Edison company made estimates the past week for nine citizens, all of whom accepted them and signed an order for the installation of the Better Lights. They are:

D D Irwin, 525 E 6th; W F L Klinge, 1815 E 3rd; Henry Huber 511 Locust; Mrs D E Hinshaw, 626 Lawrence; Harry McNair, 675 Locust; B R Rose, 1205 Washington; David Steel 611 E 12th; M V Wright, 1201 Washington.

Remember the Edison company doesn't charge anything at all for sending their engineers out to make up estimates for wiring, whether you contract for wiring now or not. Telephone 4080 and ask for one of them to come out and give you an estimate of the cost of wiring your house.

Style of Newspaper Advertising Used by Topeka Company.

Electric Cooking Campaign in Scranton.

On October 28 the Scranton Electric Company, of Scranton, Pa., inaugurated an electric cooking campaign using Globe electric ranges manufactured by the Globe Stove & Range Company, Kokomo, Ind. These ranges made most favorable impressions on all visitors to the company's show-room. The pushing of these Globe electrics, in connection with the three-cent cooking rate in use in Scranton, is looked upon by the Electric Company as a favorable business transaction.

Electric Delivery Company for Chicago.

The Union Motor Transfer Company, of Chicago, has recently been incorporated to do a general delivery and haulage business in that city. Electric vehicles will be used exclusively.

Digitized by Google

House-Wiring Campaign Successful in Lynn.

The Lynn (Mass.) Gas & Electric Company is conducting a successful house-wiring campaign, securing the contracts from house owners and, if desired, financing the cost of the installation, the owner paying the company in twelve monthly installments.

The business is distributed among the contractors of the city, the prices charged for installation being reckoned on the basis of outlets plus the introduction of service into the building.

There are two forms of contract, one covering an agreement between the owner and contractor direct, and the other a three-party contract under which the central station agrees to pay the contractor for the work, the owner to repay the amount to the company.

LOCATION	¢	Ct.	PRICE	Fixtures	TOTAL
Service	$11.00				
Cellar. Outlet, Switch	5.50				
Piazza. Outlet, Switch	7.75				
Hall. Outlet, Switch	7.75				
Parlor. Outlet, Switch	7.75				
Dining Rm. Outlet, Switch	7.75				
Kitchen Outlet	3.25				
Pantry Outlet	3.25				
China Closet Outlet	3.25				
Back Hall Outlet	3.25				
2d Hall Outlet	3.25				
Bath. Outlet and Switch	7.75				
Chamber	3.25				
Chamber	3.25				
Chamber	3.25				
Chamber	3.25				
Other Outlets	3.25				
Outlets on 1st Floor with Flush Plug Receptacle	4.50				
Extra Switches	1.50				
Three-way Switches	6.75				
For each additional floor above the first floor add to 1	4.50				
Special Wiring					
Bryant Heater Control. Comb. No. 437	4.50				
Allowance for Switches	3.25				
FIXTURES					
Hall	2.00				
Piazza	1.00				
Parlor	4.50				
Kitchen and Pantry	1.35				
Bath Room	1.40				
Dining Room	5.00				
Bed Room Brackets	1.40				

House-Wiring Price List Used in Lynn Campaign.

A price schedule is established for service, switches and outlets, in accordance with the estimate blank herewith reproduced. Fixtures are supplied at prices advertised in a catalog showing styles and types of glass, etc.

Fixtures installed in connection with the offer are: Opal ball for porch, single-lamp shower for hall, three-light brass link fixture for parlor, side bracket for bathroom or bedroom, three-light pendent chain chandelier for dining room.

Three-way switches are recommended for the halls, and a buzzer switch for the head of cellar or foot of attic stairs. The usefulness of wall or baseboard receptacles, for the attachment of portable lamps, vacuum cleaners, vibrators, toasters, percolators, washing machines and other domestic appliances, is pointed out.

Though the Lynn company is a combination gas and electric company, the circulars issued specifically state that with the use of the new Mazda lamps the cost of electric light is only about one-third of its former price, "making it the cheapest form of illumination."

Kansas City Company Sells Many Appliances During Ten-Day Show.

The fall festival electric of the Kansas City Electric Light Company was particularly successful this year in point of business produced. Miss Marie J. Russell, manager of the Electric Shop, reports that there were ten thousand visitors during the ten days; and that an unusually large proportion of them were purchasers and probable purchasers of electrical equipment. The connected load added during the ten days exceeded that of any other month during the year, except that in which the recent iron sale was conducted. The amount of goods sold was twice that of any ordinary month's business, and included nearly everything from a percolator to a washing machine. Electric grills were especially popular. Despite the big iron sale in June, more than 500 irons were sold during the ten days.

Portion of Exhibit Space of Kansas City Electric Light Company During Show.

United Company Holds Annual Booster Sales Meeting.

With the completion of the 201st Street generating station of The United Electric Light & Power Company, located at 201st Street, Sherman Creek and the Harlem River, New York, the company began an intensive campaign for new business. The sales department was considerably augmented and the work of increasing the connected load continued with energy.

Two years ago Joseph F. Becker, sales manager for the company, inaugurated what he termed a "Booster" meeting at which the entire sales force together with the heads of other departments interested in the promotion work and the officials of the company, were gathered, for the purpose of starting the new-business campaign with enthusiasm and to bring to the attention of the salesmen the details of the new generating and distributing facilities of the company.

On Saturday evening, October 23, the third meeting of this kind was held, it having now become an annual feature of the sales department's activities. At this meeting some one hundred employees were present, including the entire sales force, several heads of departments and the officials of the company, as well as John W. Lieb, the vice-president of the New York Edison Company and a director of the United company.

At one o'clock in the afternoon the sales force left the general office, Irving Place and Fifteenth Street, in motor-busses on a tour of inspection. The first stop was made at the new Forty-fifth Street substation, now nearing completion. This station is an attractive three-story and basement building of terra cotta and red brick designed to harmonize with the residential character of this thoroughfare. From this point the busses went to

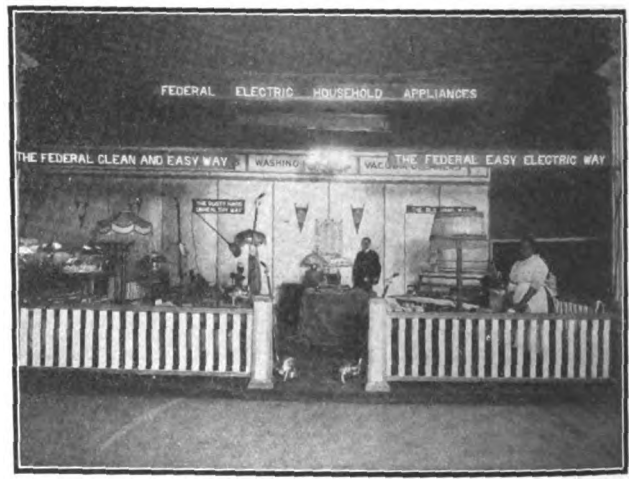
Digitized by Google

the new generating station, a number of the large and important new buildings connected to the company's lines during the past two years being inspected en route. Arriving at the generating plant the party was met by competent guides and a thorough and painstaking inspection of the plant was made.

After inspecting other properties of the company the party returned to the Hotel Martinique, where a dinner-meeting was held. Frank W. Smith, vice-president of the company, who spoke at this meeting, reviewed the work of the sales department during the recent campaign for new business and described in some detail the new construction work that has been carried on by the company during the past year. He outlined one or two interesting features of the Forty-fifth Street substation, pointing out that the ultimate capacity of the station would be 10,000 kilowatts. He stated that the current would be supplied from the station in about a week's time and that the ultimate lay-out provided for five incoming high-tension feeders from the generating plant and nineteen outgoing distribution lines or 3,000-volt feeders to the general network of the territory.

Mr. Smith called attention to the fact that special care had been taken to avoid any noise or vibration as the result of the operation of this substation and although it was strictly a static transformer station the company had left nothing undone to conserve the interests of the surrounding neighborhood. The building is completely isolated from the adjoining buildings on the east and west, the automatic regulators, condensers, etc., are insulated from their foundations by alternating steel and cork disks built up to a height of about one inch. Mr. Smith pointed out that with the completion of this substation Manhattan Island would be served by the United Company from four substations. In concluding, Mr. Smith made the point that with the growth of the company's business, the individual responsibility of every employee from office-boy to president, became greater. On this point he said, "Time was when in the recollection of many of us who have been identified with the company for a considerable number of years, we were personally acquainted with a large number of the customers of the company. In this way it was possible for us personally to come in contact with most of our customers and to do our part in keeping them satisfied. With the growth of the business and the greatly increased number of consumers this personal contact is divided among a number of employees, with each one of whom I would leave this thought—the impression which you individually create upon the mind of a prospective or existing customer is to a very large extent the impression which that customer will have of your company and therefore I say that the responsibilities of each employee have greatly increased, as the business grows and expands."

General View of Exhibit of the Commonwealth Edison Company at the Home Exposition, Coliseum, Chicago.



Joint Exhibit of Edison Company and Federal Sign System (Electric) in Which Various Household Appliances Were Shown.

The Old and the New in the Household.

In planning the exhibit of the Comwealth Edison Company at the Home Exposition at the Coliseum, Chicago, held on October 20 to 30, inclusive, the guiding idea was to contrast the old laborious ways of doing housework or giving household service with the modern electrical methods.

There was an old spinning wheel operated by a young lady in the costume of a Colonial dame, and near it was a modern electrically driven sewing machine. There was an old-fashioned wash tub and wash board with a colored "mammy" of ample proportions in charge. Close at hand were an up-to-date electric washing machine and an electrically driven wringer. An old worn-out broom was contrasted with the sanitary electrically driven vacuum cleaner of the present day. And so on.

Extending along the northern end of the exhibit hall, the space of the Commonwealth Edison Company was divided into five sections. Over the whole exhibit was a conspicuous flashing electric sign displaying the words "Edison Service." One of the five "rooms" was equipped by the Edison Company in conjunction with the Federal Sign System (Electric). This served as the "laundry" of the five-room household, and contained washing and ironing machines, vacuum cleaners and other household appliances.

The center room, with rugs and dignified furniture, was fitted very attractively as a music room. It contained a modern Telektra player piano, and contrasted with this was an old-fashioned square piano of the Civil War period. This room contained a handsome mantelpiece, having beneath it a unique electric fire "log" imported from Germany.

Other rooms contained portable and other electric lamps, electric heating and cooking utensils, an electrically cooled refrigerator, electric stoves, flatirons, etc. Various styles of fixtures were suspended from the ceilings of the different rooms. Electrically cooked waffles and other delicacies were distributed to the visitors to the Exposition.

One feature was an exhibit illustrating the progress of lighting units from the old tallow dip to the modern tungsten lamp.

Dana H. Howard, W. P. Lyon and H. H. Forner, of the Commonwealth Edison Company, planned and installed the "Old and New" display.

Digitized by Google

Electrical Construction

By-Laws of California Association.

The California Association of Electrical Contractors and Dealers has been doing pioneer work on the adjustment of the relations of its own membership with other branches of the electrical industry in such a way as to make possible co-operation for the good of all. The workings of this organization have been watched with interest in all parts of the country, and it is believed that the rules under which it operates will be of interest to other similar organizations. The by-laws of the Association, as adopted May 27, 1914, are consequently given below, with the omission of those sections of a stereotyped nature, which would be of little or no interest.

Sec. 1. The name of this Association shall be California Association of Electrical Contractors and Dealers.

Sec. 2. Its objects are to promote the welfare of its members and to distribute among them the fullest information obtainable in regard to all matters affecting the business of the electrical contractor and dealer.

To encourage its members in establishing attractive retail stores where the consumer may obtain his requirements of electrical material.

To aid in bringing about a more friendly relation between electrical contractors and dealers, and to promote home industry by co-operating with manufacturers and wholesalers, who maintain stocks and organizations in the territory of its members.

To assist in standardizing and marketing high grade electrical merchandise of American manufacture, and by encouraging the proper installation reduce the fire hazard by co-operating with the National Fire Protection Association, the Board of Fire Underwriters of the Pacific and local municipal electrical inspection departments.

To improve the standard of specification by co-operating with the American Institute of Electrical Engineers and local chapters of the American Institute of Architects, and by closest co-operation with the central stations, assist them in solving the problems which will improve the service to the consumer.

To encourage the more general use of electrical appliances by encouraging its members to affiliate with and support the work of the Co-operative Electrical Development Society.

To encourage and support local Electrical Development Societies and Jovian Lunch Clubs.

Sec. 6. Any individual, firm or corporation in California engaged exclusively in the business of an electrical contractor, or dealer, may become a regular member.

Sec. 7. Associate membership shall be divided into two classes, namely, "A" and "B."

Class "A" membership shall comprise all central stations, telephone companies and electric railway companies and companies of like character.

Class "B" membership shall comprise any individual, firm or corporation, except those qualified as regular or Class "A" Associate members engaged in any branch of the electrical business, but who do not do installation work, and also any retailer handling electrical material, but not engaged exclusively in the handling of the same, and also any electrical dealer or contractor coming within the division of a regular member, but operating in a territory outside of the state of California, and also electrical engineers.

Sec. 8. For the purpose of determining whether an individual, firm or corporation is engaged in the business of electrical contractor or dealer, the following definition shall be used:

An electrical contractor or dealer shall be any individual, firm or corporation carrying a general stock of electrical supplies, or who may be prepared to make electrical installations.

He shall have an established location where he transacts his business with the public, and must have displayed any ordinary sign or placard announcing the character of his business, and shall maintain the usual set of books and records incident to the conduct of any ordinary business.

He shall carry a stock of electrical supplies of not less than $250, and shall have a full equipment of tools necessary for the performing of electrical installation work.

But the Executive Committee, by the concurrent vote of not less than two-thirds thereof, may admit to membership any electrical contractor or dealer, who does not qualify in all respects, under the above definition.

Sec. 9. The membership shall stand in the name of an individual as representing the person, firm or corporation, and the secretary shall recognize such person as authorized to represent as a member such person, firm or corporation, with power to vote at meetings.

Each individual, firm or corporation shall be entitled to name, in addition to the representative in whose name its membership shall stand, an alternate, but no individual firm or corporation shall change its representative, or alternate, during any fiscal year of the Association, except with the approval and consent of two-thirds of the members present at any general meeting, or two-thirds of the Executive Committee present at an executive meeting.

Sec. 10. A Membership Committee shall pass on all applications for membership.

The Membership Committee shall comprise not less than five members inclusive of the president, a vice-president and three members at large in the city or territory from which application originates.

The members at large shall be appointed by the president when applications are received.

Any applicant who receives a majority vote of the Membership Committee shall be declared duly elected. If the applicant does not receive a majority vote of the Membership Committee, it shall be the duty of the secretary to submit the application at the first regular meeting following of the Association. Application will then be submitted to the members at large, together with a full report from the secretary, giving the result of the votes of the Membership Committee.

If the applicant receives a two-thirds vote of members voting at any regular session, he shall be declared duly elected.

Sec. 12. The initiation fee shall be $10 and the annual dues shall be $30. The dues shall be paid quarterly in advance on the first day of January, April, July and October.

If, however, any member remits for his dues within 30 days after due date for the fiscal year he shall be entitled to a discount of 20 per cent.

Every member shall pay dues for the quarter during which he is elected as follows: If elected during the first month of such quarter he shall pay full dues for such quarter; if elected during the second month of such quarter, he shall pay two-thirds of such dues; and if elected during the last month of such quarter, he shall pay one-third of such dues.

Sec. 13. The initiation fee for Class "A" members shall be $10 and the annual dues shall be $30.

The initiation fee for Class "B" members shall be $5 and the annual dues $12.

Any regular member operating a branch house shall pay additional dues for said branch equal to 50 per cent of the dues of any regular member and subject to the same discount. For the purpose of determining what is a branch house, the following definition shall apply: A branch house shall comprise an establishment operating as is defined in the definition of a regular member, provided, however, that said branch is operated under the identical name of the main house. If, however, the name of the branch differs in any way from the name of the main house it shall be constituted as separate membership. Nothing in this definition shall be construed as meaning that a branch shall be defined where a regular member establishes a temporary office in another location for the purpose of making individual installations.

Class "A" Associate membership entitles the said Class "A" Associate member to nominate one representative and one alternate who may attend all meetings of the Association and receive all literature distributed.

Digitized by Google

Class "A" members may appoint additional representatives, who will have the privilege of attending all meetings and receive all literature distributed by the Association upon the payment of $1 per year for each additional representative so named.

Associate members shall be entitled to attend all meetings of the Association and receive all literature distributed, but shall not, however, be entitled to vote.

Sec. 14. Upon majority vote of the Executive Committee, initiation fee may be suspended or reduced for a period not exceeding any one quarter, and in the event of the reduction of the intiation fee, the Executive Committee shall determine amount of initiation fee during quarter so affected.

Sec. 15. Any member may be expelled from the Association for nonpayment of dues, after a period of 90 days from the date when the said dues become due and payable.

The membership of any member suspended as aforesaid who fails to pay such dues within 90 days after suspension, shall, as a result of such failure and without further action in the premises, terminate, unless said period of 90 days be extended by the Executive Committee, in which case his membership shall without further action terminate at the end of the extended period.

Sec. 16. Subject to instructions given by resolutions passed in general meeting, the management of the Association's affairs shall be vested in the Executive Committee.

In the absence of instructions on any subject, the said Executive Committee shall have power to act at its discretion, but its action shall be subject to the subsequent alteration, amendment or repeal by the members present at any subsequent general meeting.

Sec. 17. The officers of the Association shall be a President, elected by ballot at the annual meeting of the Association, as many Vice-Presidents as there are territories, elected as hereinafter specified, and a Secretary-Treasurer, who shall be chosen by the Executive Committee, as hereinafter specified.

Sec. 18. The Executive Committee shall be comprised of the President, Vice-Presidents from each territory, elected as hereinafter specified, and the Secretary-Treasurer.

Individuals representing only regular members shall be qualified to act as members of the Executive Committee.

In the event that it is impossible for any member of the Executive Committee to attend any meeting of such committee, the secretary may appoint a substitute located in the same district as such member to attend in his place.

A temporary committee shall be appointed by the Executive Committee, who shall divide the state into districts and each district shall be entitled to one representative. Thereafter the Executive Committee may, upon two-thirds vote, make any changes which they may deem advisable for the subdivision of territory for the purpose of apportioning the territory from which members of the Executive Committee may be elected.

Sec. 19. As many Vice-Presidents as there are districts shall be elected by ballot at the annual meeting, and shall hold office for one year, or until the election and qualification of their respective successors.

The members to be voted on for Vice-presidents representing particular districts shall be chosen as follows:

The members located in each district shall, five days previous to the annual meeting, send to the secretary of the Association for election as a Vice-President, the names of one or more members, but not more than three, located in their district, which names shall be submitted for vote at the annual meeting, and the member for whom the highest number of votes are cast shall be declared elected Vice-President for such district.

The members in each district may determine in any manner they may deem best, the name or names to be submitted for Vice-President.

Sec. 20. The Executive Committee shall have the power to appoint such sub-committees as it may from time to time deem necessary.

Sec. 21. The entire state will be divided into — districts to be numbered from 1 up.

The above described districts may be altered in number, size or description at any time by a majority vote of the Executive Committee.

Sec. 22. The General Secretary shall be chosen by the Executive Committee, and his compensation shall be fixed by such committee. He shall keep the books of the Association and shall perform such duties as may be delegated to him by the Executive Committee.

Sec. 23. Where it is deemed advisable to establish district officers of the Association, the members of all such districts to be covered by such branch office may select an assistant secretary, who shall be subject to the orders of the Executive Committee and of the General Secretary.

The salaries of the District Secretaries shall be fixed by the Executive Committee.

Sec. 24. The Secretary of the Association shall act as the Treasurer. He shall be custodian of Association funds subject to the control of the Finance Committee. He shall deposit such funds with banks or trust companies approved by the Executive Committee and shall file with each of such banks and trust companies a copy certified by the Secretary, of Section 24, of these by-laws.

He shall furnish a bond in an amount to be determined by the Executive Committee and the expense of such bond shall be borne by the Association.

The Executive Committee shall employ a certified public accountant who shall at least quarterly audit the accounts of the Treasurer and the Secretary. Such public accountant will file a written report of his investigation with the President and such reports shall be read at the next regular meeting following.

The Executive Committee shall appoint a committee of five, of which the president and secretary-treasurer shall be members, to have control of and to direct the disposition of the funds of the Association. No limitation shall be placed upon said committee's power to draw on and invest the said funds. The action of this committee must have the consent and approval of a majority of its members.

Sec. 25. The Association shall hold a general meeting at least once in every ninety days at such time and place as may be determined by a majority vote of members under the following conditions:

Of the four quarterly meetings, two shall be held in the territory north of the thirty-fifth meridian, and two shall be held in the territory south of the thirty-fifth meridian. For the purpose of deciding the place of meeting, all members in the territory north of the thirty-fifth meridian shall be entitled to vote when the quarterly meeting is scheduled in their territory. All members in the territory south of the thirty-fifth meridian shall be entitled to vote when the quarterly meeting is scheduled in their territory. The meetings shall be so arranged as to alternate in the territory north and south of the thirty-fifth meridian.

The time and place of the quarterly meeting shall be decided at each preceding meeting of the respective territory.

Sec. 26. The Executive Committee shall designate one of the quarterly meetings as the annual meeting, provided, however, that annual meetings shall be held alternately in the territory north and south of the thirty-fifth meridian.

Sec. 27. Meetings of the Executive Committee shall be held upon request of five of its members or upon the call of the president or secretary at such time and place as may be designated by them or him.

Sec. 28. Any action taken in any quarterly meeting shall be subject to ratification by the members at large.

Immediately following each quarterly meeting, the secretary shall forward to each member copies of the minutes of said quarterly meeting with which shall be enclosed returned postal card upon which the member may express his approval or disapproval of any or all action taken at the meeting. Any member failing to reply within thirty days after date such notification is sent out, shall be considered as having approved of same, and upon a majority approval, any action taken at a quarterly meeting shall be considered as final. If the majority vote is unfavorable, it shall be considered as if no action had been taken at the quarterly meeting and it shall be the duty of the secretary to notify all members.

Sec. 32. A vote on any question by any member of any body or committee may be taken by mail or telegraph and such votes shall have the same force and effect as though given at a duly convened meeting.

Sec. 33. If at any future date two-thirds of the total membership of the Association shall reside in the territory either north or south of the thirty-fifth meridian, all sections of these by-laws that refer to majority vote, shall automatically be changed to two-thirds vote, and the secretary must consider all decisions taken by vote on this basis.

Sec. 34. There shall be nominated by the regular membership in each territory, from the regular members, a vice-president, provided, however, that where the total regular membership in any territory is more than twenty-five, an additional vice-president shall be nominated for each additional twenty-five regular members or fraction thereof.

Sec. 36. The president shall be entitled to an expense allowance not to exceed $25 per month and the treasurer is empowered to pay such an amount monthly to the president.

Sec. 37. The Executive Committee

Digitized by Google

shall elect annually as counsel, a regular practicing attorney, prescribe duties and determine his compensation.

Sec. 38. Resignations shall be addressed and sent to the secretary and shall be thereafter acted upon at the next meeting of the Executive Committe and the member resigning shall be amenable to all rules and regulations of the Association to the date of such meeting.

Sec. 39. By a two-thirds vote of the entire Executive Committee, any member may be expelled for cause, provided, however, that such member is given an opportunity to be heard before the said committee. On the question of such expulsions neither the accusing nor the accused member shall be entitled to vote.

Sec. 40. These by-laws may be revised and amended at any general meeting.

A paper entitled "Co-operation Between Electrical Contractors and Jobbers—What It Means to You," which was drawn up by a joint committee of contractors and jobbers, has also been adopted as a part of the by-laws, since it contains the recognized principles of the members of the Association. This paper follows:

Co-operation Between Electrical Contractors and Jobbers.

It is a recognized fact that certain branches of the electrical industry are today in a very demoralized condition. As this is due largely to lack of proper co-operative effort on the part of the different branches of the industry, it is the belief of the committee that, with a proper organization whose primary interest is to educate its members to a greater responsibility, much good can be done in the way of properly serving the consumer and of creating a desire on his part to use electrical appliances and to adopt the idea, "Do it electrically," the slogan of "The Society for Electrical Development."

As examples of what can be accomplished we only have to review the work of Improvement Clubs, Societies, Chambers of Commerce and similar organizations throughout the country. Could individuals in the same period of time have brought about the reforms and changes in business methods that these associations have accomplished for their membership? The Panama-Pacific Exposition is an evidence of co-operative association team work.

The central stations, through their strong organization, the National Electric Light Association, have brought the lighting and power industry to a high degree of development, and, while doing so, have reduced rates to the consumer—neither of which could possibly have been accomplished through individual effort.

Electrical engineers, through the American Institute of Electrical Engineers, have been better prepared for their work through fuller knowledge of the requirements to be met and of the means of fulfilling them. This Institute is conducted purely for educational purposes and without individual profit to its members, except in so far as they improve themselves by participating in the work.

Electrical manufacturers and jobbers, through co-operative work, have done much toward educating themselves and as a result have placed their businesses on a firmer, more economical and more satisfactory basis. It has been proved through this work that, notwithstanding the increased cost of living and the consequent increase in the cost of almost every known commodity, the cost of electrical appliances has been steadily reduced and the quality of the articles steadily improved. The principal effort on the part of these industries has been toward educating their members to the necessity of efficiency in order that the various branches may operate their particular businesses at a minimum of expense.

Architects have the American Institute of Architects as their national association. We would hardly recognize as progressive an architect who is not a member of this Institute.

Some of his most valuable information is obtained through such membership and through his affiliation with other architects in association work.

While undoubtedly electrical products have made more rapid strides in the last ten years than any other industry, the building industry, generally, has kept apace with the times.

It is the belief of the committee, however, and it will be admitted by architects generally, that, while satisfactory progress has been made in the building industry, at least from an architectural standpoint, the electrical equipment in buildings of all classes has been steadily neglected, and it is common practice today, among many architects, to use electrical specifications which have been regarded by the electrical industry for a long time past as obsolete.

San Francisco today is an evidence of this. It has been almost entirely rebuilt within a period of seven years, and yet probably more than 95 per cent of the buildings erected in that period prove conclusively that the electrical specifications (and the ultimate installation) were neglected by architects generally. Of the remaining 5 per cent probably not more than 25 per cent, or 1.25 per cent of the whole, have been equipped with modern electrical installations, and in making this estimate, all classes of buildings have been taken into consideration.

Very recently certain firms of architects in San Francisco have engaged competent electrical engineers to prepare for them suitable specifications, but, notwithstanding, the engineer is handicapped in the preparation of specifications on account of the small proportion of the total cost of the building allowed him as his share. This condition is, of course, a direct reflection on the individual or firm of architects making the allowances.

The occupant of any commercial type of building, hotel, apartment house, flat, bungalow, or private home generally realizes only too late that no provision has been made for the many electrical conveniences. Many attempts have been made on the part of electrical people to assist architects in the drawing of proper specifications, but they invariably receive no encouragement, as certain architects really believe that they have forgotten more about proper electrical installations than all the electrical men in the country ever knew, and for this one reason they are impossible to approach.

They make no distinction between the reputable and the irresponsible electrical contractor. Their one idea seems to be to let the electrical contract simply on price. The result is evident:

Original cost of installation.....100%
Extra before occupancy of building 25%
Extra after building is complete.. 50%

And the installation is still incomplete. An additional allowance, in the first place, would undoubtedly have provided a better installation with less cost to the owner.

Electrical contractors have their national and state associations, which have done much to educate their members in the proper conduct of their business, and through their local meetings and state conventions have made possible an exchange of ideas that has tended to elevate the standard of work.

Notwithstanding the great results that have been accomplished by the Association, there are many electrical contractors who have failed to recognize the advantages to be gained by such Association effort. This is evidenced by the present state of the electrical contracting business.

In the past, when a contractor has been approached and the suggestion offered that he become a member of the Association, he has immediately asked: "What am I to gain by joining it?" The answer to this question is that he gets out in proportion to what he puts in. Having put in nothing in the past, nothing is what he has gotten out.

It is the belief of the committee that an electrical contractor unattached is unable to keep apace with the progress of the industry, and, consequently, is unable to properly serve his customers.

If he will become a member of the Association and will give it his support, it would be impossible to esti-

Digitized by Google

mate the benefits he will derive from it, as evidenced by the results of association work in other lines of endeavor, whether commercial or political.

As we have shown above that a competent architect should of necessity be a member of the American Institute of Architects or in some way affiliated with its local chapters, so it is clear that an electrical contractor should for the same reason be a member of some association which represents his craft.

It is fully recognized that the economic and proper channel of distribution of electrical supplies is through the electrical supply jobber to the dealer and contractor, who, in turn, serves the consumer. By this method the dealer and contractor is enabled to have the advantage of a complete stock of electrical merchandise in the warehouse of the jobber, which can be drawn on at any time, no matter whether it is one item or a hundred, and can be assured of prompt shipments and satisfactory service from every standpoint.

The jobber makes it his business to keep in close personal contact with the dealer and contractor in his territory, studies his wants, and plans to serve his needs, no matter what they may be. Through frequent calls of his salesmen he is often enabled to give valuable information, keeping him advised of the new lines of standard goods on the market, and furnishing technical data or giving such other information as may be useful from time to time.

He is frequently able to be of service by carrying his contractor or dealer, who has been tied up financially on account of delays in jobs over which he has had no control.

This kind of service cannot be had where the contractors and dealers do business at long range, and with people who are not in close touch or sympathy with their conditions or problems.

The dealer and contractor is the natural channel for distributing various electrical devices to the consuming public. He carries the material in stock and displays it on his counters and in his show windows. The consumer is thus enabled to see the material which he is purchasing, and knows that he is getting full value for his money. He can get promptly any information he needs or instructions in the use of the various electrical devices, which is a service that could not be rendered satisfactorily by correspondence with some distant point.

The object of this joint committee is to promote the use of electrical appliances and to influence the public to adopt the idea: "Do it electrically."

The co-operation of the central station in each district is highly desirable, and a closer relationship with the architects and those engaged in the industry must be maintained. In the past, the industry has failed to provide suitable show rooms, at which the consumer can obtain electrical appliances, therefore we will encourage the establishing of proper stores where material can be obtained at retail.

To accomplish this end, a campaign of education is about to be instituted. It provides for visits by the committee to all parts of the state, where public lectures will be given, supplemented by motion pictures, stereopticon views and working demonstrations of electrical appliances.

In order to gain the full confidence of the public in the industry we represent, the class of material furnished and the excellence of workmanship in its installation must be of the highest order. We should never recommend for sale an article in which we have not absolute confidence, and a full knowledge of the functions it will be called upon to perform.

We should not consider an installation as tending to promote the best interests of the industry, unless it has met with the unqualified conviction on the part of the contractor that it is of the highest class. An installation made by an electrical contractor, simply because it will pass inspection, is undoubtedly bad practice.

We recognize that, in our business, probably more than in any other, the public is woefully ignorant of the quality and merits of electrical devices. Whether or not they are satisfied depends upon how we serve them. We should recognize that the National Electrical Code, while having accomplished a great good, does not to the fullest extent accomplish the desired results, for the reason that it does not distinguish between standards of material.

We will advocate the grading of material by the National Fire Protection Association.

We recognize that local inspection bureaus are not responsible for installations in compliance with architects' specifications.

We will advocate the employment of one or more competent electrical engineers, whose duty it will be to furnish architects with certificates, certifying that work has been performed in accordance with the specifications embodied in the contract.

Work may be performed which in every respect meets the requirements not only of the National Fire Protection Association, but local, state or municipal inspection bureaus, which is not a credit to the electrical industry. We are opposed to electrical contractors, who, after executing a contract, endeavor to substitute materials of lower grade. We advocate that the various Electrical Contractors' Associations should assume the responsibility for seeing that their members perform work in accordance with specifications without attempting to evade their contract in any detail.

We believe that with proper co-operation on the part of the architect and other allied interests, the various State Associations of Electrical Contractors will ultimately be able to guarantee on behalf of their members the completion of any contract entered into.

We will ascertain the names of all societies of architects, times and places of meeting, and will endeavor to have representative electrical engineers, as well as members of our joint committee, appear before these associations to explain the necessity of not only the proper drawing of, but also the compliance with recognized modern specifications.

Caution should constantly be exercised to see that only those contractors are admitted to membership of an association whose character and honesty are unquestioned, and who have an established reputation for square dealing.

Among the Contractors.

Sayre & Record Electrical Company, Weiser, Idaho, recently took over the business of the Burns Electrical Company, of that city. The affairs of the company will be conducted in the same place on West Idaho Street.

M. C. Melton, of Henderson, Ky., has purchased the plant and business of the Seiffert Electric Company, and will continue it under the name of the Melton Electric Company.

Having a big billboard advertisement in each of two corners of the State Capitol grounds, in the busiest part of town, is the privilege being enjoyed by the Sackett Mine Supply Company, Columbus, O. This company is electrical contractor for two comfort stations, one for each sex, at some considerable distance apart, on the grounds in question. These improvements will be beneath the surface, and of the most modern type, reached from the street by short flights of stairs. The electrical work includes wiring for lighting and for ventilating fans, the installation of about 30 lamps for the interior of each station and outside standard lamps.

The Ackerman Electric Company, Grand Rapids, Mich., will build a shop, 22 by 36 feet, on Pine Street.

The Devere Electric Company, Cincinnati, O., will handle all electrical work on the new Children's Home buildings in Madisonville.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary desires to call the attention of members to the fact that at the moment of writing his desk is absolutely bare of material for the question department—either no work has been done anywhere during the summer, or else by some miracle no member has met with any circumstance which could not be settled with no chance for argument arising, or that was not so perfectly obvious to him that in his opinion it contained not the smallest interest for his brother inspectors!

However ideal, such a state of things would appear too good to be true and the alternative is simply that members are *not doing their share*. The Secretary cannot run this department alone and without material, being definitely restrained from supplying any original matter; *Ergo, it is up to you.*

Notes From the Sections.

The first meeting of the Western New England Section was held at the Weldon Hotel, Greenfield, Mass., on Wednesday, October 13 at 10:30 a. m. Two new members were elected:

W. H. Nichols, superintendent of wires, Bennington, Vt.; A. H. Keeney, inspector of wires, Holyoke, Mass.

A motion was passed that the plans for the January meeting be left with the Executive Committee.

F. L. Hunt, chief engineer of the Turners Falls Power and Electric Company, read a very instructive paper on Outdoor Substations.

At the close a vote of thanks was extended to Mr. Hunt, after which the paper was fully discussed. Lunch was served in the Hotel grill room at one o'clock, after which the officers of the Turners Falls Company transported the members to Turners Falls by automobile, where the new water-power development of the company was looked over and explained.

Four guests from Greenfield, one from Holyoke, one from Springfield and one from South Manchester, Conn., were present.

The first installment of Mr. Hunt's paper is published herewith. The conclusion will be printed in the next issue containing this department.

THE DEVELOPMENT AND OPERATION OF OUTDOOR SUBSTATIONS.[1]

By F. L. Hunt.

A good idea of the progress in the development of outdoor apparatus and substations may be had by referring to papers which have appeared during recent years in the *Proceedings* of the American Institute of Electrical Engineers on this subject.

Until about ten years ago, arc lamps and small distributing transformers up to a capacity of 50 kilowatts and up to a voltage of 2,300 volts were about the only pieces of electrical apparatus operated outdoors.

In 1907 a paper appeared by Ralph D. Mershon in the *Proceedings* in which he described the station and transmission lines of the Niagara, Lockport, and Ontario Power Company, and which description includes that of a substation at Lockport, N. Y., that had been put into operation in July, 1906. In this substation only a small start was made toward what we know as an outdoor substation at the present time. The only equipment placed outdoors was the buses, the lightning arresters and the selective disconnecting switches from the buses to the various transformers and circuits. The transformers themselves, the oil switches and the control switchboard were all placed inside the station. This substation is still in operation, and I had occasion to see it within the last few months. Its operation has been, for all practical purposes, quite successful.

The next step of advance may be noted in a paper by K. C. Randall, which appeared in the 1909 *Proceedings*. In the second paragraph of Mr. Randall's paper he says: "Thus far about 50 kilovolt-amperes has been the limiting capacity found in outdoor service, but there are a few exceptions. Outdoor transformers of 100 kilovolt-amperes capacity or greater for any voltage have been almost unknown. Recently, however, large transformers have been taken up and a few are in service, most of them but for a short time." He states further on that transformers for outdoor service may be built for any requirements that the ordinary indoor type of oil-insulated unit will satisfy, but that the limit of capacity is about 500 kilowatts for self-cooled transformers, although it was his opinion that water-cooled outdoor transformers could be built up to any capacity. His paper shows comparative layouts for indoor and outdoor stations to take care of the same conditions, and gives detailed estimates to show, for instance, that in the case of a 2,000-kilowatt, 25,000-volt, 60-cycle transformer station there was a saving of 30 per cent by using the outdoor type of construction, as against the indoor type, and that in a 3,000-kilowatt, 22,000-volt, 25-cycle transformer and motor-generator station supplying railway service, a saving of 13 per cent was to be obtained by using the outdoor construction; the smaller saving in the latter case being due, of course, to the larger percentage of indoor apparatus required, since the motor-generator sets required to obtain direct current for railway purposes had to be placed indoors. This paper also shows photographs and describes outdoor oil switches, current and potential transformers and electrolytic lightning arresters up to 60,000 volts.

In 1912, three years later, a paper by F. C. Green describes the development of outdoor substation work which had occurred since the paper of 1909 appeared, and shows that there had been manufactured, installed and put into operation during the period since the paper of 1909 more than 100 transformers having a total capacity of more than 60,000 kilowatts, ranging in capacities of individual units from 140 to 3,333 kilowatts, and ranging in primary voltage from 16,500 to 110,000 volts. This paper then goes on to deal with the various problems to be met in the design and manufacture of outdoor apparatus, especially transformers. This paper shows that the sizes and the voltages for which outdoor transformers and equipments were being built had increased very materially during the three years preceding 1912.

The next papers read before the Institute on the subject of outdoor substations appeared in the *Proceedings* for Febru-

[1] Paper read before Western New England Section of National Association of Electrical Inspectors, Greenfield, October 13.

Digitized by Google

ary, 1914, when there were four papers; one describing susbtations in the Middle West, one in Pennsylvania, one in New England, and one entitled "Outdoor versus Indoor Substations," which discussed the subject in a general way. These papers brought out the fact that there are few large transmission companies at the present time which do not have more or less outdoor equipments and substations, and that there was in course of construction or operation at that time more than 300,000 kilowatts in high-tension outdoor-type transformers.

The increase in the use of such apparatus is also shown by the following figures giving the kilowatt capacity of outdoor transformers in units of 200 kilowatts and over, produced by one manufacturing company for each year since 1910.

Year	Kilowatts	Percentage of outdoor transformers over 200 kilowatts to total transformer apparatus
1910	500	2
1911	65000	5
1912	125000	8
1913	200000	15
1914	150000	20

The development and application of outdoor substations have been brought about by two conditions:

First, by the necessity of some such arrangement in order to serve small communities or small loads from high-tension transmission lines passing through the country. This has been especially true in the West, where lines of great length have been built and where they pass through small towns in which the cost of service, if supplied by an isolated plant, would be exorbitant, and where the amount of business available would not even support the investment necessary to build a substation large enough to house the high-voltage transformers and switching. Such communities may frequently be served profitably from a passing transmission line when outdoor transformers, lightning arresters and switching can be made use of. For instance, a typical station of this kind which is described in one of the papers mentioned above consists of one three-phase, 33,000-volt, 200-kilowatt, outdoor-type transformer set on a concrete foundation outdoors, inclosed by a wooden picket fence and fed from a transmission line passing directly over it through horn-gap lightning arresters and disconnecting switches, all placed on wooden poles.

This station feeds a small community, requires no attendant, is arranged with fuses so that trouble in the outdoor apparatus will automatically free itself from the transmission line, and all at a total investment of not more than $6.00 per kilowatt. The cost of a building alone to house the equipment would increase the total investment at this point more than 50 per cent.

A little-higher-grade outdoor substation which is used a great deal consists of transformers set on steel towers, so that the transformers are six or eight feet above the ground, and outdoor current and potential transformers may be installed on this same tower, which will supply current to a meter placed in an iron box, also mounted on the tower. Above the transformers on the top of the tower may be mounted necessary disconnecting switches and lightning arresters, so that all the elements of a substation are present and the installation is done in a very permanent and lasting manner. In such an installation as this, the lower part of the tower may sometimes be inclosed, and one or more separate feeder panels installed in the lower inclosure, so that more than one circuit may be fed and controlled from the secondaries of these transformers.

The second feature which has brought about the development of outdoor substations in larger capacities is probably the large amount of space that is required for any extensive switching arrangements on high-voltage circuits. A typical station of this kind may be seen at Millbury, Mass., where the Connecticut River Transmission Company has a switching station which is laid out to accommodate four 66,000-volt circuits and two 110,000-volt circuits, including a sufficient amount of switching so that energy may be brought into and out of this station from any one circuit to any other circuit, including the additional switching which is required to take care of the different voltages and the transformers from which the current is stepped up or down from one voltage to the other. It is not difficult to see that a building large enough to accommodate this arrangement of circuits, switching and transformers would be very expensive, whereas the whole arrangement can be laid out outdoors where the value of real estate is not great at a very reasonable cost.

There are in the West and South many outdoor stations operating at high voltages at the junction points in large transmission systems where power is fed in from a great many generating plants to one system.

Substations built by the Turners Falls Power & Electric Company on its circuits between Turners Falls and Springfield in the year of 1913 are also good examples of the larger-capacity outdoor substations. As these stations were designed and built under my charge, it is possible for me to give you a more detailed description of them, and I think such a description may be of interest to you.

One of these is located at Chicopee and one at Agawam, Mass., both being supplied from the company's double-circuit, 60-cycle, three-phase, 66,000-volt transmission line.

When these stations were being laid out, considerable attention was given to a study of the advantages and disadvantages of indoor and outdoor apparatus, the result of which was the adoption of what might be called a semi-outdoor substation in which all the 66,000-volt equipment, including the step-down transformers, was placed outdoors, as were also the aluminum lightning arresters on the 13,200-volt outgoing lines, while the 13,200-volt buses and switching, the control switchboard, the 2,300-volt distributing switchboard and the railway apparatus were placed inside.

The choice between indoor and outdoor apparatus in different parts of the equipment was based on the following considerations.

(1) The 66,000-volt apparatus was the most bulky part of the equipment, and therefore the greatest saving in building space could be accomplished by putting it outdoors.

(2) The more complicated switching necessary with the numerous 13,200-volt and 2,300-volt outgoing circuits and synchronous-motor circuits would have been much more difficult and expensive to handle in an outdoor installation. Hence, they were placed inside.

(3) The control switchboards, with their meters, instruments and storage battery, and the railway motor-generator sets have not at the present time been developed to the point where it is practical to operate them outdoors; therefore these were placed inside. Except in the case of the switchboards with their meters and instruments, the storage battery and the railway sets, none of which are suited to outdoor operation, the relative location of the remainder of the apparatus, that is, whether it would be placed indoors or outdoors, was determined principally by comparison of estimated first costs, since no well-founded objection to the use of outdoor aluminum lightning arresters, oil switches, transformers or buses could be found.

The saving in the first cost of the building may be arrived at very closely on the basis that the cost of two proposed buildings, erected on the same site, for the same purpose and of the same general design and material, will within reasonable limits, have first cost in the direct proportion to their cubic contents. A building, similar to the one actually erected, but of the dimensions necessary to accommodate indoors all the apparatus, including the 66,000-volt equipment, allowing for the same switching scheme, and providing a space for future expansion equal to that which is incorporated in the present station and outdoor foundations, would cost on the above basis 2.3 times the cost of the present building. After allowing for the extra cost of outdoor apparatus and the cost of outdoor foundations and steel structures, the saving in this case was an amount equal to 11 per cent of the cost of the complete station and equipment as built.

Digitized by Google

The general arrangement at the Chicopee substation, as it was built, was as follows. A tap circuit is brought in from each of the two transmission lines through choke coils, disconnecting switches, and solenoid-operated non-automatic oil switches to a transfer bus, from which the transformers are supplied through disconnecting switches and solenoid-operated automatic oil switches, one set for each bank. An aluminum lightning arrester is installed on each incoming line. At present there is one bank of three 1,500-kilowatt oil-cooled transformers of the radiator type in use here, with one spare unit, and foundations and conduits were installed for a second bank. This second bank is now on order and will consist of three 5,000-kilowatt water-cooled units of the same voltages as the first units. From the transformer bank one circuit is carried underground into the building to the 13,200-volt double bus in a concrete bus structure.

The arrangement, so far as outdoor station is concerned, is the same at Agawam, except that there is a difference in the capacity of transformers, and there are two circuits from the secondary side of the transformers into the building; one leading to the 13,200-volt bus, and one to the 2,300-volt bus, as power is distributed at both voltages from Agawam station.

The transformers and oil switches are connected by a complete piping system to a two-compartment oil tank buried in the ground, so that oil can be drained from any transformer or oil switch into its respective compartment of the oil tank, and from there can be pumped through a portable oil filter press back into the transformers or switches. Alarm thermometers on the transformers are connected to bells in the station.

When it becomes necessary to disassemble a transformer it is rolled on to a transfer truck upon which it is run into a compartment at one end of the station where a hoist is available of sufficient capacity to lift and remove the core.

Outdoor equipment may also be used in some cases in connection with generating stations. Where a considerable amount of switching at high voltage is necessary in a generating station, it will sometimes be found that the use of outdoor switching equipment and of transformers may show a considerable saving in the cost of the power house. It is the practice at the present time, especially in power houses, to place all high-voltage apparatus, such as large power transformers, oil switches, current and potential transformers for metering, lightning arresters and disconnecting switches on voltages of 33,000 volts or more, and in some cases on less voltages, in separate individual compartments. Such compartment construction is, of course, expensive, and when a great deal of this is required in order to place the apparatus indoors, the opportunity of a saving by putting this apparatus outdoors is almost certain to exist.

The design of each individual station will, of course, determine the necessity of the use of outdoor equipment. In a station designed similarly to the one which the Turners Falls Power & Electric Company is now building at Montague City, the space required for the high-tension transformers and switching was obtained at a very small additional investment, as this equipment was placed immediately over penstocks, which place would have been more or less vacant if it had not been used for this purpose, and the additional expense required to install the apparatus here did not amount to much more than the cost of building the roof over it.

The principal advantages of outdoor substations and equipment may be called attention to.

(1) *Less Cost.*—The saving in cost in various types has already been pointed out, and will amount in most cases, where it is advisable at all, to from 10 to 25 per cent.

(2) *Ease of Extension.*—This is a very decided advantage in the outdoor-substation arrangement, since it is ordinarily necessary in arranging high-tension apparatus in a building to build the structure considerably larger than the present requirements call for, in order not to greatly increase the expense of increasing the capacity of equipment. An outdoor substation may be laid out so that it can be extended indefinitely with an initial investment no greater than would be necessary if the building would never be extended, and with an investment required at each extension only proportional to the extension which is made at the time.

(3) *Fire Hazard.*—It is, of course, self-evident that the fire hazard is much less in outdoor substation, since there is much greater possibility of confining a fire to the particular piece of apparatus in trouble than when everything is confined inside a building.

(4) *Communication of Trouble.*—The various pieces of apparatus in an outdoor substation can be placed far enough apart so that the liability of trouble in one being communicated to another is very much reduced over that which exists in an indoor station.

The disadvantages which have been discussed more or less in connection with outdoor stations may be set down as follows.

(1) *Difficulty of Repairs.*—It is, of course, more difficult to make repairs on apparatus outdoors, especially in the case of bad weather although in most of the outdoor stations at the present time arrangements are made so that apparatus needing repairs can be taken under cover with little additional loss of time and the actual repairs necessary to transformers and switching equipment of high voltage and large capacity are becoming less and less frequent.

(2) *Operating Risks.*—This is offered as an objection in some cases, although in actual practice we have not been able to discover any risks which seemed any greater than those which occur in indoor stations.

(3) *Danger to Public.*—This disadvantage we believe can be entirely eliminated by properly inclosing the outdoor apparatus.

(4) *Appearance.*—We have to admit that the appearance of an outdoor substation is not particularly good from the standpoint of beauty but it is not likely that this is great enough disadvantage to stop the use of this style of construction where any great saving can be shown by using it.

(5) *Danger of Interference from Outsiders.*—This disadvantage can also be practically eliminated by properly inclosing the equipment installed out of doors.

(To be continued.)

Australian Electrical Trades Union.

According to an Australian newspaper, it was reported at the annual meeting of the Electrical Trades Union of New South Wales that there was a membership of 1,704. Despite the war, the financial year had been the most successful in the history of the Union. The Newcastle branch was on a sound footing, and had a membership of 90. In Sydney more than 350 positions had been filled direct from the union office. The union's relations with the main body of employers had been cordial throughout. Although cases had arisen in which it was found necessary to report breaches of awards, these had mostly occurred among the small irregular contractors and firms not primarily connected with the electrical industry. On the whole, trade had been unexpectedly good since August of last year. The falling-off in other directions had been largely counterbalanced by naval activity.

Electrically Propelled Coasting Vessel.

The Swedish vessel *Mjolner* is designed for electric propulsion. It is 225 feet long and has a displacement of 2,250 tons. The normal speed is 11 knots and 900 horsepower is required.

There are two Ljüngstrom double-rotation steam turbines driving alternators which deliver three-phase current to two motors driving a common helical spur on the propeller shaft. Each unit is rated at 400 kilowatts at 500 volts and 120 cycles. The turbine is 7,200, the motor speed 800 and the propeller speed 85 revolutions per minute. A saving in coal of 38 per cent over reciprocating engines is anticipated.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

NEW YORK—Second District.

Peoples Natural Gas Company. The franchise of the Natural Gas Company limited the price it could charge for gas to 25 cents per thousand cubic feet. The company showed, however, that for several years it had not been able to do a profitable or satisfactory business. The Commission issued an order permitting the company to increase its rates to 32 cents per thousand cubic feet, with a discount of two cents per thousand cubic feet on bills paid within ten days.

Judge Hodson in his opinion declares the principle that it is the duty of the Commission to conserve the interests of the company as to income and benefits, quite as much as it is to protect the rights of the public as to rates and service. "It would be a denial of justice to those who have made this utility a public convenience, to even permit them, much less to require them, under the circumstances, to continue the operation of this business without profit, and indeed at considerable loss. . . . The earnings of the company, in order to be reasonable, must be large enough to provide sufficient funds to pay all operating expenses and fixed charges, and to cover also such proper amounts for interest, profit and depreciation as can be regarded as fair under the circumstances of this case.

"Adequate prices which will yield a fair return upon the invested capital of the company, after providing for all such expenditures, are as necessary and proper as the day wages of a laborer or any other just compensation in the economy of business. This proposition is not always recognized by the public which sometimes makes unreasonable demands upon a public service corporation in order to gain some slight advantage in the matter of rates and service, which course often deprives the utility of a proper current income for the service rendered, and usually terminates in loss and inconvenience to all parties concerned."

The company, in presenting its case to the Commission, carried a resolution of the town authorities which agreed that the case should be considered without regard to the limitations on the price of gas contained in the franchise. Commissioner Hodson commends this action of the town authorities as "recognizing the principle that the company and the customers it serves have a mutual interest in the business and the good service by the company should be properly compensated by the customers in order to make such business remunerative to the company and a benefit to the people of the town, and that, by the same token, a blow at either would work serious injury to the other."

WISCONSIN.

The Bloomer Electric Light & Power Company asked for authority to put in effect special provisions respecting service to rural consumers, alleging that under the present rates the company could not afford to extend service to rural customers.

The Commission says: "The increasing demand for electric service from rural districts presents new problems for the electric utility. Chief among these are questions relating to the obligations of the company to serve such consumers, the duty to furnish service equipment, and the matter of rates chargeable for such service."

Before taking up the matter of rates, the Commission considers the question as to the obligation of the company to furnish equipment. In this connection the Commission says: "The question of line-extension cost, rather than the cost of other equipment, is the one variable factor in the situation. In order to work out a rate that is not discriminatory, it is necessary to eliminate as far as possible the variable factors. If the rural extensions were of uniform length, and it were found reasonable to require the company to install them, then an average rate would meet the situation. Since this is impossible, the elimination of line extensions seems necessary. This would mean that this cost should be borne by the consumers.

"Since a utility is bound to furnish service and since the consumer is under no obligation, save when under contract, to continue to use this service, it would seem unreasonable to expect the utility to install a long service line without an assurance of continued use. When the consumer must spend from $100 to $300 in the construction of his own line, it stands as an expression of probable continued use; otherwise, the investment of the consumer would be wasted.

"While it may be claimed that, in the event of discontinued service, the utility is in a better position to make use of the line material, it should still be remembered that the cost of salvaging such a line is not small, and that this cost, if loaded upon the reconstruction of the line for a new consumer, would bring the cost up to about that of a new service line, without securing the same prospective life as a new service would have.

"The question of revenues derivable from this service as determining the feasibility of requiring the company to install the service lines does not appear pertinent in this case, as equity to all consumers could not be done by establishing a uniform rate for rural service based on average costs.

"So far as line extension is concerned, then, the request of the petitioner that consumers shall furnish this part of the equipment is reasonable."

In regard to transformers and lightning arresters, the Commission says: "A utility is ordinarily bound to furnish safe and usable current. This principle holds, then, that the petitioner company should furnish transformers and lightning arresters. This is an expense that can be supported by the rates charged, and is distinguishable from the matter of extension of lines in that the investment required per consumer is much more standard and uniform than in the latter case. An adequate demand charge or minimum bill saves the utility from loss. The mere fact that the investment is somewhat larger than an urban consumer would require cannot constitute a sufficient reason for forcing the rural consumer to buy all of his own equipment. Rendering service of this kind in rural districts has hitherto been regarded by utilities in general too much as a favor extended to which their common law obligations did not attach. Where a utility has undertaken to supply a rural district, it must do so without discrimination, supplying the necessary equipment where this can reasonably be done. We have found that, in this case, the installations of rural services cannot reasonably be required of the company, but we cannot find that the company

Digitized by Google

should not be required to furnish transformers and protection devices."

With these matters settled, the Commission determines a proper minimum bill. "The minimum bill allowable can now be determined upon the basis of installation of equipment as is hitherto found reasonable. The following estimate shows about what the bare cost of supplying a consumer would be, without considering fixed charges on any portion of the transmission system or any part of the general expenses. The average investment by the company is assumed to be about $150 and the bare cost of current including line and transformer loss, to be two cents per kilowatt-hour.

Minimum Bill Estimate.

Interest, depreciation and taxes on average investment, 13 per cent on $150	$20.00
Reading meters	4.00
Current	6.00
Total	$30.00
Or, per month	2.50

"The additional cost to the consumer who has a service line a mile long, in lost interest and depreciated capital will be about as much more per month.

"The foregoing expense is based upon the assumption that lighting service only is taken. If two meters are installed and power service is also rendered, the fixed expenses per service are decreased proportionately. Inasmuch as these estimates must be based on assumptions of the amount of the connected loads, the results themselves can only be taken as indications or approximations. However, it would appear that if lighting service alone is taken, the minimum bill of $2.50 per month is reasonable; if power service alone is taken, the regular demand charge is reasonable, provided that a minimum of $2.50 per month is established; or if both services are taken, the minimum bill of $2.50 for lighting service should apply, with the minimum for power service based solely on the present demand charge of 75 cents per horsepower per month without stipulation as to minimum except that perhaps installations of less than one horsepower should be counted as one horsepower."

An order was issued in accordance with the above opinion.

Richland Telephone Company. The Commission, on its own motion, conducted an investigation of certain complaints regarding the company's rates, rules and regulations for telephone service. Certain complainants alleged discrimination in that a bank president and a doctor receive the service of a patented device known as an automaphone which is not furnished to other subscribers.

The Commission recommends that the company arrange for the change to a central-energy system as soon as its finances warrant such an improvement, and holds that unless the company is in a position to extend automaphone service to all of its subscribers who desire such service and are willing to pay a reasonable additional rental therefor, it should not install automaphones or permit the installations of automaphones by individuals. The Commission regards the existing situation as discriminatory, and requires that automaphone service be furnished to all who desire it without discrimination, or be entirely discontinued.

A number of the complaints brought before the Commission arose from the company's rule providing for the disconnection of service if the telephone rental is not paid on or before the fifteenth of the month.

The Commission says: "A telephone utility is required to render adequate service at reasonable rates, and in fixing such reasonable rates it is ordinarily assumed that all rentals will be paid and paid promptly. Under such circumstances it is entirely permissible for a utility to require payment in advance for a reasonable period. The experience of many telephone companies, whose financial status has been examined by the Commission, indicates that where payment is not required until after the service is rendered, many uncollectable bills are found on the books, resulting in a serious handicap in meeting current obligations. It being permissible to require prepayment of rentals, it follows that reasonable measures for securing prompt payment in advance are justified. In the present case the subscribers are notified in the printed directory that payment is due on the first of the month and is to be made prior to the fifteenth of the month in advance. The collecor makes one call prior to the tenth, and on the tenth notice is mailed to the subscriber enclosing a bill which specifically reminds him of the disconnection rule. It can scarcely be held unreasonable to require a patron to pay his rental within 15 days after it is due. If he does not wish to be annoyed with monthly statements and collections, the company will no doubt be glad to accept payment in advance for as long a period as the patron may designate. The existing rule should work no hardship on any subscriber if he meets his obligations with reasonable promptness."

Central-Station Output Figures.

Last year the total output of the 5,521 central electric stations in this country was 14,000,000,000 kilowatt-hours.

Electrical Exports for August.

The monthly summary of imports and exports of the United States for last August has been issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C. From this are obtained the following facts regarding the electrical exports during that month.

Although the electrical total is below that of July, it exceeds that of August, 1914, by nearly 80 per cent. The latter month, however, was the first month of the European war when all international commerce was very seriously curtailed. For the four classes for which the number of articles exported is given in the government report, there were shipped last August the following: electric fans, 1,112; arc lamps, 75; carbon-filament lamps, 140,282; metal filament lamps, 461,580.

The following table gives the detailed figures for the electrical classes reported:

Articles.	August, 1915.	August, 1914.
Batteries	$ 114,516	$ 38,722
Dynamos or generators	216,906	114,570
Fans	15,453	5,528
Insulated wire and cables	251,083	51,236
Interior wiring supplies, etc. (including fixtures	49,202	43,511
Lamps—		
Arc	1,633	1,620
Carbon-filament	17,221	4,338
Metal-filament	74,119	9,592
Meters and other measuring instruments	57,244	23,747
Motors	277,940	118,490
Telegraph instruments (including wireless apparatus)	17,030	3,101
Telephones	50,841	78,403
Transformers	29,146	33,609
All other	633,958	497,543
Total	$1,806,292	$1,024,010

The total value of all electrical exports for the first eight months of 1915 was $14,977,440, compared with $13,654,569 during the corresponding months of 1914, and $18,949,235 for 1913.

New Concern Organized to Give Battery Service in Salt Lake City.

The Electric Truck Service Company has been organized in Salt Lake City with A. O. Whitmore as its president, to furnish electric batteries and electric battery service for electric trucks in operation in the city. Mr. Whitmore has maintained an agency and garage for electric pleasure vehicles for the past several years. George B. Turner, for several years past identified with the automobile industry, is manager of the new concern. The company has leased and remodeled for use as a garage the large building on Second East Street between South Temple and First South formerly used by the Utah Light and Railway Company as a car-barn. While several central stations have inaugurated battery service for trucks it is believed that the Electric Truck Service Company is the first one independent of a central station to adopt this policy.

Digitized by Google

THE FUTURE OF WATER-POWER DEVELOPMENT IN ALABAMA.[1]

By Thomas W. Martin.

Of all the natural resources which abound so profusely in Alabama, there is none that promises so much for the development of the state at this time as does the proposed water-power development of the Tennessee, Coosa and Tallapoosa Rivers. The state of Alabama has reached a point in its industrial progress where plants must be built with which to convert crude material into finished products for the markets of the world, and the water-power developments will afford the dual purpose of supplying the power which may be used at the present day in almost every branch of manufacture, and at the same time enable navigable waterways to be opened to the coast.

Prior to 1830 the government of the United States took cognizance of the Tennessee and Coosa Rivers looking to their development, and from time to time large sums of money have been spent by the United States with that end principally in view. The many rocky shoals in those rivers, as well as their flashy nature, make it now impracticable to proceed with a development, such as the United States originally proposed, consisting of a number of small dams creating slack-water pools of shallow depth. To meet this condition the modern school of thought has developed the plan of increasing the height of dams, creating larger pools and utilizing the water not only for the purposes of navigation but for the equally important purpose of the development of electric energy. The engineers of the United States have comprehended in a broad and thorough way the possibilities of co-ordinating commerce and industry in the development of the rivers of this state, and be it said to their credit that if they had received the support of the Congress of the United States far greater progress would have been made on this subject in almost every part of the country. At the present time there is one large development recently completed by the Alabama Power Company on the Coosa River in Alabama at Lock 12, being the site selected some years ago by the engineers of the United States for the location of one of the navigation dams upon that river. This one development today is supplying the power and lighting needs of the great industrial section of Alabama, as well as a number of cities and towns, and the plant is not completely loaded. At the same time, a stretch of the Coosa River of some twenty miles in length has been opened to navigation. This result, however, was accomplished by the Alabama Power Company after many difficulties were surmounted, both physical and financial, and the power is now being sold at an extremely low rate on account of the cheapness of coal and the potential competition from the steel companies and by-product furnaces.

The future of such developments lies entirely with the public. The state of Alabama many years ago placed upon the statute books a system of laws having the definite purpose of encouraging the development of the water-power resources of the state. This was in pursuance of a demand on the part of the public that the power of the streams, which has been going to waste all the years, should be turned to a useful purpose. The laws of the state may therefore be said to be ample for this purpose, and tend to encourage such developments. The great water powers of the state are with few exceptions located on navigable streams; and even other streams, such as the Tallapoosa and Little Rivers, empty into navigable rivers; and it is the policy of the Federal Government to assert control not only over the navigable rivers but the streams leading into them, and therefore developments which might be made on the non-navigable streams of the state are seriously affected by the possibility of federal control.

There has been no important action by Congress in the aid of water-power developments since 1907. Prior to that time a number of developments had been authorized under government permits, which were revocable at the will of the government. However, those who made the developments proceeded upon the theory that their investments would be protected if made in good faith, but notwithstanding this sound principle a large number of permits were some years ago arbitrarily revoked by the Secretary of the Interior, although the permittees had not violated any law or regulation; and at this time a large number of ejectment suits are pending in the United States courts which, if successful, will in effect confiscate about one hundred million dollars' worth of property, the most of which was built on the assumption that government permits were secure. Those who have taken up and followed the so-called Pinchot idea of conservation have insisted upon the same principle in every water-power bill that has been proposed in Congress and as a result no dams have been built under any general legislation since 1907; and it is safe to say that in the light of the experience of those who have invested on the faith of federal permits which were revoked, none will be made until a sound, stable and conservative law is enacted by Congress which shall fix with certainty the status of developments made on the faith of laws. It may be argued that those who desire to make the developments have insisted upon conditions and terms which were not fair to the public, but such is not the case, and those who have followed the subject in and out of Congress will find that the water-power companies have long ago conceded practically every principle of federal control, save and except that one which reserves to the government the right to arbitrarily revoke such grants.

The coming session of Congress will doubtless see a conclusion upon this subject; and either a practical system of laws will be enacted under which developments may proceed, or else the opposing theory of revocable permits and the like will control, which it is safe to say will prevent water-power development not only in this state but elsewhere.

If the federal laws favor water-power development there is no state which will eventually secure greater benefits than will Alabama. As a result it is entirely possible that within a few years Alabama will take a front rank among the industrial states of the country. The electric energy thus produced may be used in many ways among which the electric furnace is possibly the most important at the present time. New processes involving the use of this furnace have been perfected within the past few years. A large amount of horsepower has been developed in European countries for the fixation of atmospheric nitrogen in the form of nitrate of lime, nitrate of soda and cyanides, which products are used in the manufacture of fertilizers, cyanamids, and other needful products.

Frank S. Washburn, president of American Cyanamid Company, thus described the process in his address before the National Conservation Congress at Washington November 18, 1913:

"The cyanamid process for the fixation of atmospheric nitrogen proceeds by the way of combining nitrogen gas with calcium carbide to form calcium cyanamid. The characteristic steps of the process are simple, consisting first of bringing calcium and carbon, in the forms respectively of lime and coke, into chemical combination in the intense temperatures of the electric furnace, forming calcium carbide, grinding this product to a powder and treating it in a secondary set of electric furnaces with nitrogen gas of a high

[1] Paper read at meeting of Alabama Light and Traction Association, Montgomery, Ala., October 21, 1915.

Digitized by Google

degree of purity. The nitrogen is best secured by the mechanical liquefaction of air and its coincident fractional distillation. The product from the secondary furnaces is crushed and reduced to the form of powder, hydrated to remove caustic lime, and is ready in this state for direct application to the soil, either alone or in combination with other plant foods. Cyanamid has other uses as the raw material in the manufacture of a long line of derivatives, such as ammonia, nitric acid, ammonium nitrate, and, possibly more important than all of these together, in the production of a cheap cyanide, which may have a profound effect on gold, silver, and copper reduction. The product, ton for ton, has a higher fertilizing value than Chilean nitrate, and per unit of nitrogen practically the same fertilizing value as calcium nitrate, Chilean nitrate, sulphate of ammonia, blood, tankage, and cottonseed meal."

The cyanamid industry at this time represents the investment of more than $30,000,000, and is established in practically every country in Europe, in Canada and Japan, but there is no factory in the United States. This process may be expected later to give the world its nitrogen supply at half the price that it will otherwise command. The conservation of the soil fertility would be wholly inadequate to the needs of the world except that it included the use of nitrogenous fertilizers.

It would be difficult to imagine a combination of circumstances offering a more extreme case of the value of conserving the natural resources, for we have here the possibility of using the power of the rivers which has been going to waste by nonuse since the dawn of the world, and harnessing this wasting energy in the manufacture of a fertilizer by the fixation of the nitrogen in the atmosphere, the supply of which will be inexhaustible to the end of time, and as a most useful result, directly cheapen and increase the country's food supply.

In 1912 arrangements were made to introduce the cyanamid industry in Alabama. It was early perceived by the Alabama Power Company that the development of a single power site on a stream as variable in its flow as southern rivers usually are could not possibly be remunerative, and it appeared advisable to proceed immediately with plans for another development on the Coosa River at the site selected for lock and dam numbered 18. Application was made to Congress for the necessary permission to construct the dam at that site, under the terms of existing federal statutes. The Act was passed by Congress, but because of certain opposition at Washington, the president vetoed the bill, although in exact accord with the general Dam Act of Congress which was then, and for that matter, still is, in vigor. The veto of the president and the consequent uncertainty of the company's position made it impossible to establish the proposed cyanamid factory in Alabama, and as four million dollars had been specifically provided for this purpose, and could not be indefinitely held up, it was decided to establish the new works in Canada where power was much cheaper and every protection was offered. That plant has since been completed and is now in successful operation.

This new policy of the Federal Government prevented the opening to navigation of another long stretch of the Coosa River, and deprived Alabama of a new industry which promises to be one of the world's greatest. It prevented the location in Alabama of a new factory permanently employing hundreds of men, of whom a very large percentage would have been skilled scientists of the highest class.

Let it be remembered that to prevent the use of running water for the fixation of atmospheric nitrogen is simply to prolong and strengthen the monopoly of the world's supply of nitrogen controlled from the plains of Chile, because it is otherwise the single natural available source of supply. In one recent year, $75,000,000 worth of nitrate was exported from that country, practically 80 per cent of which was used in agriculture. During the last decade the exportation of Chilean nitrate has increased 60 per cent in quantity, 60 per cent in price and 150 per cent in total value.

With cheap power Germany has been able to produce new nitrogen compounds which threaten to revolutionize our present system of fertilization. This industry, to which the war has given the impetus, has assumed such dimensions and has given such unexpected results, that the government requested the German parliament to grant an imperial nitrogen monopoly. From the official documents it appears that chemical compounds have been discovered which allow the production of a *universal fertilizer*.

That this scientific achievement will prove of momentous importance appears from the fact that the giant chemical works which supply the world with dyestuffs, synthetic remedies and other coal-tar products, have become important factors in the fertilizer industry of Germany.

These sources of nitrogen assure to Germany an unlimited supply of nitric acid for all war purposes, and enable that country today to prosecute the war with practically absolute independence of all other sources of nitrate.

Senator Underwood recently pointed out that the Ordnance Bureau of the War Department had under congressional authority been endeavoring for years to accumulate a reserve supply of 65,000,000 pounds of sodium nitrate, and had at this time approximately from 40,000,000 to 50,000,000 pounds, and at the present rate of supply it would require something over five years to complete the reserve, and consequently much of the country would be unprotected for want of an adequate supply of sodium nitrate in time of war. This condition alone furnishes an opportunity to build up a great nitrogen industry in the United States, which would require enormous quantities of electric energy, and would free this country from its dependence upon foreign countries in this respect.

The electric furnace is being used more and more in metallurgy, and it is apparent that with the development of cheap hydroelectric power great amounts of electricity will be used in the treatment of ores and the manufacture of steel.

It is further of interest to note the use of electric energy in the operation of pumping plants to convey water in the arid regions of the west, and the operation by electrical energy of several lines of railroads in the mountainous regions of the west. Through some sections this has resulted in a large reduction of operative delays, an increase in ton-miles hauled per annum, and a large decrease in operating expenses, and as a result, of course, much coal is saved, and the water power, a product that has gone to waste from the beginning of time, is utilized. Furthermore, a large amount of the equipment owned by the railroads, normally used in carrying coal, is released for more useful purposes.

The foregoing are merely a few examples which show that new uses and new markets are created for electrical energy, if only the tenures are permanent and safe, and the size and cheapness of development are such as to make reasonable profits possible at low selling costs. Every practical man of wide experience in the electrical industry knows that the permanency and safety of the investment means more and cheaper development capital, if not the ability to get capital, and that in turn the cost of capital is by far the most important element in the development of the industry.

Water-power development in different parts of the country is already projected to the extent of more than $100,000,000, and only awaits the passage of water-power legislation by Congress under which capital may be safely provided for construction purposes.

Digitized by Google

New Electrification Work on London Suburban Railroads.

The electrification of practically all the suburban lines of the London and South Western Railway which has been in progress for the past two years in England is now nearing completion. The power house is situated about the center of the system as regards distribution, and takes condensing water from the River Wandle. The boiler-house equipment comprises 16 Babcock boilers with a firing floor between two sets of eight. They have chain-grate stokers; Green's economizers are fitted; coal-bunkers holding 1,400 tons of coal are over the firing floor and the basement contains the suction ash plant and the main flues.

In the turbine house there are five main turbo-alternators of 5,000 kilowatts capacity (1,500 revolutions), generating at 11,000 volts three-phase; the turbines are of the impluse type and each has a separate condenser in the basement. Each set embodies a direct-connected exciter and motor-driven fan for ventilating the alternator. There are three auxiliary turbo-generators of 400 kilowatts, 200 volts, direct current, for power and lighting; the turbines run at 5,000 revolutions and drive the generators through gearing at 575 revolutions per minute.

All the high and low-tension switchgear is placed in a separate bay running the whole length of the power house. This bay is 21.5 feet wide and the switchgear is arranged on three floors. The high-tension switchgear is of the remote-control type and is in three groups. The group busbars are connected to the main or interconnecting busbars through oil switches fitted with an automatic maximum release with a time element. Cable boxes and transformers are on the turbine-house floor, oil switches and operating mechanism on the first floor, on which is also the control room, and the busbars on the second or top floor. The auxiliary switchboard for the 200-volt continuous-current supply is erected in the switchroom adjacent to the main control-board. A 220-volt battery is also installed for the purpose of ensuring the supply of current for control purposes. To ensure a continuous supply of feed water, a storage tank having a capacity of 110,000 gallons runs the whole length of the building on the flat roof over the switchgear bay.

As mentioned above the condensing water is normally obtained from the river and two ferro-concrete ducts are laid for this purpose. At times of drought circulating water will be drawn from the outlet duct by means of motor-driven centrifugal pumps, and pumped over cooling towers erected beside the water ducts at the power-house and nearest the river. Two motor-driven screens in the inlet duct will remove weeds, leaves and other refuse from the river water. The outer or coarse screen consists of fixed bars, cleaned by a motor-driven rake, and will deal with 2,000,000 gallons of water per hour. The inner or fine screen is a rotating disk, the top being cleaned by water jets and the bottom collecting any fine particles or gelatinous matter getting through the outer screen. The water flowing back from the power house to the river forms a series of cascades and is cooled before being finally discharged into the river.

Repair and inspection shops for dealing with the electric trains have been erected adjacent to the power house.

The extra-high-tension feeders between the power house and the substations are three-core, delta-section, paper-insulated, lead-sheathed, single-wire-armored, and jute-served. Four sizes of cable are used: 0.2, 0.15, 0.1, and 0.06 square inch respectively. Generally, the cables are run beside the line upon hooks fixed to posts, but where they cross the line or run through station platforms they are laid in asphalt troughing. A large proportion of the 11,000-volt feeder system is in the form of a ring main and where duplicate cables are provided in this ring, they are fitted with protective gear consisting of balanced relays, which, in the event of a fault, isolate the length of defective cable at both ends. Duplicate cables which do not form part of the ring main are provided with balanced relays at the feeding end and balanced reverse-power relays at the receiving end. Two lengths of single feeder are fitted with Merz-Price protective gear, in connection with which three-core pilot cables have been provided.

The 11,000-volt supply is distributed to nine substations where it is transformed down and converted to continuous current at 600 volts, at which pressure it is delivered to the conductor rails on the track.

The substations are situated at Waterloo, Clapham Junction, Raynes Park, Hampton Court Junction, Kingston, Sunbury, Twickenham, Isleworth and Barnes.

They contain static transformers, rotary converters and the necessary high and low-tension switchgear. The rotary converters are of two sizes, viz., 1,875 and 1,250 kilowatts, and each of them is supplied by three single-phase oil-cooled transformers.

The high-tension switchgear is completely inclosed in molded stone cells, and, with the exception that the oil switches are hand-operated, is similar in construction to that installed at the power house. Each of the continuous-current feeder panels controls two circuits, each of which has a maximum capacity of 5,000 amperes.

The feeder circuit-breakers are equipped with indicating lamps which, when the breakers are open, show the position of the breaker through which the different sections of conductor rail are fed from the next substation.

The third rail is laid at one side of the track 16 inches from gauge, and 3 inches above rail level; it is of special high-conductivity steel and weighs 100 pounds per lineal yard. The resistance is approximately 6.75 times that of copper of equal volume. It is bent down at the ends to form the ramps, and is bonded at the joints with four copper bonds having a total cross-sectional area of 1.4 square inches.

The jumper cables connecting adjacent lengths of conductor rail at crossings and other points where it is necessary to have a gap in the rail, are of one square inch sectional area, and are made up of 127/0.101-inch diameter copper wires insulated with rubber, bitumen-sheathed and braided.

The return circuit is formed by the running rails, the joints of which are bonded with two copper bonds of the protected type placed under the fish-plates. These bonds are made up of copper strips, and have a total cross sectional area of 0.33 square inches.

The running rails are cross-bonded at frequent intervals.

The rolling stock consists of 252 51-foot compartment-type coaches, until recently used in steam service and now converted for electrical working.

The substations, passenger stations, freight yards and sidings, between Waterloo and Clapham Junction, and on the "Kingston Roundabout" line, will take their lighting supply through a separate cable, which will also serve for supplying power in connection with the track-circuit signaling arrangements. Single-phase alternating current at a pressure of 3,300 volts is supplied through this cable to static transformers placed in small brick chambers built at intervals along the route, current being transformed down to 220 volts.

The 3,300-volt supply is obtained from frequency-changer sets situated at the power house and at Waterloo, Clapham Junction, Raynes Park, and Twickenham.

Four of the sets consist of single-phase generators driven by three-phase induction motors, which obtain their supply from the 11,000-volt busbars through step-down transformers.

To ensure an absolutely reliable supply, three motor-generator sets are

Digitized by Google

also provided. Two of these are at the power house, and consist of single-phase generators direct-coupled to 220-volt motors driven off the power-house auxiliary supply and storage battery.

The third set is at Waterloo substation, and the motor driving the generator is, in this case, supplied from a 600-volt battery installed as a standby to the lighting of the terminal station.

The 3,300-volt feeders are 0.05 square inch, twin-core, paper-insulated, copper-taped, lead-sheathed, wire-armored, and served, and are divided into sections at the transformer chambers, where they are connected to oil switches.

These oil switches are fitted with trip coils operated by relays, having operating coils connected to the copper tapes on the cables. In the event of a fault developing on a length of cable, the relays at each end of the defective length come into operation, and trip the oil switches, thus cutting out the length.

The London suburban system of the London and South Western Railway is one of the largest electrification works carried out on British railways. The lines form the circular route from Waterloo via Wimbledon, Kingston, Twickenham and Richmond, back to Waterloo, the Hounslow loopline, and the Hampton court, Claygate and Shepperton branches. The route length is 47 miles with 140 miles of single track. Later a further 50 miles of route with 100 miles of single track will probably be electrically equipped.

It was after a full investigation of all the systems in commercial use that the engineers of the railway decided to adopt direct current with 600 volts on the third rail. We are indebted to the general manager of the railway for the very complete particulars which we are enabled to give concerning the equipment.

The trains are equipped for multiple-unit working, and in three-coach units, a trailer coach being closely coupled between two motor coaches. Three or six-coach trains will be run according to traffic requirements. Each three-coach unit weighs 94 tons unloaded and seats 190 passengers. Each unit is equipped with four 275-horsepower motors, 590 revolutions per minute, geared 21/59 on standard 42½-inch driving wheels; these motors are series-wound, totally inclosed, arranged in pairs on the bogies underneath the driving compartments at opposite ends of the unit. All the electric control gear is placed in these compartments, each pair of motors being controlled by its own set of control gear. The arrangement of the control gear in the driver's cab was decided upon by the railway company's engineers in preference to having it underneath the coach on account of the greater ease of access for inspection, cleaning and adjustment. The positions of the individual pieces of apparatus have been carefully arranged with this end in view. Access to the control apparatus is obtained on the one side from the driver's compartment and on the other through large hinged doors in the partition between the driver's and luggage compartments. The advantage of placing the control apparatus in the driver's cab is that the weight of this apparatus comes over the driving bogie and so increases the adhesive weight on the driving wheels.

The box-type frame is used for the motors; the bearings are carried in end housings and the motor is equipped with commutating poles. Special machine tools were designed to overcome the difficulties met in machining the box type of yoke, also in the planing of the interpole seats which lie as it were in the corners of the box-type frame. The motor casing is carried by a suspension bracket which is supported through rubber springs from the truck transom.

The control of the trains is effected by the Westinghouse "All-Electric" system of automatic relay control. The motor current is handled by electrically operated contactor switches, the operating coils of which are connected to control wires running throughout the length of the train and actuated by six small master controllers. The contactors are provided with interlocking switches connected in their operating circuits to ensure the correct sequence of changes in the connections. The motor equipment on each coach is controlled during the accelerating periods by its own relay, which is independent of the other relays on the train; therefore the motors on the different coaches are notched up in accordance with their individual requirements, which are, in a measure, dependent upon the diameter to which the wheels may be worn and the slight inherent differences in the characteristics of the motors. The load on the different motor coaches is equalized and a low energy consumption obtained. The master controller is a very simple piece of apparatus; the driver merely has to move the controller right round to the full "on" position and the relays automatically do the rest. Powerful magnetic blow-outs are fitted to all apparatus where there is a possibility of arcing. Each contactor and circuit-breaker is carried by a pressed-steel plate clamped to mica-insulated steel tubes which are fixed to two channel irons running the full length of the switch group. The interlocking switches are fixed at the back of the contactor switches, and are operated by a lever from the movable core of the contactor solenoid, thus ensuring a definite position of the interlocking switch, corresponding with a definite position of the contactor. The frame carrying the contactor switches forming the motor-car group lies across the width of the coach in the driving compartment. It also carries the necessary motor-starting resistances and the main fuse above the contactors. The motor resistances are of the usual three-point suspension grid type, mounted on mica-insulated tie bars fixed to pressed-steel end frames. The circuit-breaker is similar in construction to the contactor switches and is provided with heavy laminated brushes in addition to the contact jaws, and adjustable overload and trip coils.

The reverser is of the drum type. The drum castings are clamped to mica-insulated shafts provided with heavy copper contact segments. The fingers are made with renewable tips and provided with swan-neck finger springs and heavy copper shunts. The finger bases are clamped to mica-insulated bars. The interlocking of the control circuits for operating the reverser is effected by an additional contact drum attached to the main spindle, so that a fixed relationship between the making and breaking of the main control circuits is obtained. A powerful magnetic blow-out is provided for the interlock fingers, which are identical with the swan-neck fingers used in the master controller.

The master controller is of the drum type and is provided with both main and reversing handles, so interlocked that the reversing handle must be either in the forward or reversed position before the driver can operate it.

The main handle of the master controller has four operating positions, namely: The first position, usually called the "switching" position, gives series connections to the motors with all resistance in circuit; the second position brings the automatic relay into operation and the resistances are cut out of circuit step by step until full series is obtained; the third position connects the motors in parallel, the well known bridge connection being used in passing from series to parallel; the fourth position brings the automatic relay into operation again, cutting out the resistance step by step until full parallel is obtained. It is unnecessary to pause on each notch of the controller until the corresponding motor connections are completed, but the handle may be moved directly to either the series or parallel positions, when the control apparatus automatically notches up step by step until the position is reached corresponding to the particular notch on which the handle is placed.

Digitized by Google

The control apparatus throughout is constructed of non-inflammable material, and the whole of the insulation is of mica. Practically all the wiring is in the driver's cab, and the connecting train wires and through shoe cable are fixed on the roof of the coach out of the way of the uninitiated.

The lighting of the compartments was made the subject of special study by the engineers, and electric radiators are suitably grouped throughout the various compartments for heating purposes. The Westinghouse brake system is used on the trains, the air being supplied to the brake system by small compressors direct-driven by slow-speed motors, one of which is placed in each motor-car. The action of all these compressors on a train is controlled by a master governor and switch which produces uniform compressor labor throughout the train as all compressors start and stop simultaneously; this is the Westinghouse governor synchronizing system.

Important Utility Merger for Idaho Completed.

The Electric Bond & Share Company, of New York, through S. Z. Mitchell, president, has recently completed the details of a merger involving several important utility properties in Idaho. The amount of capital involved is said to be $20,000,000. The consummation of this deal has required more than a year of difficult work. All of the properties involved have been taken over by the National Securities Corporation, the holding company for the Electric Investment Company, the operating company.

Mr. Mitchell states that the immediate result of the combination of the properties will be an early unification of all of the plants affected. They will be connected as the power plants of Utah have been connected by the Utah Power & Light Company, so that the total resources of all of the plants will be available at any point of service. The present holdings of the company give them four plants, while two others are to form units in the power chain though not part of the merger. The plants to be so interconnected are the Oxbow plant on Snake River, Ore., the Swan Falls plant, the Malad plant, the Boise-Payette plant on the Payette River and the Shoshone and Thousand Springs plants. The first four are now owned by the new company. The Shoshone plant is allowed to combine in the power service by a permit granted by the state to the receiver, in whose hands the plant now is, and the Thousand Springs plant is allied with the Shoshone plant by contract.

The merger of the companies was authorized by the Idaho Comission.

Power-Plant Equipment for Massachusetts Institute of Technology.

The new boiler plant of the Massachusetts Institute of Technology will at the beginning develop about 2,000 horsepower in steam. It is modeled on the lines of a very modern power house, but unusually condensed, being ten feet narrower than any other station of similar capacity. This narrowness is because the building lies in the 90-foot strip belonging to Technology between Vassar Street and the railway. The latter affords economical delivery of coal in large quantities, and with mechanical stokers and other appliances the coal is not handled by men at any stage of its use.

The boilers lie transverse to the street and railway, being so placed in order to make more easy the addition of other boilers as the future needs of the growing Institute may demand. There will be 1,560 horsepower of new boilers and 400 removed from Trinity Place, the new ones being of the Babcock and Wilcox pattern, with Riley stokers and working under forced draft.

One especial feature will be that the boilers will be equipped for heavy overloading, so that they will be able to evaporate water to an almost unlimited extent in ratio to the combustion. When not in demand any boiler will be automatically slowed down.

There are features in this plant that make it different from ordinary commercial boiler rooms. It will itself be a laboratory for the use of students. The boilers are of the wrought-steel, water-tube type, designed for 175 pounds working pressure and superheating the steam 100 degrees Fahrenheit, an important economy in the use of the steam turbine. The stack measures ten feet in its bore and 18 feet in outside diameter and will stand 180 feet above its base.

To convey steam to the buildings and laboratories where it will be needed a subway of reinforced concrete is being built, about seven feet square in inside measurements and 625 feet long. For furnishing condensing water for the turbines a concrete main has been laid. This conduit is 30 inches in diameter, running back from the Charles River Basin along the western edge of the great court. It will be over a quarter mile in length, and in rainy weather it will collect the rainfall of the area and turn it in for condenser water.

The electrical outfit is an interesting one, since the engine room will serve for substation as well as for central station. The initial equipment will include three turbines direct-connected to generators, one of 750 kilowatts, a second of 500 kilowatts and the third of 150 kilowatts, furnishing three-phase current at 2,300 volts. There will also be one 150-kilowatt turbine and two 150-kilowatt motor-generators furnishing direct current at 110 and 220 volts, and two 35-kilowatt exciters, one each steam and turbine-driven. The current in various voltages will be conducted to the buildings and laboratories in lead-covered cables running in a special conduit.

The steam laboratory itself is to be located in the long building, near and parallel to Massachusetts Avenue. High-pressure steam coming through the subway will be distributed to two mains below the ceiling of the first floor. There will be a superheater here connected at will with the machines where experiments are to be made. The condensers of the various engines in this laboratory are in the basement and take the cooling water from one of the large hydraulic canals, passing the warmed water into a hot-water return. In the basement there will be apparatus for determining the flow of superheated steam through orifices or turbine nozzles.

On the first floor of this building will be located the engines which make a formidable showing. There will be a Curtis turbine of about 75 kilowatts capacity, a 30-horsepower Corliss engine with dynamometer attached to the flywheel, a 225-horsepower McEwen tandem compound, a compound and generator of the same make of 250 horsepower, and a triple-expansion Corliss. These engines will be ranged along the western wall of the building. On the opposite side of the great laboratory will be a Brown engine, driving a three-stage compressor, which compresses air to 2,500 pounds per square inch. There will be two or three other compressors, and a few small engines to illustrate different types.

Success of German Central-Station Company in Spain.

Information has recently been published of the successful year's work of the Compañía Sevillana de Electricidad, of Seville, Spain, the receipts during 1914 having been 2,267,436 pesetas (peseta=$0.193) against 2,077,110 in the preceding year. The net profits for 1914 were 980,336 pesetas against 886,660 pesetas in 1913, and of the former amount 47,968 pesetas was added to the reserve, 384,000 pesetas paid in dividends, and 350,000 pesetas set aside for amortization of bonds.

Since 1911 the company has paid dividends of 8 per cent annually, established a reserve of 405,480 pesetas, paid 3,348,020 pesetas for amortization of bonds, and now has a capital of 12,800,000 pesetas.

Digitized by Google

BOOK REVIEWS.

"Standard Handbook for Electrical Engineers." Fourth edition. Prepared by a staff of specialists; Frank F. Fowle, editor in chief. New York: McGraw-Hill Book Company, Incorporated. Leather, 1984 pages (4x6¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $5.00.

After considerable delay and many announcements by the publishers, the fourth edition of the "Standard Handbook for Electrical Engineers" has finally been issued. In its present form it is a much larger volume than any of the previous editions, and as it embodies so many changes and so much new matter it is substantially a new book. Practically all of the old material that has been retained has been rewritten and more conveniently and logically grouped. Much new material has been included in the old sections retained, and in addition, sections 11, 12, 14, 15, 17, 18, 20, 23, and 25 are either entirely new, or contain entirely new material.

Space does not permit a review of each individual section, suffice it to say, that the whole field of electrical engineering has been covered, as is evident from the section headings, which are as follows: Units, Conversion Factors and Tables; Electric and Magnetic Circuits; Measurements and Measuring Apparatus; Properties of Materials; Magnets, Induction Coils, Condensers and Resistors; Transformers and Rectifiers; Alternating-Current Generators and Motors; Direct-Current Generators and Motors; Converters and Double-Current Generators; Power Plants; Power Transmission; Distribution Systems; Interior Wiring; Illumination; Industrial Motor Applications; Electric Railways; Electric Commercial Vehicles; Electric Ship Propulsion; Electrochemistry; Batteries; Telephony and Radiotelegraphy; Miscellaneous Applications of Electricity; Mechanical Section; Standardization Rules of the A. I. E. E.; Engineering and Central-Station Economics.

Indices to the sections for quick reference are given on the inside of the front and back covers; each section is introduced by a table of contents and concluded with a well selected reference bibliography. This last is an exceptionally valuable feature. A most complete index to separate items closes the book.

Very little adverse criticism can be made of the contents of the volume. The high standing of the authors of the several sections is a guarantee of the reliability of the material included. It seems to the reviewer, however, that a four-place table of logarithms is of little use in an engineering handbook. Calculations made by the aid of a good slide rule are practically as accurate, and hence if the inclusion of a table of logarithms is thought necessary, a more accurate one should have been used.

Of course the reviewer has not attempted to verify the accuracy of all of the data contained in the book. There is one item, however, in regard to the constant, k, of a ballistic galvanometer which is not clearly explained in this, as well as in some other handbooks and text books. It is not stated in Section 3-17 that the values of this constant when determined by the two methods outlined are not the same and that each has its limited field of application. For example, in Section 3-297 it is not shown by which method the value of k, as used in the formula given, is to be determined. If determined by the condenser method, the values of H obtained will be consistent, but they will not be the true values. This discrepancy was pointed out by the writer in the *Electrical World*, Vol. 53, p. 864.

The mechanical make-up of the book is in harmony with the other handbooks published by the McGraw-Hill Book Company. It is well printed and bound. Both the authors and publishers are to be congratulated. In view of the fact, however, that the book is too heavy for the pocket, it is the opinion of the reviewer that the size of the page might have been advantageously increased, thus decreasing the thickness of the volume and making it more convenient to handle.

C. M. JANSKY.

"Electric Cooking, Heating and Cleaning." By Maud Lancaster. American edition revised by Stephen L. Coles. New York: D. Van Nostrand Company. Cloth, 329 pages (5½x8½ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $1.50.

Originally written for women, this volume was first edited by E. W. Lancaster, who presumably is responsible for the general technical accuracy and for a variety of curves and charts. Now the resulting British edition has been revised by Stephen L. Coles (formerly managing editor of the ELECTRICAL REVIEW), who has Americanized it to a considerable extent, although evidently unable to find adequate substitutes for scores of the illustrations showing British types of heating and cooking apparatus. Consequently, we have here a book evidently intended for women, yet containing a variety of charts unintelligible to the average housewife and illustrations which may stimulate a demand for types of apparatus which the American central station or supply house cannot readily furnish. Yet, in spite of these incongruities, this is a work which central stations ought to use in their propaganda (as, for example, by presenting copies to the more prominent of the local women's clubs) and which should also be of value to their domestic-appliance salesmen.

Nearly 200 pages are devoted to electric cooking in general and to electric cooking appliances, much valuable information being given in a form in which it should appeal to the progressive woman and stimulate her towards using the appliances offered for this purpose. Then follow a hundred pages on other household uses of electricity other than for lighting, such as water heating, room heating, vacuum cleaning and ventilation. Occasionally, some statements lack a desirable accuracy, as when the authors state that electric ozone generators increase the amount of oxygen, but such slips are infrequent. The authors' practice of giving the operating costs for each appliance is admirable, though the wisdom of basing these costs on a rate of two cents per kilowatt-hour is open to question. Indeed, the volume closes with a tabulation of the rates charged by some four hundred central stations in this country for heating and cooking, of which only three offer such a rate for the average household consumption! The others range up to 20 cents per kilowatt-hour, although a few are reported as making no charge at all for such current. The omission of nearly all the larger cities is noticeable and makes this tabulation hardly representative of the cost of such current to the average user.

For American readers, the use of electric fans as auxiliaries to steam radiator and hot-air furnaces, and as means of removing frost from windows are so important as to deserve inclusion in a work of this kind. However, the book as it stands includes a wide range of electric appliances for household, hotel and restaurant use and should serve as an effective stimulant towards a more general understanding of the countless ways in which electric appliances can add to home comforts.

ALBERT SCHEIBLE.

"The Book of Wireless." By A. Frederick Collins. New York: D. Appleton & Company. Cloth, 222 pages (4¾x7¼ inches), profusely illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00.

This is a volume for the amateur—one might say for the small boy; and the small boy constitutes the wireless operators of today to the number of thousands. The book describes the construction and use of a simple wireless outfit and devotes two chapters to the construction of induction coils, transformers and electrolytic interrupters. The government regulations are included and an appendix gives a dictionary of electrical words and other useful information for the amateur. The instructions given by the author should enable any boy with a normal aptitude for such things to do some interesting experimenting in the wireless field.

Mica is of widespread occurrence and has been mined in many countries, but the world's production has come chiefly from India, the United States, Canada, German East Africa, and Brazil. Deposits of probable value are known in more than 20 of the United States.

Digitized by Google

New Electrical and Mechanical Appliances

Three-Volt Dry Battery for Lanterns.

All dealers who sell battery lanterns will be interested in the latest development in this field: a new three-volt high-efficiency battery just perfected by the Usona Manufacturing Company, of New York City and Toledo, O. This is for use in all battery lanterns designed to use the standard No. 6 dry battery. The new battery has the same outside dimensions as the regular No. 6 battery, but is claimed to have twice the length of life and to give twice the amount of light possible from a No. 6 battery. This new battery is called No. 66 or Double Six, and should find a very large sale, as enormous quantities of battery lanterns have been sold. The manufacturer claims that the new battery will double the use-

Three-Volt Dry Battery.

fulness of the lantern both as to brilliancy of light and length of burning hours.

Factory Sewing-Machine Motor.

Practically all the labor incidental to the old-time method of sewing-machine operation is eliminated, and the output of the machine is greatly increased, by the use of the factory sewing-machine motor illustrated in Fig. 1. It is designed for heavy sewing service, such as is encountered in clothing shops, department stores, and awning and sail factories. It is very quiet in operation, requires practically no attention and can be applied to any make of sewing machine.

Modifications of the well known Westinghouse types CA alternating-current and CD direct-current motors are used on these outfits. To start the sewing

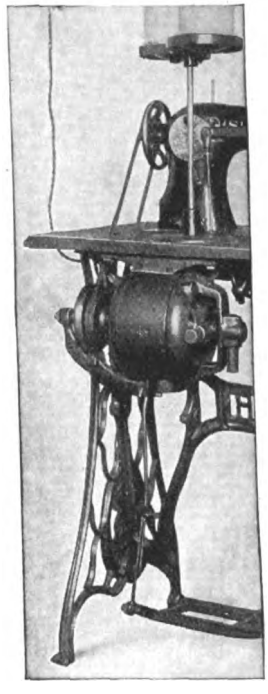


Fig. 1.—Factory Sewing-Machine Motor.

machine, a free running pulley belted to the handwheel of the machine is driven by a clutch operated from the machine treadle, and to stop it, a brake is applied as the clutch is released. Complete range of control is obtained by a slight movement of the treadle.

The needle is under the absolute control of the operator at all times. A slight pressure of the foot on the treadle is the only effort required to operate the machine even when running at a speed many times that obtainable when foot power is used. A single stitch can be made, the machine can be run continually at full speed, or any intermediate speed can be obtained.

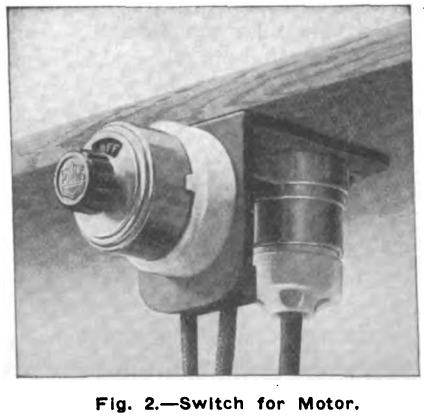


Fig. 2.—Switch for Motor.

These outfits are made in two styles, one for alternating and one for direct-current circuits. A switch, shown in Fig. 2, for mounting on the machine, is furnished for starting and stopping the motor. These motors are made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

New Porcelain Strain Insulator.

A new type of strain insulator, known as the Triangle porcelain strain insulator, has been placed on the market by the Illinois Electric Porcelain Company, Macomb, Ill. As shown by the accompanying illustration, its form is such as to give it an exceptionally large leakage distance; this is said to be 50 per cent greater than that of any porcelain strain insulator. It is claimed to be about 30 per cent lighter in weight. The material is so disposed that the body is nearly of the same thickness throughout. This insulator

Triangle Porcelain Strain Insulator.

is also of such shape that in the process of molding the porcelain is made much more dense than in ordinary forms.

Helsby Power Condensers.

As the result of experimental work which has extended over many years, a new type of Helsby condenser has been patented and is being produced by British Insulated & Helsby Cables, Limited, of Prescot, England. It is a power condenser suitable for use in alternating-current power circuits. Two types of this Mansbridge self-sealing condenser are manufactured—the oil-immersed, and the solid impregnated. The former is recommended in cases where the working pressure exceeds 250 volts, alternating and the condens-

Digitized by Google

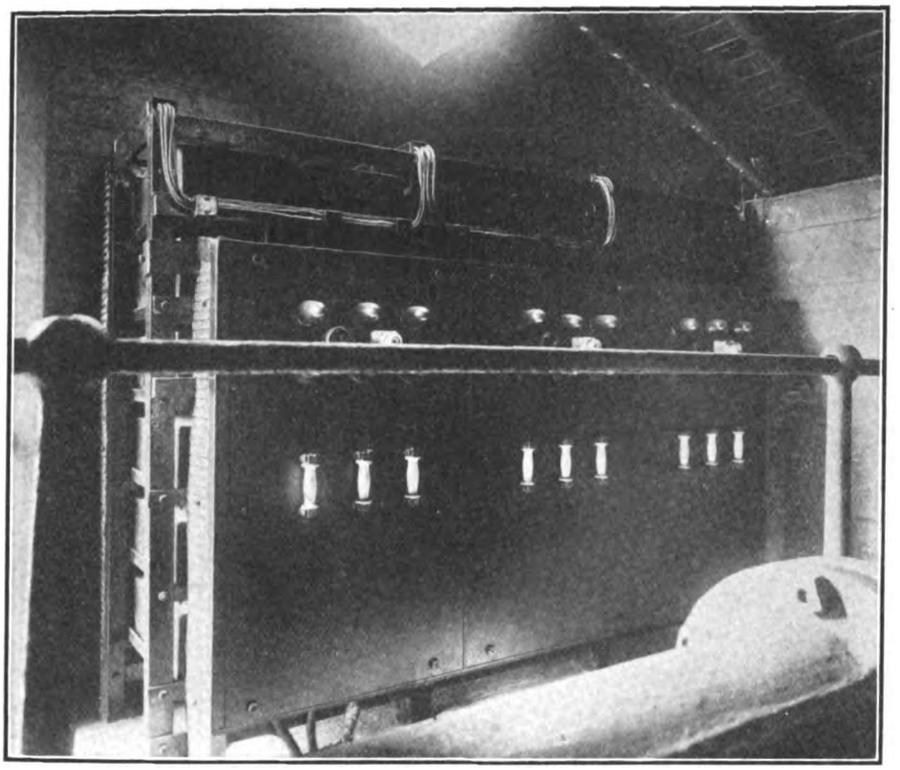


Fig. 1.—Oil-Immersed Three-Phase Power Condenser.

ers are continuously in circuit; the latter is recommended where the working pressure does not exceed 250 volts alternating or where the use of the condenser is intermittent.

The Helsby power condensers are used for power-factor improvement in alternating-current circuits; for the suppression of arcing in circuit-breakers and switches; for reducing the current or voltage on electromagnets and other electrical devices in high-voltage circuits; and for certain uses in wireless telegraphy. In addition, new uses are continually arising.

The condensers are manufactured by patent processes which give greatly increased dielectric strength while keeping the volume small and reducing the loss to a negligible quantity. Measurements of the losses made at Prescot and by independent experts, show that the efficiency at ordinary frequencies and temperatures always exceeds 99.5 per cent. The temperature rise of large capacities when working at their rated voltage and 50 cycles does not exceed 20 degrees Fahrenheit. The condensers are manufactured in units of about one microfarad and for a working pressure up to 550 volts alternating. The units are assembled in sealed metal cases in the numbers required, but for convenience in handling it is not advisable to exceed 50 microfarads in one such case. The cases of 50 microfarads each are again assembled in wrought-iron frames (or cast-iron cases for mining work) and provided with suitable switch and fuse gear.

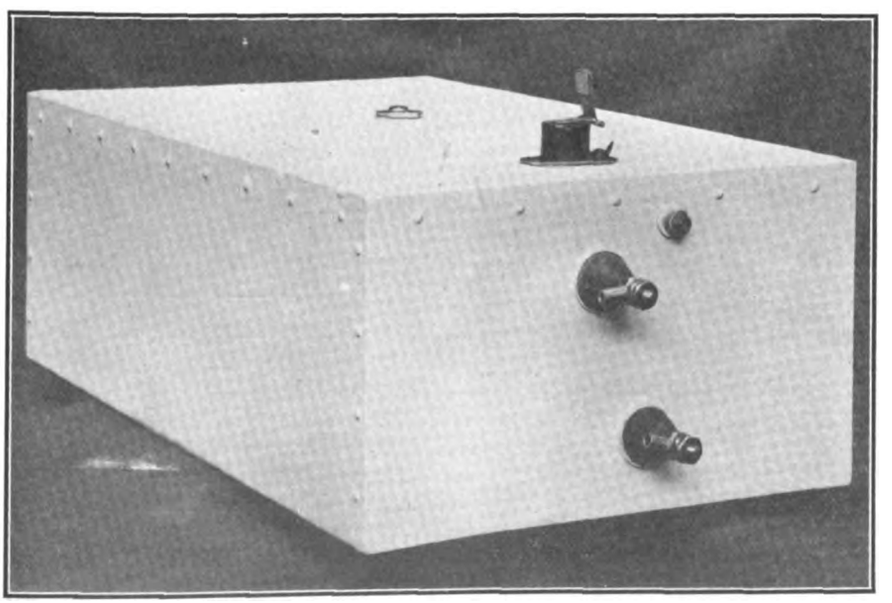


Fig. 2.—Fifty Condenser Units in Box.

It is claimed that the advantage of the use of condensers for power-factor improvement, in comparison with the installation of phase-advancers, synchronous motors, vibrators, etc., is that, if required, they can be supplied in small units, and connected directly to that portion of the system which is giving a low power-factor. The other methods entail the running of machinery, do not lend themselves to subdivision, and are costly to install and to maintain. On the other hand, a condenser can be connected directly to a transformer or motor and can be switched on and off with the machine, thus saving the losses in mains or feeders, the compensating being done exactly on the spot where it is required.

In the accompanying illustrations, Fig. 1 shows a Helsby oil-immersed three-phase condenser of 1,740-microfarad capacity in a colliery generating station; the output is 165 kilovolt-amperes at 550 volts, 50 cycles. Fig. 2 represents a box of 50 of these units for a working pressure of 550 volts alternating current. It measures 19 inches by 11 inches by 7.5 inches, and weighs 75 pounds.

Magnetic Gear Shift for Gasoline Automobiles.

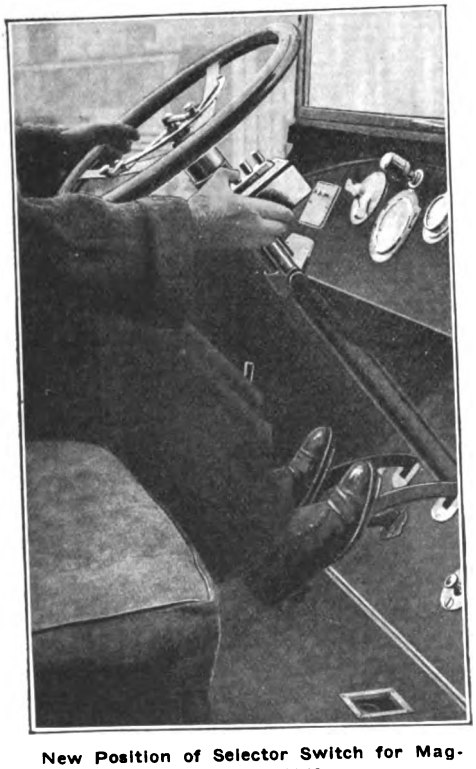
A booklet bearing the title, "The Next Big Improvement in Automobiles," has just been prepared for distribution by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. The next big improvement alluded to is the C-H magnetic gear shift for gasoline cars which provides for shifting gears by the simple means of pushing a button. A description of the operation of this gear shift was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN early last year. The new booklet, as the name implies, shows why shifting gears by means of push-buttons is the next big improvement in automobiles, not that the device itself is so new, but that the general adoption and use will be the next big step in making the operation of a gasoline motor car easy and convenient. It is pointed out that people who purchased cars just before the electric self-starter was adopted soon found their brand new cars out of date, but they had no hint of this radical change until the automobile manufacturer had disposed of his stock and was ready to make his announcement. History is prepared to repeat itself in the case of the magnetic-gear-shift equipment. The magnetic gear shift is shown to be a simpler device than the self-starter and to use very little current for operation; it makes the gear-shift lever unnecessary, just as the self-starter made the

Digitized by Google

crank superfluous. It allows selection of the next speed prior to the time the gears are actually shifted.

The book also explains how everything on a car has been improved, how for instance, electricity is used for starting the motor and for lighting, but the method of shifting gears has remained the same although it is necessary to perform this operation many times more than starting and in many tight places where the eyes are needed on the road and both hands on the wheel.

One section of the book contains an elementary and easily understandable explanation of the magnetic gear shift with interesting illustrations. Motor cars equipped with the C-H magnetic gear shift are also shown and a number of particularly strong letters of recommendations from users are reproduced. Included in the list of cars on which these C-H magnetic gear shifts are in use are the Winton, Jeffery, Pierce, Franklin and Pullman.



New Position of Selector Switch for Magnetic Gear Shift.

Since this book was prepared primarily for the public, a little space is devoted to the Cutler-Hammer Manufacturing Company, and what it makes in the line of controlling apparatus, which is well known, of course, to anyone in the electrical industry. In the perfection of the design and construction of the magnetic gear shift, the experienced forces of the company have been utilized. The accompanying illustration shows the push-buttons as now placed on a bracket under the steering wheel. Formerly these were located at the center of the wheel.

Attachment Plug With Swiveling Flexible Handle.

The rapid increase in the use of all kinds of electrical appliances of low current consumption that can be connected to ordinary lighting outlets is calling for more convenient means for connecting these devices to the circuits. To insert an attachment plug through a narrow and deep glass shade or wire lamp guard is not a convenient nor rapid operation. Usually it requires removal of the shade; if the shade is not removed, it nearly always imposes a severe strain on the connecting cord due to violent twisting.

These difficulties have now been ingeniously eliminated by the development of a new type of attachment plug. This has a swiveling screw shell to which is attached a flexible extension five inches long that serves as a very convenient and useful handle. This extension is made of a neatly and smoothly finished piece of flexible-steel conduit; this is securely fastened to the swiveling shell and permits readily screwing the plug into the socket or receptacle, even though the shade opening is very narrow. The cord passes through the handle freely and is not twisted during insertion or removal of the plug; in fact, the handle also serves to protect the cord near the plug, where it is usually subject to much wear and tear. The cap of the plug is provided with cord grip and can be used with reinforced cable up to thirteen-thirty-seconds inch in diameter.

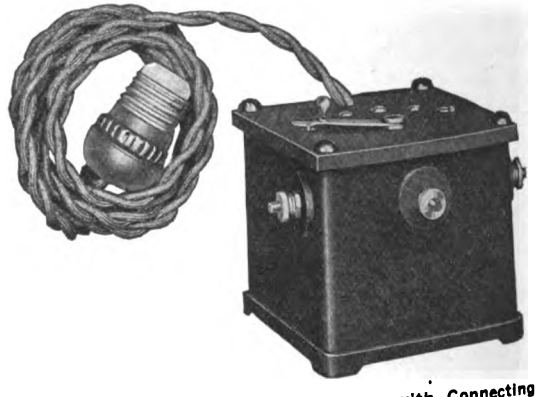
Swiveling-Handle Attachment Plug.

These new handle plugs are particularly useful with inspection lamps, vacuum cleaners, etc., that are frequently moved from outlet to outlet. They are made by the Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.

Wayne Toy Transformers.

The Wayne toy transformer is a device by means of which electricity at low voltage may be obtained from an alternating-current lighting circuit for the operation of electrical toys, such as railways, locomotives, aeroplanes, motors, or any other toys which may be operated by alternating current.

On account of the numerous sizes of toys it is necessary to have a wide variation in secondary voltage, because the smaller toys take from 4 to 10 volts, while the larger toys require from 10 to 24 volts. On these transformers the variation in voltage is accomplished by means of three terminals and a switch with a number of contacts. The different voltages are thus made available with only one change in the secondary connections. The flexibility of the voltage control not only permits of the operation of practically all the various electrical toys, but permits operating them at variable speeds. The transformer is neatly finished in black with bronze switch mechanism.



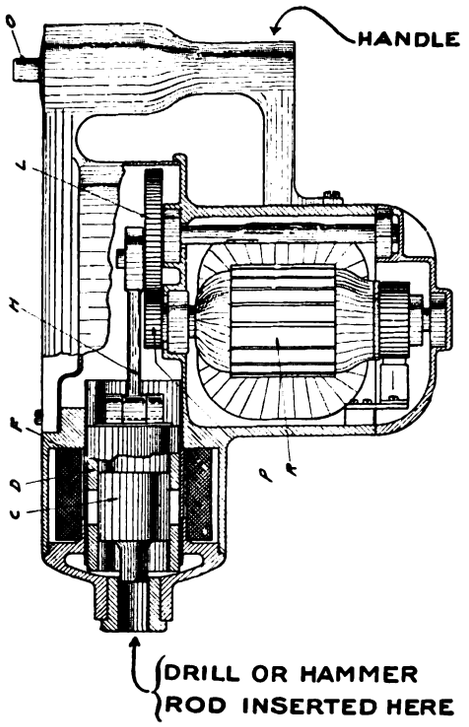
Wayne Toy Transformer with Connecting Cord.

Wayne toy transformers are manufactured by the Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

The Operation of the Western Electric Hammer.

In our issue of July 31, 1915, were shown some illustrations of a new electric hammer recently placed on the market by the Western Electric Company. The principle upon which this hammer works is as simple as it is clever and effective. The principal parts are a motor, a drill or hammer, and a magnetic clutch plunger inter-

Digitized by Google



Section of Electric Hammer to Show Operation.

posed between the other two parts.

Connected to the motor *R*, through hardened gears *P L* and connecting rod *H*, there is a cylindrical sleeve *D* having two relatively thick end sections joined together by a center section; the latter is as thin as is consistent with mechanical strength.

The plunger *C*, which delivers the blow to the drill, lies loosely within this cylinder and is not mechanically connected to any part of the mechanism. Outside of the sleeve lies the magnet coil F. This coil is stationary, the sleeve moving back and forth within it. The coil is in series with the motor and the current in it is always in the same direction and steady. As soon as the circuit is switched on, which is done by a button *O* conveniently arranged on the handle, the solenoid creates a magnetic circuit, with the thick sections of the sleeve as the poles and the plunger as the armature. As the sleeve is moved back and forth by the motor the effect is that of moving the pole faces of the magnet back and forth, and the plunger clutched across the poles moves with it, transferring its energy to the drill when it meets it, which it does near the end of the stroke. The plunger is slightly longer than the thin section of the sleeve which gives it a certain amount of overtravel and an elasticity of connection which entirely removes the strain and jar of the blow from the machine.

The motor is series wound and the gears are of oil-hardened special gear steel. Ball bearings are used throughout to reduce friction to a minimum.

Hotpoint Boudoir Set.

The approach of the holiday season is creating a demand for gifts that are truly useful, as well as pleasing to the eye. Since electrical gifts peculiarly fill this requirement, the coming holidays will doubtless see much greater sales of electrical gifts than heretofore. An outfit that is especially suitable as a holiday gift for ladies is the new Hotpoint boudoir set illustrated herewith.

This set includes a three-pound Hotpoint electric iron with beveled edge sole plate to permit ironing under and between ruffles, plaits, tucks, etc., an inverting stand by means of which the iron can be converted into a small electric stove for light cooking or heating, a hood or cover which can be placed over the sole plate of the inverted iron and form a receptacle in which two ordinary curling tongs or a marcel waver can be readily heated, a pair of folding curling tongs, and a connecting cord with small switch plug interchangeable with other Hotpoint appliances.

Electric Boudoir Set Complete.

This entire outfit is arranged to be easily packed into a neat felt bag, making it convenient in traveling and easy to put aside, on account of the small space occupied. This outfit is very tastefully designed and finished in highly polished nickel, so as to make it attractive enough as an ornament to the dressing table. Despite its extensive equipment the entire set is obtainable at a very moderate price, making it within the reach of anyone as a holiday gift. This outfit is manufactured by the Hotpoint Electric Heating Company, Ontario, Cal.

Robbins & Myers Sales Conference.

The annual convention of the sales organization of the Robbins & Myers Company was held at Springfield, O., on October 20 to 22. Two and one-half days were devoted to the business of the conference and the final afternoon to relaxation and pleasure. Wednesday morning the meeting opened with a discussion on fan sales; W. W. Mumma, fan sales manager, presided at this session. On Thursday morning two sessions were held; the first was devoted to a discussion on motor sales, conducted by Eugene Newnham, motor sales manager and supervising engineer; the second session was concerned with advertising, the discussion being led by C. H. Clark, advertising manager. On Friday morning there was a general discussion on credits and collections, this session being presided over by C. C. Miner, auditor.

Both Wednesday and Thursday afternoons were allotted for individual conferences between the branch-office managers and the heads of the various departments of the home office. These conferences were arranged and carried out according to a definite schedule. Friday noon the serious business of the convention was brought to a close and all of the delegates were taken in two of the company's motor trucks to the log cabin of W. A. Myers, secretary of the company, where they were entertained with a buffet lunch. The afternoon was given to a get-together meeting and general good time. The illustration below shows the delegates at the close of the business sessions.

Delegates to Robbins & Myers Sales Conference.

Digitized by Google

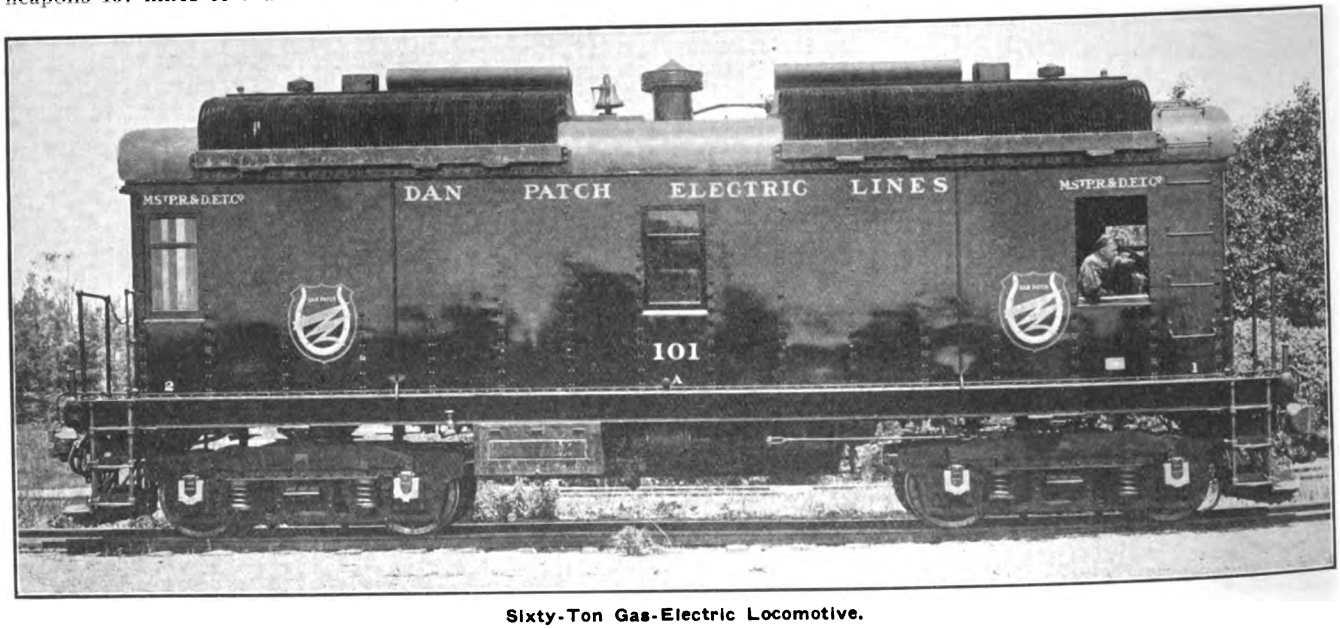
New Gas-Electric Locomotives for "Dan Patch" Electric Lines.

The Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, operating what are popularly known as the "Dan Patch" Electric Lines, has recently placed in commission three 60-ton gas-electric locomotives for freight, passenger and terminal service. These are somewhat similar in design although heavier than the 57-ton gas-electric locomotive which has been in successful operation daily on the company's lines for the past year or more from Minneapolis to Mankato, Minn. The four gas-electric locomotives, as well as 13 gas-electric motor cars which the railway company has purchased to date, were designed and built by the General Electric Company. It is interesting to note that this is said to be the first railroad in the world operated entirely with gas-electric service.

The railway extends south from Minneapolis 107 miles to Mankato. About midway of the line a branch runs northeast from Northfield to Randolph, seven miles distant. Another extension is contemplated from Faribault southeast to Owatonna, Waseca, Geneva, Albert Lea, Austin, Dodge Center, Rochester and beyond, having Dubuque, Ia., as its objective terminal point. The fine rolling section of Minnesota thus traversed, with productive grain fields, dairy and truck farms, and numerous thriving towns and cities of varied industrial activity, is one of the most prosperous in the state. The territory presents few difficulties in road construction, the severest grade on the present line being 2 per cent. The roadway was built, and improvements are being constructed, with a view to permanent stability. Substantial stations are located at the various cities and towns along the route, and smaller stations have been erected every few miles at rural stops to afford protection to the traveling public from inclement weather.

About 25 miles south of Minneapolis several thousand acres of farm land have been divided into five and ten-acre tracts by the company and are being sold to residents of Minneapolis and St. Paul, many of whom have erected houses and travel to and from their places of business in the city each day on the railway. There are also many attractive lakes along the route.

Four through trains daily each way, one of which is a limited parlor-car train, constitute the normal passenger schedule of the road. The limited makes the run of 107 miles, including four stops, in three hours and twenty-five minutes. This service is supplemented by local trains between certain points of the line and the terminals, and by excursion trains during the summer season as occasion requires. One 70-foot gas-electric motor car, seating 89 passengers, normally makes the run; when travel is somewhat heavy, a trailer is added to this; and for excursions and extra heavy traffic, a train is made up of trail cars drawn by a 60-ton gas-electric locomotive.



Sixty-Ton Gas-Electric Locomotive.

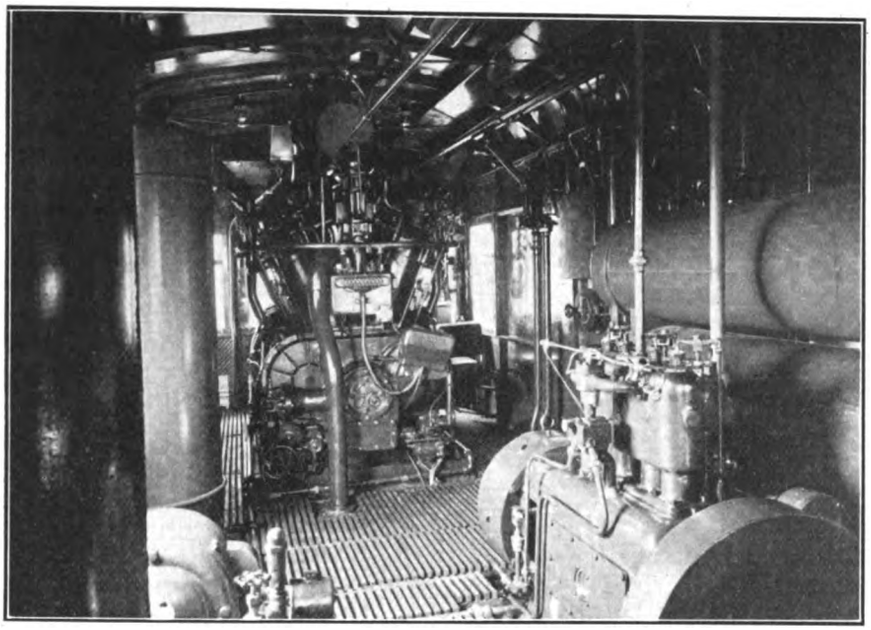
The new 60-ton locomotives are double-ended and are built with the box type of cab extending nearly the entire length of the underframe so as to have all the weight on drivers. Each locomotive is equipped with four type GE-205-D motors. The power plant consists of two generating sets similar to the one used in the gas-electric motor cars. Only an engineer is required to operate the locomotive.

The box cab is of all-steel construction. Both ends of the cab are removable to permit readily the installation of apparatus. The interior is not divided into compartments. The generating sets and the controllers are installed in each end, while the auxiliary lighting set, air compressor and storage tanks are grouped in the central section. The operator's seat at the side of each end of the cab affords a clear view ahead of both sides of the track. The mechanical parts of locomotives, such as underframing, draft gearing, trucks, etc., are of the most modern type of construction and are massively built to carry all the weight of equipment and withstand all possible strains.

The air brakes, with 16-inch brake cyinders, are of the combined straight and automatic type, arranged for double-end control. Air is supplied from the main engine compressors piped to the air tanks. The connections between the tanks and the operating valves are arranged to furnish air for starting and for operation of the brakes from independent sources. The brake rigging is proportioned for a brake-shoe pressure of 85 per cent of the weight on the drivers with 50-pound pressure in the brake cylinders.

Each of the two gas-electric generating sets for the power plant equipment is composed of a 175-horsepower, 550-revolutions-per-minute, eight-cylinder, four-cycle gasoline engine of the V type, which is direct-connected to a 60-volt, commutating-pole, compound-wound generator with an outboard bearing supported by brackets bolted to the magnet frame. The cylinders are 8 inches in diameter bore by 10 inches stroke. Ignition is accomplished with low-tension magnetos and the sets are started by air pressure in the same way as in the gas-electric motor cars, with the additional feature that after one set is running, the second may be started from the first electrically. The control is so arranged that either one or both of the generating units may be used to operate the locomotive from either end, in accordance with the requirements of the trailing train load. The engines are

Digitized by Google



Interior of Cab Showing End of One Main Unit and Side of Auxiliary Set.

of the highest type of construction.

Compressed air for starting is taken from the main reservoirs of the air-brake system, which are built with surplus capacity. The two main single-cylinder air compressors are driven from the crank shafts of the main engines, have a displacement of 22.5 cubic feet of free air per minute at the rated speed and are fitted with automatic governors to maintain constant pressure.

Greater flexibility of control and economy of operation result through electrical transmission of the energy. The engines can rotate at normal speed irrespective of the speed of the locomotive and deliver their maximum power, a feature of great advantage on grades, in case of snow storms or other emergency conditions involving sudden and heavy power demands.

There is also an auxiliary gas-electric set, the function of which is to furnish power for lighting the cab, headlights and train coaches, and for pumping an initial charge of air to fill the tanks and start the main engines. This set is started by hand. It consists of a vertical, 750-revolutions-per-minute, four-cylinder, four-cycle gasoline engine, which is direct-connected to a five-kilowatt, 65-volt, commutating-pole, compound-wound generator. The cylinders are 3-inch diameter bore by 6-inch stroke, and ignition is effected by a high-tension magneto. The air compressor on the 65-volt circuit is a two-cylinder, motor-driven, railway type machine, and has a piston displacement of 25 cubic feet per minute when pumping against a tank pressure of 90 pounds per square inch. Air is taken from the cab interior through screens and is delivered to the three reservoirs installed at one side of the cab in the center and connected in series, thereby affording an opportunity for radiation of heat and condensation of moisture before entering the brake cylinders. After starting the main engines, the governor on this motor-driven set cuts it out and all air is supplied by the air compressors on the main engines.

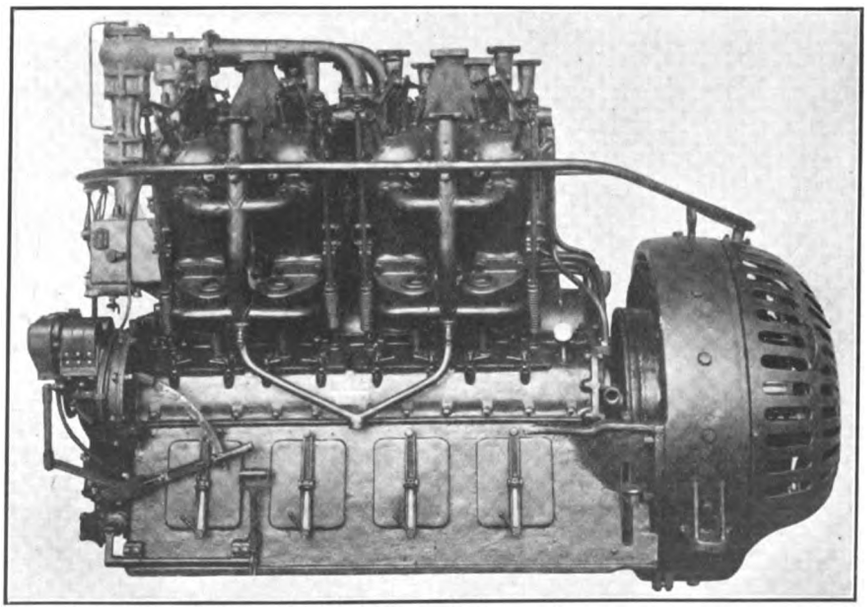
Mounted on the axles with nose suspension are four 600-volt, series, commutating-pole, oil-lubricated, box-frame railway motors having an hourly rating of 100 horsepower each. All four axles are therefore driving axles, a forged pinion being mounted on each armature shaft and meshing into a corresponding cast-steel split gear mounted on the axle. The gear ratio is 58 to 17, which is especially adapted for freight and terminal switching service, as it affords maximum tractive effort at start and low speeds. The motors are ventilated by a special vacuum system in conjunction with the engines.

The control of the motor equipments is similar to that of the standard gas-electric motor cars, a type P-53 controller being installed in each end. Two motors are, however, connected permanently in parallel and these two pairs, operated like single motors, are placed progressively in series and parallel. The controller provides seven running steps in series and six in parallel, without rheostats in the main circuit. There are also two additional points for shunting the series fields, making a total of fifteen efficient running points.

Inasmuch as electrical energy is transmitted directly, there are no losses through the intervention of mechanical change-speed gearing. To produce the smooth and rapid acceleration, the speed changes of the motors are effected by governing the voltage through varying the strength of the generator fields, which is accomplished by the movement of one handle on the controller. Separate handles are provided for throttling the engine and for reversing the motors. The latter is accomplished instantly by changing the motor connections in the usual manner, without stopping the engines, which always rotate in the same direction. This allows the train to be brought to a halt quickly, independent of the brakes, in an emergency.

A single-unit headlight, fitted with a 250-watt, 65-volt, gas-filled Mazda lamp, is mounted on each end of the cab. Car lighting arrangements include six Mazda ceiling lamps; four receptacles for the portable lamp; one portable lamp with guard, flexible cord and plug; and bus line connections at each end for train lighting.

In 1914 the mica produced in the United States was valued at $328,746. The output of sheet mica amounted to 556,933 pounds, and that of scrap mica amounted to 3,730 pounds.



One of the 175-Horsepower Main Engine and Generator Sets.

Digitized by Google

Edwards Lighting Fixtures.

Great progress has been made in the production of designs of lighting fixtures combining artistic appearance, good lighting effect and moderate price. In view of this advance by the fixture designer and manufacturer in making available an array of designs satisfactory in respect to all these usually conflicting requirements, it is now possible to select lighting equipment to satisfy the very general desire for good quality combined with more or less individuality.

One of the fixture houses that has given a great deal of attention to these matters is the Edwards Lighting Fixture Company, 65 East Lake Street, Chicago, Ill. This company has produced fixtures ranging from the very exclusive and highly ornamental designs commanding high price to the relatively inexpensive and very simple designs. A new series of pleasing designs has been announced by the firm, comprising an extended assortment of patterns available for immediate shipment. These fixtures include a very large number of distinct types meeting the requirements of the different rooms in a residence or apartment and the many different tastes. In all cases there is incorporated in the design practical utility and as much decorative effect as is warranted.

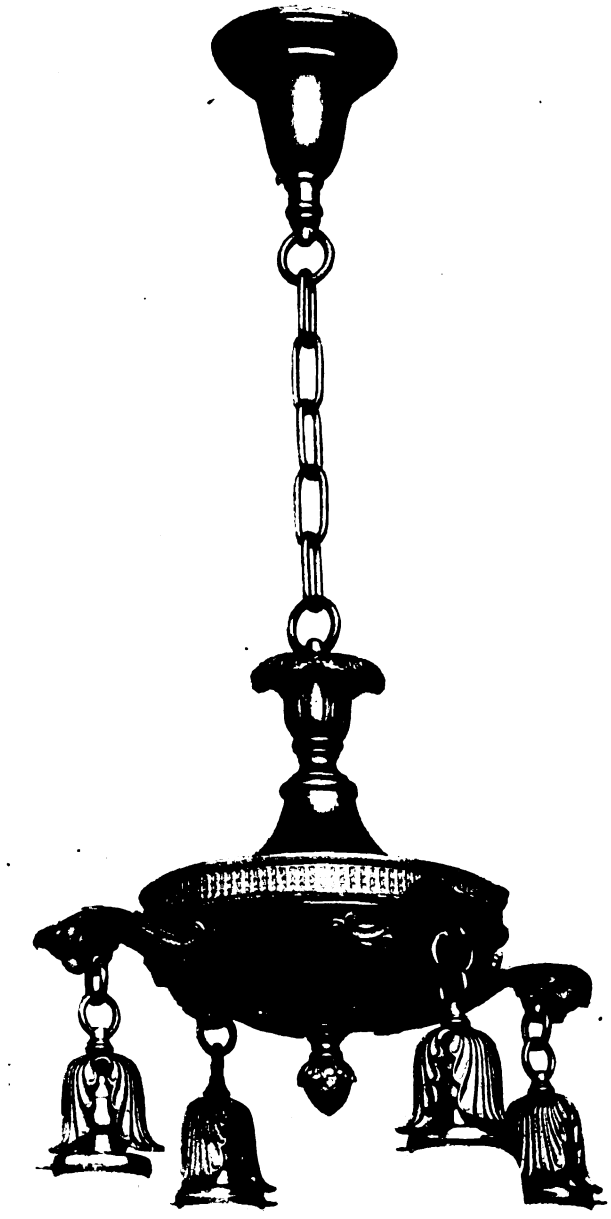


Fig. 1.—Attractive Four-Light Fixture.

Fig. 1 shows one of these new designs. This is a unique and very handsome fixture. The four arms, the socket husks and other ornaments are made of cast metal. The finish is a rich antique brush brass. Attractively etched glass shades screen the lamps. The full length of the fixture is 35 inches and its spread is 13 inches. Key sockets and spring shade-holders are furnished.

Fig. 2 is a pleasing design of the rapidly increasing popular semi-indirect type of fixture. The bowl is 16 inches in diameter and is made of a good diffusing white glass tastefully ornamented. The fixture is 33 inches long. Three lamps are arranged in the bowl, giving it a uniform brightness. Canopy, chains and bowl supports are finished in brush brass.

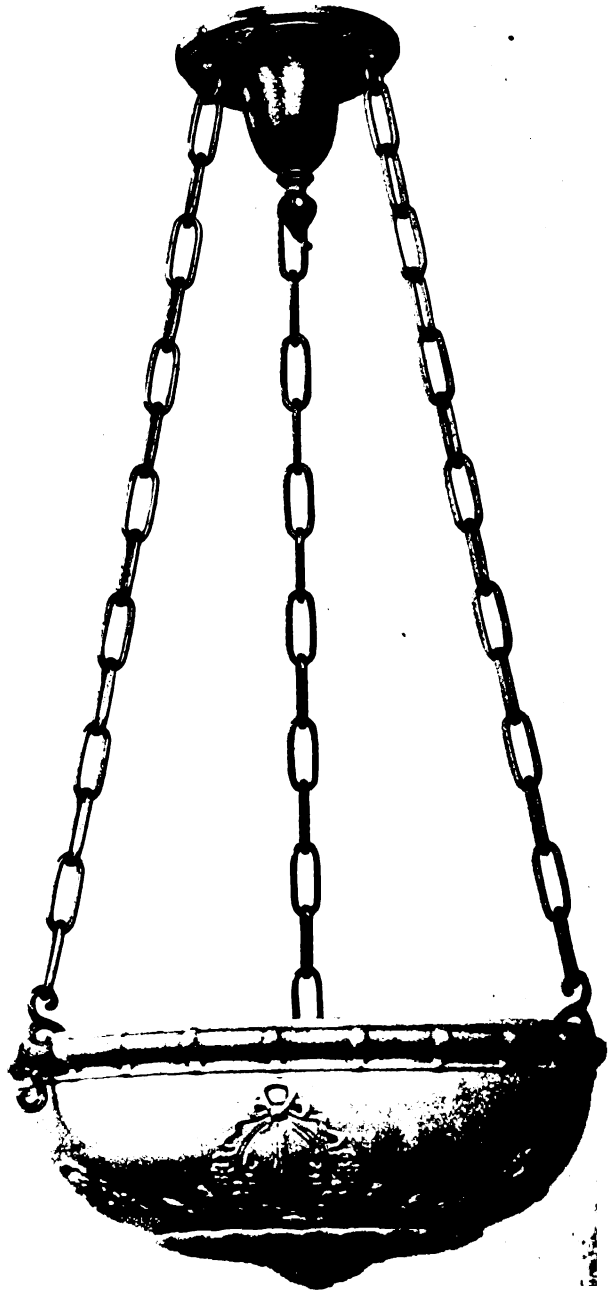


Fig. 2.—Semi-Indirect Fixture.

An attractive upturned bracket is shown in Fig. 3. This has a cast canopy and husk. A key socket with cover is supplied. The shade is of Veluria glass of a handsome pattern. Antique brush brass finish is given to the metal parts.

Digitized by Google

Fig. 3.—Upturned Bracket.

A simple but pleasing type of ceiling fixture is that shown in Fig. 4. This has a cut glass shade with star pattern; its dimensions are 3.25 by 7 inches. The finish is brush brass and black.

Fig. 5 shows another bracket of artistic pattern. It has an oval back 4.5 by 9 inches. The supporting arm is cast brass. Key socket with cover and including a unique shadeholder part is furnished. A very pleasing form of Veluria glass shade screens the lamp.

The few designs shown are typical of this entire new line which includes also combination fixtures. All these fixtures are obtainable for immediate shipment complete as shown, or unwired and without glassware, if desired.

Fan-Window-Display Contest.

Considerable interest has been manifested in the layout of the displays that won the six prizes in the fan-window-display contest conducted by the Western Electric Company. The list of the prize winners was published in our last issue, also illustrations of the displays which were awarded the first and second prizes. Herewith are shown views of the displays which received third and fourth prizes, respectively. The third prize was given to the Albuquerque Gas, Electric Light & Power Company, of Albuquerque, N. M. The fourth prize was awarded to the Clinton Electric Light & Power Company, Clinton, Ind.

British Standardization of Meters.

The British Engineering Standards Committee issued in September its standard specification (No. 37) for electricity meters (excluding electrolytic meters). During the past 12 months this specification has been undergoing revision by the electrical accessories subcommittee, and in its new form it has been entirely redrafted and considerably extended in consequence of the large increase during recent years in the size of individual in-

Fig. 4.—Ceiling Fixture.

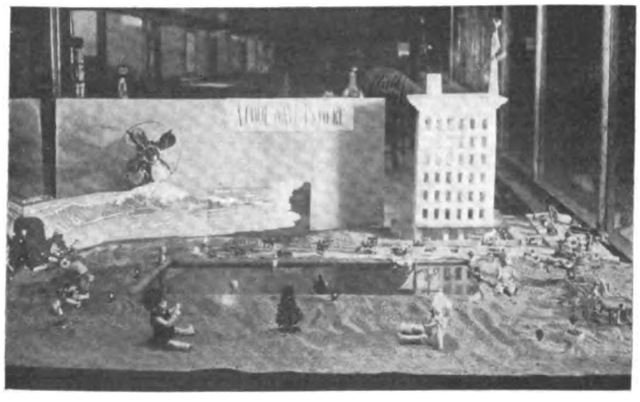
stallations arising from the extended use of electrical energy supplied from central stations. The first edition which appeared eight years ago referred only to consumers' meters of sizes up to 100 amperes, but the revised report includes provision for meters up to the very largest sizes in use, as well as for three-wire and three-phase meters.

The new specification is intended to apply to the purchase of new meters, governing their sale by the manufacturer to the purchaser and it has no direct bearing on any questions arising between the central stations and their consumers in connection with such of the meters as are employed to register energy supplied from their mains. The requirements have, however, been drawn up so that the meters conforming to them may reasonably be expected to fulfill the conditions imposed by the British board of trade on meters used in connection with public supply undertakings, and to satisfy inspectors under the English electric lighting acts during a considerable period after the meters have been put into use.

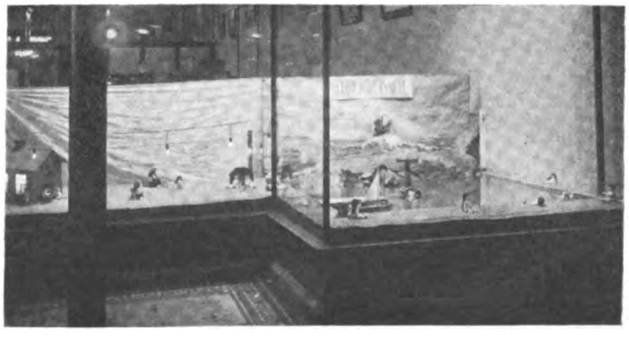
Fig. 5.—Pendent-Lamp Bracket.

Important modifications and additions have been made as to standards and definitions. It has now become necessary to distinguish between the portion of the main circuit in the meter and the portion outside the meter. This is done by defining, in addition to the definition of main circuit, the pressure circuit and the meter current circuit and meter pressure circuit. The standard sizes of meters include sizes for currents up to 5,000 amperes. The registering maximum is dealt with at some length and the terms to distinguish the different types of counting mechanism are pointer type for the ordinary clock face, with a rotating pointer and counter type for the so-called cyclometer mechanism. In the latter case it is specified that the figures shall spring quickly into position excepting the lowest figure used. The meters are required to have the testing constant plainly marked and this constant is specified as the number of revolutions per minute which the rotor should make at the full load of the meter under standard temperature conditions.

The factory of the United States Electrical Manufacturing Company, at Los Angeles, Cal., was destroyed by fire on October 27. Temporary quarters were immediately secured, machinery installed and by November 1 the output was nearly up to normal. In about 60 days the company expects to move back to its rebuilt plant, which will have new machinery and up-to-date equipment throughout.



Third-Prize Display in Fan-Window Contest.



Fourth-Prize Display in Fan-Window Contest.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CONDUIT BOXES.—The Adapti Manufacturing Company, 919 West Street, Cleveland, O.

Pressed-steel and cast-iron conduit boxes.

For use with rigid conduit, types 5400, 5500, 5600, 5700.

Listed August 26, 1915.

FIXTURES.—Faries Manufacturing Company, Decatur, Ill.

Straight electric, combination, and portable types.

Listed September 20, 1915.

FIXTURE PARTS. — Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Fixture-supporting attachment for use with Benjamin ceiling fixtures and receptacles having threaded shade-holder shell. 660 watts, 250 volts, catalog No. 1412.

Listed October 12, 1915.

FIXTURES, Supports for. — The Elandee Construction Company, 4305 North Lawndale Avenue, Chicago, Ill.

This device consists of two steel crossbars provided with a fixture stud and locking nut, for use in old work with an outlet box or ceiling plate as a fixture support.

Listed October 2, 1915.

FUSELESS ATTACHMENT PLUGS.—Weber Electric Company, Schenectady, N. Y.

Non-separable attachment plugs.

660 watts, 250 volts, catalog No. UL120 with keyless socket.

250 watts, 250 volts, catalog Nos. UK120 with key socket; UP120 with pull socket.

Listed September 29, 1915.

HEATERS, Electric.—General Electric Company, Schenectady, N. Y.

"G. E." heaters, 95-250 volts.

Toasters, 550-3,500 watts, types D-72, D-73.

Radiant grills, 600 watts, type D-70.

Ranges, 3,600-4,600 watts, types R-2, R-2S, R-3, S-1.

Air heaters, 1,200-5,000 watts, type A-53.

Individual contact plugs, catalog Nos. 173019-20 for use with "G. E." heaters.

Listed September 15, 1915.

HEATERS, Electric.—Premier Electric Company, Cuyler and Ravenswood Avenues, Chicago, Ill.

Automatic electric vulcanizer.

This device consists of a case inclosing a heating element and thermostatic cutout with push button. A base, stand, hooks, chains, length of portable cord and attachment plug complete the outfit. Premier, 6 amperes, 110 volts.

Listed October 12, 1915.

HEATERS, Electric.—Simplex Electric Heating Company, Cambridge, Mass.

Simplex, 100-250 volts.

Coffee pots, percolaters, and tea kettles, 83-500 watts, catalog Nos. 1227-28, 1326-27-28-34, 1337-1340 inclusive, 1344, 1872-73.

Portable disk stoves and cooker combinations, 83-2700 watts, catalog Nos. 1710, 1749, 1757, 1760-61-74-87-87½-88-88½-94-94½.

Chafing dishes, 83-500 watts, catalog Nos. 1208C, 1218C.

Dining room sets, 500 watts, catalog Nos. 40-45 inclusive.

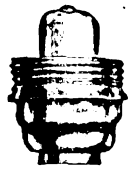
Listed August 23, 1915.

HEATERS, Electric.—Simplex Electric Heating Company, Cambridge, Mass.

Simplex, 100-250 volts.

Combination disk heaters, 500-1,935 watts, catalog Nos. 2048, 2050-2057 inclusive.

Food warmers, 170-400 watts, catalog Nos. 1302-03, 1306-1309 inclusive, 1311-1316 inclusive.



Supporting Attachment for Fixtures.—Benjamin Electric Manufacturing Company.

Broilers and griddles, 300-3,300 watts, catalog Nos. 1184-1187 inclusive, 1415-16-17-22-22½-23-24-27-28.

Fry kettles, 850-2,400 watts, catalog Nos. 1410-1413 inclusive.

Plate warmers, 300-400 watts, catalog Nos. 1661-1662.

Hot closets, 200-1,200 watts, catalog Nos. 1621-1623 inclusive.

Toasters, household and hotel types, 250-1,700 watts, catalog Nos. 211, 213, 1419, 1420.

Urns, 83-4,500 watts, catalog Nos. 412-415 inclusive, 417, 418.

Ovens, household type, 366-2,400 watts, catalog Nos. 1605-06.

Ovens, large baking, 1,500-10,000 watts, catalog Nos. 152, 154, 156, 158.

Listed August 24, 1915.

HEATERS, Electric.—Simplex Electric Heating Company, Cambridge, Mass.

Simplex, 100-250 volts.

Ranges, maximum capacity 2,475-8,175 watts, catalog Nos. 4K-15K inclusive, 21K-24K inclusive, 31K-34K inclusive (catalog Nos. 6K, 7K, 8K, 21K, 22K, 23K, 31K, 32K, 33K are standard when provided with a 30-ampere, 250-volt main line switch only when they are also provided with a switch preventing simultaneous operation of broiler and oven).

Listed September 15, 1915.

INSULATING MATERIALS.—Delaware Hard Fibre Company, Wilmington, Del.

Fiber for insulating purposes.

This material is furnished in sheets and tubes of various thickness in red, black, yellow and gray colors.

Laboratories' tests show that this material has fair dielectric strength. Its tensile strength, toughness, flexibility and uniformity of thickness are such as to make it suitable for use in pieces of small size in electric fittings. It is absorptive of moisture to about the same degree as all ordinary fiber of its class. Its properties are but little changed by exposure to temperatures below 250 degrees Fahrenheit. It burns at from 525 to 540 degrees.

While insulating material of this general type is not classed as either non-absorptive or non-combustible and should, therefore, not in general be used as a substitute for materials so classed, this fiber is judged suitable for crossbars, washers, bushings and other small parts of electrical fittings where use of fiber has been recognized.

Manufacturers desiring to use this material should submit samples in commercial form for tests.

Listed October 2, 1915.

MISCELLANEOUS. — Electric Products Company, 1069 East 152nd Street, Cleveland, O.

Watton battery chargers.

Automatic types R-20, R-30, R-45, RE-20, RE-30, RE-45, RR-20, RR-30, RR-45, RRE-20, RRE-30, RRE-45.

Non-automatic types, CN, CNC.

Listed August 26, 1915.

MOLDING. — Connecticut Electric Manufacturing Company, Bridgeport, Conn.

C. E. M. metal molding.

Listed September 3, 1915.

MUSICAL INSTRUMENTS.—Estey Organ Company, Brattleboro, Vt.

Electric action for pipe organs.

A 10-volt, self-excited, ungrounded generator belted to the blower motor sends current through a series of manually or automatically operated switches in console and corresponding magnets in organ controlling air valves. The generator is fused at the terminals with standard fuses. Standard rubber-covered wire from generator, special cotton-insulated cables from console to organ, are all inclosed in rigid conduit installed by manufacturer.

The electrical portions of this equip-

Digitized by Google

ment are judged to be as well safeguarded as can be demanded in an instrument of this type.

Before installation the Inspection Department having jurisdiction should be consulted.

Listed October 1, 1915.

PICTURE MACHINES AND APPLIANCES. — Ad-Display Machine Corporation, Richmond, Va.

Automatic moving slide machine.

This device consists of an arc lamp arranged for projecting purposes, and a motor-operated, slide-handling apparatus for placing and removing glass picture slides from in front of lamp. The entire equipment is mounted on a cast-iron stand.

Direct-current motor: Robbins & Myers Company, 140 horsepower, 115 volts.

Listed October 2, 1915.

PICTURE MACHINES AND APPLIANCES.—The Phantoscope Manufacturing Company, Bond Building, Washington, D. C.

"Graphoscope" motion-picture machine, equipped with driving motor and mechanical speed controller. This machine employes a three-carbon arc lamp, and a right-angle prism, through which light is refracted in machine head.

Listed October 12, 1915.

RECEPTACLES, For Attachment Plugs. — Simplex Electric Heating Company, Cambridge, Mass.

Simplex receptacles.

Surface type.

15 amperes, 250 volts. 25 amperes, 125 volts.

Single-heat: catalog No. 851; receptacle only, catalog No. 861; plug only, catalog No. 871.

Three-heat: catalog Nos. 853-S and 853-T; receptacles only, catalog Nos. 863-S and 863-T.

Flush type.

15 amperes, 250 volts; 25 amperes, 125 volts.

Single-heat: catalog Nos. 960 and 961; receptacles only, catalog Nos. 963 and 964; plug only, catalog No. 962.

Listed August 13, 1915.

RECEPTACLES, For Attachment Plugs. — Union Electric Company, Trenton, N. J.

Union flush receptacles.

Edison type, 660 watts, 250 volts, catalog No. 754.

Listed September 3, 1915.

RECEPTACLES, Standard. — The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Porcelain shell C. E. M. Co.

Keyless, 660 watts, 250 volts, catalog Nos. 2746-47, 2758, 9001.

Listed August 28, 1915.

RECEPTACLES, Standard.—Weber Electric Company, Schenectady, N. Y.

Porcelain shell.

Key, 250 watts, 250 volts, catalog Nos. PK321 (1,728), PK322 (1,731), PK323 (1,734), PK324 (1,737), PK325 (1,740), PK326 (1,743), PK327 (1,746), PK328 (1,749), PK329 (1,752), PK330 (1,755), PK331 (1,758), PK332 (1,761), PK333 (1,764), PK334 (1,767), PK337 (1,770), PK339 (1,773).

Keyless, 660 watts, 250 volts, catalog Nos. 1,504, 4,000, 4,001, 4,002, 4,013, 9,402, 9,403, 28,795, 50,715, 61,000, 61,001, 61,230, 61,231, 61,329, 61,330, PL321 (1,729), PL322 (1,732), PL323 (1,735), PL324 (1,738), PL325 (1,741), PL326 (1,744), PL327 (1,747), PL328 (1,750), PL329 (1,753), PL330 (1,756), PL331 (1,759), PL332 (1,762), PL333 (1,765), PL334 (1,768), PL337 (1,771), PL339 (1,774).

Fifteen hundred watts, 600 volts, catalog Nos. 1,422, 1,423.

Pull, 250 watts, 250 volts, catalog Nos. PP321 (1,730), PP322 (1,733), PP323 (1,736), PP324 (1,739), PP325 (1,742), PP326 (1,745), PP327 (1,748), PP328 (1,751), PP329 (1,754), PP330 (1,757), PP331 (1,760), PP332 (1,763), PP333 (1,766), PP334 (1,769), PP337 (1,772), PP339 (1,775).

Listed October 9, 1915.

RECEPTACLES, Weatherproof.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

C. E. M. Co., 660 watts, 250 volts.

Cleat type, catalog No. 2748.

Listed August 28, 1915.

RECEPTACLES, Weatherproof.—Weber Electric Company, Schenectady, N. Y.

Weber, 660 watts, 250 volts.

Cleat type, catalog No. 59275.

Listed October 13, 1915.

RHEOSTATS.—Industrial Controller Company, Milwaukee, Wis.

Automatic starters, 1 to 15 horsepower, 110 and 220 volts.

Bulletin Nos. 7110, 7115, 7305.

Listed September 4, 1915.

RHEOSTATS. — Pawling & Harnischfeger, Thirty-eighth and National Avenues, Milwaukee, Wis.

Drum controllers, types R, S, U, UC, V.

Listed October 2, 1915.

ROSETTES, Fuseless. — The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

C. E. M. Co., 3 amperes, 250 volts.

Combines cleat and concealed, catalog Nos. 2693-B, 2694-B, 2695-B.

Listed August 28, 1915.

SOCKETS, Standard.—The Electrical Manufacturing Company, 1951 Lawrence Street, Denver, Colo.

New England all-porcelain pendant, consisting of a one-piece porcelain shell containing removable switch body and attached screw shell.

Key, 250 watts, 250 volts, catalog No. 1938.

Listed August 30, 1915.

SOCKETS, Standard.—Weber Electric Company, Schenectady, N. Y.

Porcelain shell.

Key, 250 watts, 250 volts, catalog Nos. PK301(1701), PK302(1704), PK303 (1707), PK303½(1710), PK304½(1713), PK309½(1716), PK310½(1719), PK317 (1722), PK318(1725).

Keyless, 660 watts, 250 volts, catalog Nos. PL301(1702), PL302(1705), PL303 (1708), PL303½(1711), PL304½(1714), PL309½(1717), PL310½(1720), PL317 (1723), PL318(1726).

Pull, 250 watts, 250 volts, catalog Nos. PP301(1703), PP302(1706), PP303 (1709), PP303½(1712), PP304½(1715), PP309½(1718), PP310½(1721), PP317 (1724), PP318(1727).

Listed October 11, 1915.

SWITCHES, Automatic.—The Automatic Refrigerating Company, Capitol Avenue and Willow Street, Hartford, Conn.

A thermostatic switch for remote control of motor starters operating refrigerating systems and designed to maintain temperature of cold-storage rooms within predetermined limits.

Standard for use with standard direct-current and alternating-current self-starters of the Cutler-Hammer Manufacturing Company.

The self-starters for use with this switch are for 550 volts or less and are provided with special current-limiting resistances in control circuits.

Listed October 12, 1915.

SWITCHES, Automatic.—The Cutler-Hammer Manfacturing Company, Milwaukee, Wis.

Crane-protecting panel, bulletin No. 10125.

Listed September 24, 1915.

SWITCHES, Oil-Break. — Condit Electrical Manufacturing Company, Boston, Mass.

Oil starter for alternating-current motors; a completely inclosed, three or four-pole, two-throw, oil-immersed switch used as a means whereby running fuses are out of circuit during starting process. In off position motor windings are disconnected from the line.

Type I, 250-600 volts; maximum amperes: 30; maximum horsepower: 10.

Oil switch for alternating-current motors or other alternating-current circuits; a completely inclosed, two, three or four-pole, single-throw oil-immersed switch. Non-automatic type: fused and fuseless. Automatic type with overload, no-voltage or shunt-trip attachments mounted on outside.

Type ID, 250-600 volts; maximum amperes: 50; maximum horsepower: 25.

Listed October 11, 1915.

SWITCHES, Push-Button Flush.—General Electric Company, Schenectady, N. Y.

Single-pole, 10 amperes, 125 volts, 5 amperes, 250 volts, catalog No. GE632.

Three-way, 10 amperes, 125 volts, 5 amperes, 250 volts, catalog No. GE634.

Also above types with lock attachment.

Listed August 30, 1915.

SWITCHES, Push-Button Flush.—The Hart & Hegeman Manufacturing Company, 342 Capitol Avenue, Hartford, Conn.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 4401.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 4403.

Listed August 26, 1915.

SWITCHES, Surface-Snap. — The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E.

With porcelain covers.

Double-pole, 10 amperes, 250 volts, catalog Nos. 6214, 6219.

Listed August 23, 1915.

SWITCHES, Surface Snap. — The Standard Electric Manufacturing Company, 551 West Washington Street, Chicago, Ill.

Double-pole, 10 amperes, 250 volts, catalog Nos. 3014-15, 4014-15.

Listed September 24, 1915.

SWITCHES, Surface Snap. — The Trumbull Electric Manufacturing Company, Plainville, Conn.

Double-pole, 10 amperes, 250 volts, catalog No. 7476.

Listed October 1, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

MIDDLEBURY, VT.—It is announced that a syndicate composed of Charles H. Thompson, of Montpelier, and others will undertake the development of latent water powers in Middlebury, Vt. A water power on the East Middlebury River, which the syndicate is reported to have in view, is believed capable of developing 25,000 electric horsepower twenty-four hours a day throughout the year. The market in this region consists of sawmills and other industries. W.

BATAVIA, N. Y.—The city will vote on November 9 at a special election on the proposition to raise $175,000 for municipal improvements, including the rebuilding of the lighting plant. Address town clerk.

CORNING, N. Y.—The Lamoka Power Corporation has been organized to generate electricity, etc. The company is capitalized at $300,000. Incorporators: Hasell W. Baldwin, Robert G. Hayt, and E. L. Conklin.

NORRISTOWN, PA.—A large three-story brick, steel and concrete bottling house for the Adam Scheidt Brewing Company will soon be erected here. It is said that all machines will be electrically driven. Peuckert & Wunder, Philadelphia, Pa., are the architects.

PHILADELPHIA, PA.—A one-story stone edifice, to cost $250,000, will be erected at the corner of Twelfth and Chestnut Streets for the Beneficial Savings Fund Society. The electrical installation will be of the highest order. Horace Trumbauer, Philadelphia, Pa., is the architect.

WYOMISSING, PA.—The borough council is planning ways and means to install a $10,000 light system. Address borough clerk.

NORTH CENTRAL STATES.

EATON, O.—A large amount of electrical construction is called for by the plans of the Eaton Lighting Company, to extend its wires to Camden, O. Additional stock to the amount of $30,000 has been authorized for this purpose, and work is to begin as soon as possible, and be pushed to completion rapidly. L.

MASSILLON, O. — Ornamental lighting standards for a new viaduct will probably be installed by the county authorities, as the city has refused to take action on account of the structure lying outside of the city limits. It is estimated that twelve standards and lights, with the necessary wiring, can be installed complete for $600.

SANDUSKY, O.—In the issue of October 23 it was stated that a temporary injunction had been issued stopping work on the ornamental street-lighting system. The fact is that a temporary injunction had been granted property owners restraining the city from assessing and collecting from the abutting property owners 50 cents per month per foot frontage. The injunction in question has since been dissolved, the court holding that the city had a right to order such improvements and assess abutting property for the same. The white way installation has been completed for some time, and the city is paying the Sandusky Gas and Electric Company regularly every month for this service.

MANSFIELD, ILL.—The Mansfield Electric Company is reported to be planning the construction of a line to Bellflower, a distance of seven miles, and supply light to that village. A line may also be run to Mahomet.

ROCK FALLS, ILL.—An ordinance calling for an election to vote for a $5,000 bond issue for a municipal electric-light plant has been passed by the city council. Z.

ST. FRANCISVILLE, ILL.—The citizens have voted to issue bonds for the erection of new light plant. Address city clerk.

STREATOR, ILL.—An ordinance has passed the city council providing for $10,168.97 for boulevard lighting. Address city clerk.

MIDLAND, MICH.—The Consumers' Power Company has just purchased the property of the Bristol Electric Light Company, of Midland, assuming immediate control. The company will extend and enlarge the system and make changes in the street-lighting service.

NEENAH, WIS.—An ornamental system of street lighting is being agitated for this city's main thoroughfares. Address city clerk.

BOVEY, MINN.—The electric plant destroyed by fire will be rebuilt at once. Address town clerk.

BUTTERFIELD, MINN.—The sum of $8,000 in bonds has been voted for an electric-light plant. Address town clerk.

ELY, MINN.—The council may establish an electric-lighting system. Address village clerk.

KANAWHA, IOWA. — Bonds amounting to $15,000 have been voted for municipal lighting. Address town clerk.

NORTH M'GREGOR, IOWA.—The McGregor Electric Light and Power Company has asked for a franchise to furnish electric lights and power to Luana. Luana will hold a special franchise election on November 12.

OSAGE, IOWA.—Surveys are being made in connection with the installation of an electric light plant. Address town clerk.

KANSAS CITY, MO.—The entire equipment of machinery of the Ridenour Baker Grocery Company, a large wholesale house, will be operated by electricity. The building is now being erected; the motors have not been contracted for.

BUCKLIN, KANS.—The council will expend $10,000 for an electric-light plant. Address town clerk.

HARDINER, KANS.—Bonds have been voted by the city council for franchise for an electric-lighting system. Address city clerk.

LAWRENCE, KANS.—Lawrence has wanted a white way for some time, and it is now assured through the gift of $1,000 by the Lawrence Railway & Light Company towards the expense of the equipment. The total expense will be about $4,000, the remainder being raised by a special tax. M.

PRESTON, KANS.—Estimates are being prepared for a $7,000 electric light plant. Address town clerk.

ELGIN, N. D.—C. L. Rausen, of Holdingford, Minn., has just been granted a twenty-year franchise and will immediately begin the work of installing an electric lighting plant.

SOUTH CENTRAL STATES.

CAMDEN, TENN.—Wade Lowry and John D. Rice, of Camden, have purchased a site here, where they will build and equip a modern electric light plant. They have also acquired from J. S. Madrey all the existing poles, and wiring which belonged to the old plant that burned last spring. The new owners expect to have the new plant in operation by December 1. They will operate under the name of the Camden Electric Light Company.

FAIRHOPE, ALA.—The city contemplates acquiring water works and installing electric-light plant at estimated cost of $12,000. Address the mayor.

YELLVILLE, ARK.—W. C. Stephenson, of Marshall, who has organized a company known as the Yellville Light, Ice and Power Company, has been granted a franchise. Work will start about November 1 on the new electric-light plant.

EL CAMPO, TEX.—A complete system of electric street-lighting is to be constructed here. D.

PLAINVILLE, TEX.—The Malone Electric Power Company is engaged in wiring the towns of Hale Center and Abernathy for electric light and power. The company has just finished its high-tension wire line to Lubbock and is now furnishing light and power to that place from its plant in Plainville. Another line will soon be extended to Floydada and Crosbyton, and possibly to Ralls and Lorenzo.

PORT ARTHUR, TEX.—The Port Arthur Gas and Power Company, which has been organized here with a capital stock of $250,000, will construct an electric light and power plant. The incorporators are J. S. Connelly, S. B. Redmond and Edward S. Ellis. D.

Digitized by Google

SAN ANGELO, TEX.—Extensive improvements are to be made in the water and light plants of the San Angelo Water, Light and Power Company. About $50,000 will be spent within the next six months in improving.

SHERMAN, TEX.—The city commission has decided to call an election to vote on issuing $150,000 in bonds, part of which proceeds are to be used in making improvements to the electric-light plant. D.

TEMPLE, TEX.—The city water commissioners plan to substitute electric-driven pumps for steam power at the municipal pumping station. The proposed improvement will cost about $6,000. D.

WESTERN STATES.

GLASCOW, MONT.—The special election held here to vote on the issuance of $18,000 bonds for buying new equipment and enlarging the municipal electric-light plant, resulted in favor of the proposition by a substantial majority. Work will begin in the near future. U.

TERRY, MONT.—L. H. Gaffney has been granted a franchise by the town council for the installation and operation of an electric-light plant.

KEMMERER, WYO.—The town council is advertising for bids for the installation of a special street-lighting system, consisting of 12 posts, each equipped with five 100-watt lamps. Specifications covering the same may be obtained from John Mason, city clerk. U.

FORT COLLINS, COLO.—The city council is considering the installation of a special street-lighting system, information in regard to which may be obtained from the city clerk. U.

FREDERICK, COLO.—The city council has under consideration the installation of a special street-lighting system. Address the town clerk for information. U.

ALBION, IDAHO.—The $8,000 of bonds recently authorized have been sold. These bonds were issued for the purpose of installing an electric-light plant, and steps will soon be taken by the council for its installation. Information in regard to the same may be obtained from the city clerk. U.

BLACKFOOT, IDAHO.—The city council has employed Engineer James Young, of this city, to inspect several sites on the Blackfoot River which are under consideration for the location of a municipal electric light and power plant. He will also prepare plans and specifications for the proposed system. The chances look favorable that construction will be proceeded within the near future. U.

KENDRICK, IDAHO.—A certificate of public convenience and necessity has been granted to A. V. Dunkle by the Public Utilities Commission, at Boise, permitting him to install an electric-light and power plant in this city. The cost of the system is estimated at $8,000. U.

ROCKLAND, IDAHO.—M. R. Stipe, and J. E. March have filed an application for a certificate of public convenience and necessity with the Public Utilities Commission, at Boise, asking for permission to install an electric light and power plant to serve this village. U.

ROCKLAND, IDAHO—The public utilities commission, at Boise, has granted a certificate of convenience and necessity to G. H. Hodgin for the construction and operation of an electric-light plant for this village.

METALINE FALLS, WASH.—Hugh L. Cooper has applied to the Interior Department at Washington, D. C., for a preliminary permit, to begin work on the construction of a $10,000,000 power plant in "Z" Canyon, of the Pend O'Reille River, near this city. O.

LEBANON, ORE.—The light and power plant which was recently destroyed by fire is to be rebuilt at once by Scroggin & Washburn.

PILOT ROCK, ORE.—L. K. Harlan and J. B. Sparks have a plan for moving an electric-light plant to Pilot Rock from Lexington. The council has ordered an ordinance drawn granting a franchise to Mr. Harlan.

LOYALTON, CAL.—An ordinance has been passed providing for the issuance and redemption of bonds in the sum of $5,000 for the construction of an electric light and power plant.

FINANCIAL NOTES.

The American Light & Traction Company has sold to Bodell & Company, of Providence and Boston, $700,000 Consolidated Gas Company of New Jersey first-refunding five-per-cent bonds of April, 1965, recently authorized by the New Jersey Public Service Commission. These bonds are part of an authorized issue of $5,000,000 of which $1,000,000 are reserved to retire the first-mortgage five-per-cent bonds due in 1936 and are the first to be offered under the first and refunding mortgage. The company is controlled through the ownership of all its stock by American Light & Traction, and its property has been valued and its rates established by the New Jersey commission. It gives gas or electric service to seventeen towns on the Jersey coast serving a population of 52,000 and has net earnings of approximately $87,000 a year. The company was purchased by Emerson McMillin & Company in 1895 and acquired by American Light & Traction in 1902.

Dividends.

	Term	Rate	Payable
Boston Elev.	Q	$1.50	Nov. 15
Conn. Pw., pf.	Q	$1.50	Dec. 1
Conn. Ry. & Lt., com.	Q	1 %	Nov. 15
Conn. Ry & Lt., pf.	Q	1.75%	Nov. 15
Houghton Co. Elec. Lt., pf.	S	3 %	Nov. 1
Houghton Co. Elec. Lt., com.	S	2.5 %	Nov. 1
Mobile Elec.	Q	1.75%	Nov. 15
Monongahela Val. Trac., pf.	Q	1.25%	Nov. 2
Pacific Gas & Elec., first pf.	Q	$1.50	Nov. 15
Pacific Gas & Elec., orig. pf.	Q	$1.50	Nov. 15
J. G. White Eng. Corp., pf.	Q	1.75%	Dec. 1
J. G. White Management Corp., pf.	Q	1.75%	Dec. 1
J. G. White, Inc., pf.	Q	1.5 %	Dec. 1
Wash.-Va. Ry.	S	2.5 %	Nov. 1

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 18,951. ELECTRICS, BATTERIES, ETC.—An American consular officer in Brazil reports that an engineer in that country desires to represent American manufacturers of electric vehicles, storage batteries and supplies for generating and utilizing electrical power (not light).

NO. 18,981. ELECTRICAL APPLIANCES.—The Bureau is informed by an American consular officer in Australia that a business man in his district desires to secure the sole agency for a good line of American electrical appliances.

NO. 18,984. ELECTRICAL GOODS. The Bureau is informed by an American consular officer in India that a man in his district wishes to be supplied with catalogs, price lists, etc., of electrical goods, with the intention of becoming the sole representative of an American firm.

NO. 18,988. ELECTRIC APPARATUS, ETC.—An American consular officer in the Netherlands reports that a man in that country is interested in automobiles, electric apparatus, boat motors, motorcycles and supplies, and new inventions in the technical line. It is stated that the man desires to buy such goods for his own account and act as sole buying agent for Holland and colonies. He proposes to pay cash against documents in the Netherlands or cash in New York. Correspondence may be in English. References are given.

NO. 18,995. POCKET LAMPS.—An American consular officer in England reports that a firm in his district desires to be placed in communication with American manufacturers of advertising novelties and electrical pocket lamps.

NO. 19,002. LABORATORY SUPPLIES.—The Bureau is informed by an American consular officer in Siberia that a firm in his district desires the names and addresses of American manufacturers and exporters of laboratory accessories for schools, for chemical study, physical apparatus for general mechanic, hydrostatic, optic, magnetic and electrical experimentation. Catalogs and prices are requested. Correspondence should be in Russian.

NEW PUBLICATION.

CHICAGO AUTOMATIC TELEPHONE SYSTEM.—Kempster B. Miller, consulting telephone engineer to the City Council of Chicago, has submitted his "Report on the Automatic Telephone Situation in the City of Chicago." This reviews the history of the automatic telephone enterprise in the city, takes up the commercial aspects of the present auto-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 1	Oct. 25
American Tel. & Tel. (New York)	124⅝	124½
Commonwealth Edison (Chicago)	140	134
Edison Electric Illuminating (Boston)	238	239
Electric Storage Battery common (Philadelphia)	72½	73
Electric Storage Battery preferred (Philadelphia)	72½	73
General Electric (New York)	181¾	176½
Kings County Electric (New York)	120	120
Massachusetts Electric common (Boston)	7	7
Massachusetts Electric preferred (Boston)	40	42
National Carbon common (Chicago)	150	155
National Carbon preferred (Chicago)	121	120½
New England Telephone (Boston)	132½	134¾
Philadelphia Electric (Philadelphia)	27	26
Postal Telegraph and Cables common (New York)	79½	78
Postal Telegraph and Cables preferred (New York)	65	65¼
Western Union (New York)	80¾	79⅝
Westinghouse common (New York)	72⅝	72¾
Westinghouse preferred (New York)	140	140

Digitized by Google

matic system and discusses its present usefulness, showing reasons for the financial failure of the present enterprise. It is generally claimed that the company has forfeited its franchise because of failure to serve over 20,000 subscribers. Possible courses open to the municipal authorities are discussed under five different propositions. Of these, I is ownership and operation by the city; II, ownership by city and operation by licensee; III, city to dismantle and dispose of plant; IV, non-forfeiture and operation by the Tunnel Company; V, Non-forfeiture and sale to American Telephone & Telegraph Company. Among the conclusions reached in the report is that any attempt to continue operation of the automatic system as a competing enterprise without connection to the system of the Chicago Telephone Company is not conducive to better or cheaper telephone service in the city.

PERSONAL MENTION.

MR. W. S. CAMPBELL, Lind, Wash., who for several years has been manager of the Washington Water Power and Light Company, of Spokane, in Lind, has resigned his position and retired to his ranch near Medford, Ore. A successor to Mr. Campbell has not been named to date.

MR. A. H. PURDY, the new president of the Kansas Public Service Association, started business life in 1888 in the office of the Topeka Edison Company. He had been born in Topeka and followed his natural inclination in seeking employment with this company. After a continuous service, with frequent promotions, he was made secretary and treasurer of the company in 1905 and general superintendent in 1910.

MR. GEORGE K. MILTENBERGER, of St. Louis, who has been stationed at Hickman, Ky., for several months in the capacity of local manager of the Public Service Company, which operates the city light and water plants, has been transferred to St. Louis. Doyle Jurney, who has been Mr. Miltenberger's assistant, is in charge of the property.

MR. JAMES BARTON BROKAW, manager of the Southern Idaho Water Power Company, and Miss Mary Gray Marston were married in New York City on November 3. Miss Marston has been the electric range expert for the General Electric Company for the past year in charge of its western campaign. She was formerly with Wells, Mowbray & Company, New York, the United Electric Light & Power Company, New York, the United Electric Company, Springfield, Mass., and the Edison Electric Illuminating Company, of Boston.

MR. NORMAN D. CRAWFORD has resigned as president and general manager of the Reading (Pa.) Transit and Light Company, operating traction lines and lighting properties in and about Reading, Norristown, Lebanon and other cities in Pennsylvania. Mr. Crawford went to Reading from Youngstown, O., about two years ago, where he was succeeded by R. P. Stevens as president of the Mahoning and Shenango Railway and Light Company. His plans for the future have not been announced, although he will continue his residence in Reading for the present. His successor will be named at a special meeting of the directors.

OBITUARY.

DR. PAUL RASEHORN, chief engineer of the Siemens & Halske Aktien-Gesellschaft, died at Berlin, Germany, on September 19, at the age of 50 years. Dr. Rasehorn had been identified especially with the development of the electrical measuring instruments made by this company, whose staff he joined in 1892.

MR. BRYANT JARVIS DAILY, manager of the Efficiency and Economy Department of National Lamp Works of the General Electric Company, died Friday, October 29, at his home in Cleveland. A blood clot on the brain was the immediate cause of death, and though his health had been impaired from this cause for over a year, he was attending to his duties and a complete recovery was expected.

DATES AHEAD.

Electric Power Club, Homestead Hotel, Hot Springs, Va., November 8-10. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

The Utilities Bureau Conference on valuation, Hotel Adelphia, Philadelphia, Pa., November 10-12. Acting director, M. L. Cooke, 1009 Finance Building, Philadelphia, Pa.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 12-13. Secretary, H. F. Wheeler, Hattiesburg, Miss.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Zanesville, O., November 18 and 19. Secretary, Frank E. Sanborn, Ohio State University, Columbus, O.

American Society of Mechanical Engineers. Annual meeting, New York City, December 7-10. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

With the Electrical Manufacturers

The Connecticut Electric Manufacturing Company, Bridgeport, Conn., is sending out little folders calling attention to its new approved nonbreakable Edison fuse plug, which is made of white horn fiber.

The Faultless Anchor Company, Fostoria, O., is sending out folders on its Faultless anchors. These are very ruggedly built to withstand heavy strains. The anchors are made with two, three or four fins and are well described and illustrated in the folders.

Sprague Electric Works of General Electric Company, New York City, has recently opened a sales office in the Provident Bank Building, Cincinnati, O., under the management of Frank H. Hill. The Cincinnati office has been established to facilitate the prompt and efficient handling of the increasing business in that section.

Lindsley Brothers Company, Minneapolis, Minn., announces the opening of a southwestern sales office at St. Louis, Mo., in charge of F. O. Grayson. The company has felt the necessity of giving its customers in the Southwest more intimate service, and the new sales office will handle business in Missouri, Kansas, Oklahoma, Texas, Arkansas, Louisiana, Tennessee and Southern Illinois.

The Barkelew Electric Manufacturing Company, Middletown, O., has issued catalog No. 22 on its knife switches and specialties. This covers 64 pages well illustrated with the company's great assortment of standard and special knife switches, motor-starting switches, quick-break and field-discharge switches, disconnecting switches, switch parts, fuses, wire brushes, etc. A very complete index is given at the back of the book.

Holophane Works of General Electric Company, Cleveland, O., has issued several new booklets dealing with its new Regent glass. One of these described this type of illuminating glassware. Another (catalog No. 500) is devoted to the many designs of roughed and etched shades. Still another shows the colored decorations on type GC Regent shades. There has also been issued a booklet of corrections and additions applicable to Holophane catalog No. 711.

Kuhlman Electric Company, Bay City, Mich., celebrated the formal opening of its handsome and commodious new factory at Bay City by means of a concert on the evening of October 28 given by the Thirty-third Regiment Band. The buildings were thrown open to inspection by the citizens, who were conducted through the establishment and informed on the construction of Kuhlman transformers. The Bay City Board of Commerce took a prominent part in the ceremonies.

The Globe Stove & Range Company's electric ranges and cooking appliances are being featured in a strong electric cooking campaign inaugurated on October 28 by the Scranton Electric Company, of Scranton, Pa. This progressive central station offers

Digitized by Google

a three-cent cooking rate. The attractive features of the Globe Electrics are making a most favorable impression on visitors to the Scranton company's show rooms. The Globe Stove & Range Company, Kokomo, Ind., is preparing to assist other central stations in similar campaigns.

The General Electric Company, Limited, 67 Queen Victoria Street, London, E. C., England, has issued the fourteenth edition of its general catalog of electric light fittings. The catalog contains 68 large pages with a multitude of illustrations of fixture parts and accessories, lamp guards, switch boxes and switch plates, Striplite and other fixtures, electric signs, street lighting and other outdoor fixtures and posts, ship, mill and other waterproof fixtures, handlamps, steel reflectors and a large variety of glassware, including reflectors,, bowls, shades, globes, also silk shades.

Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York City, has ready two new bulletins on ozonators. No. 49,126 is devoted to ozonators for cold-storage warehouses. The use of ozone has been found very beneficial in such places for preventing cross tainting and eliminating odors from perishable goods. These equipments are mounted on trucks to permit bringing the apparatus to any room needed. The bulletin is well illustrated. Bulletin No. 49,127 deals with ozonators for use in stores. The installation in the department store of Lit Brothers, Philadelphia, is described and illustrated.

Western Electric Company, New York City, is making special offers to appliance dealers on the Western Electric Junior range. This outfit is a complete but small size electric range, particularly suitable as a holiday gift to little girls who like to learn to cook and bake. The company is making a strong campaign on this novel appliance and expects that 50,000 of these ranges will be sold before Christmas. Several circulars relative to the utility of this new electrical toy for girls "playing house," to its value as a central-station load, and to the strong advertising campaign on the device have been prepared by the company to stimulate the interest of dealers.

Record of Electrical Patents

Issued by the United States Patent Office, October 26, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,157,663. Automatic Circuit-Control Apparatus. M. Barron, Rogers, Tex. Electromagnetically operated switching mechanism.

1,157,672. Illuminated Sign. R. O. Brittain, Boston, Mass. Slotted gears act as shutters for perforations in opaque casing to alternately shut off the light and permit it to shine.

1,157,687. Branding Iron. J. C. Garner and W. Gutman, Detroit, Mich. Electrically heated.

1,157,690. Starter for Internal-Combustion Motors. A. L. Golden, Oakland, Cal. Igniter circuit interlocked with valves.

1,157,691. Electric Furnace. S. Guggenheim, Berlin-Wilmersdorf, Germany. For use on three-phase circuit.

1,157,694. Process of Insulating Wire. O. T. Hungerford, Belleville, N. J. For applying insulating compound to fabric-covered wires.

1,157,696. Ignition System. L. D. Kellogg, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Details of circuit arrangements.

1,157,701. Reflector-Lamp. F. Kratz, assignor to firm of Robert Bosch, Stuttgart, Germany. Lamp movably supported to permit insertion and removal through opening in rear of reflector.

1,157,702. Catenary Suspension of the Trolley Wire for Electric Railways. F. Lautenbacher, Munich, Germany. Manner of suspending trolley wire from messenger.

1,157,714. Keyboard for Telegraph Transmitters. C. E. Nelson, Wilkinsburg, Pa. Depression of one key locks adjacent keys against depression.

1,157,723. Apparatus for Controlling Railway Trains. J. O. Query, Somerville, Mass. Track trip is electrically controlled.

1,157,730. Static Frequency-Changer. F. Spinelli, Milan, Italy. Transformers for transforming three-phase currrent into single-phase current of treble frequency.

1,157,731. Electric Cooking Apparatus. R. Sprenger, assignor to General Electric Co., Schenectady, N. Y. Electrically heated plate yieldingly supports cooking utensil, circuit being broken on removal of utensil.

1,157,732. Knickdown Lamp Stand and Shade. W. P. Stephenson, Windsor, Ont., Canada. Particular structure of table or floor lamp.

1,157,740. Controlling Mechanism for Printing Presses. J. J. Walser and C. A. Dresser, assignors to Goss Printing Press Co., Chicago, Ill. Arrangement of motors and gearing for high-speed and low-speed control.

1,157,744. Combined Lamp and Horn. P. B. Whitney, assignor to Mesinger-Whitney Electric Co., New York, N. Y. Lamp-enveloping shell acts as resonating chamber for electromagnetic horn. (See cut.)

1,157,745. Automatic Telephone System. R. S. Wilbur, assignor to Western Electric Co., Chicago, Ill. Side switches controlling the actuating connections of automatic switch mechanisms are controlled over trunk wires independent of voice-current wires.

1,157,746. Telephone System. C. S. Winston, assignor to Kellogg Switchboard & Supply Co. Arrangement of link circuits.

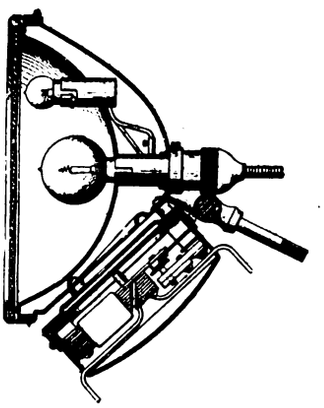
1,157,748. Vehicle Lighting System. H. L. Wohlers, Oak Harbor, O. Mounting and gearing of generator driven from vehicle wheel hub.

1,157,765. Electric Lighting Fixture. W. W. Dean, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Special lamp socket for illuminating instrument dial on automobile dash.

1,157,771. Smoking Pipe. W. H. Fulton, New York, N. Y. Bowl is fitted with tobacco-igniting electric conductor.

1,157,777. Control System. A. J. Hall, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Electropneumatically operated multiple-unit train control.

1,157,779. Means for Suppressing the Resistance of the Negative-Electrode Flame in Vapor Electric Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Mercury-vapor tube has solid anode in horizontal extension and mercury cathode in main chamber, the extension having its axis parallel to the cathode surface.



No. 1,157,744.—Combined Lamp and Horn.

1,157,782. Winding Switch for Self-Winding Clocks. E. A. Hummel, assignor to A. L. Haman, St. Paul, Minn. Particular structure of contacting device.

1,157,803. Motor Vehicle. L. S. Pfouts, Canton, O. Mounting and gearing of motor.

1,157,804. Starting Device for Mercury-Vapor Apparatus. J. C. Pole, assignor to Cooper Hewitt Electric Co. Electromagnetic tilting device.

1,157,819. Electric Furnace. E. Stassano, Turin, Italy. Arrangement for mounting the electrodes.

1,157,820. System of Control. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Relates to details of pneumatic apparatus in electropneumatic train control.

1,157,821. System of Control. N. W. Storer and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Electropneumatically operated reversing and field control switch.

1,157,823 and 1,157,824. System of Car Operation by Vapor Converters. P. H. Thomas, assignor to Cooper Hewitt Electric Co. First patent: accelerating direct-current voltage varied by step-by-step variation of voltage on alternating-current side. Second patent: steady rectified voltage produced from three-phase supply.

1,157,830. Electrolytic Refining of Tin. R. L. Whitehead, assignor to Americaan Smelting & Refining Co., Maurer, N. J. From impure tin containing lead.

1,157,839. Telegraphy. B. L. Bobroff, assignor to Universal Indicator Co., Milwaukee, Wis. "In" and "out" annunciator.

1,157,845. Signal System. C. W. Coleman, assignor to Hall Switch & Signal Co., New York, N. Y. Block system for double-track roads.

1,157,850. Traffic-Controlling System for Railways. A. V. T. Day, assignor to Hall Switch & Signal Co. Signal system having alternating track circuit controlling signal relay through amplifying apparatus consisting of concatenated generators.

1,157,856. Letter Plate. J. C. Eubank, Chicago, Ill. Glass inclosed lamp bank for electric talking sign.

1,157,859. Ozone-Generator. W. O. Freet, Hackensack, N. J., assignor to Steynis Ozone Co. Particular structure and arrangement of electrodes in air-tight box.

1,157,863. Combined Burglar-Alarm and Lock. A. Hamelin, assignor of one-half to Hamlau's Patents Co., Montreal, Que., Canada. Latch and staple permit slight movement of door which closes alarm circuit.

1,157,881. Machine Switching Telephone System. F. R. McBerty, assignor to Western Electric Co. Registering and controlling equipment for semi-automatic exchange.

1,157,904. Controller for Electric Motors. L. G. Riley, assignor to Westinghouse Electric & Mfg. Co. Interlocking arrangement between resistance-controlling drum and combined reversing and field-controlling drum.

1,157,912. Commutator. H. W. Turner, assignor to General Electric Co. Bars insulated by metal sheets coated with insulating enamel.

1,157,916. Insulated Wire and Terminal Therefor. A. M. Wentworth, assignor to General Electric Co. Method of making sheathed or "concentric" wire having an enlarged terminal, from ingot comprising copper imbedded in insulation surrounded by metallic sheath.

1,157,919. Electric Cutout. W. C. Arsem, assignor to General Electric Co. Inclosed fuse having fuse element surrounded by loose, dry particles of silicic acid.

1,157,921. Coupling. W. C. Banks, assignor to N.-W. Equipment Co., New York, N. Y. Insulated mechanical shaft coupling between motor and driven machine.

1,157,922. Water-Power Plant. E. Bassett, Shelbyville, Ind. Electrically controlled pneumatic devices for raising and lowering water wheel.

1,157,923. Electric Permutation-Switch Mechanism. O. D. Bowers, Arcanum, O. Comprises special means for preventing undesired connections to be made between a controller and its operating means.

1,157,925. Vacuum-Tube Electrode and Process of Operating Same. W. D. Cool-

Digitized by Google

idge, assignor to General Electric Co. Relates to X-ray target of copper and tungsten.

1,157,926. Electric Meter. A. G. Davis, assignor to General Electric Co. Resistance arranged in connection with sectional potential coil in series with armature so that friction-compensating current may be varied while maintaining ampere-turns of coil constant.

1,157,930. Mechanism for the Control of Circuit-Breakers. L. L. Elden, assignor to General Electric Co. Automatic circuit-breaker with provision preventing it being held closed on overload.

1,157,937. Electric Meter. M. Helm, assignor to General Electric Co. Multiple-rate, plural-circuit meter.

1,157,945. Electric Motor. N. D. Levin, assignor to Jeffrey Mfg. Co., Columbus, O. Special arrangement of ball bearings and lubrication.

1,157,948. Alternating-Current Commutator Machinery. H. Meyer-Delius, assignor to General Electric Co. Excitation of machine through transformer and interpoles.

1,157,949. Electric-Alarm Mail Box. B. D. Miller, assignor of six-tenths to E. S. Landes, W. B. Bryson, P. C. Given and G. H. Kepple, Wooster, O. Alarm circuit controlled by lid.

1,157,955. Electric Regulator. G. S. Neeley, assignor to General Electric Co. Electromagnetic control of generator in storage-battery system.

1,157,960. Time-Controller. H. B. Post, assignor of one-half to W. P. Allen, Ardmore, Pa. Dashpot arrangement for timing contacts.

1,157,963. Control Mechanism. E. T. Shaw, assignor to General Electric Co. Brush-shifting arrangement controlling speed of motor in one direction and biased to reverse with switch opening motor circuit when brushes are moved to reverse.

1,157,966. Headlight. R. G. Standerwick, assignor to General Electric Co. Lamp support for headlight.

1,157,970. Dynamo-Electric Machine. J. B. Wiard, assignor to General Electric Co. Comprises special structure of centrifugal switch.

1,157,981. Apparatus for Delivering Mail. W. J. Griffiths, assignor to Electric Mail Carrier Co., New York, N. Y. Automatically controlled electrical carrier system.

1,157,990. Electric Signal. C. H. Light, assignor of one-half to E. Rudnich, Manning, Iowa. For indicating the separation of detachable hose sections.

1,157,995. Incandescent Lamp. G. M. J. Mackay, assignor to General Electric Co. Filament in superposed coils proportioned to operate at same temperature.

1,158,001. Automatic Voltage-Regulator. G. S. Neeley, assignor to General Electric Co. Arrangement of coils in electromagnetic resistance-controlling device.

1,158,029. Fluid-Pressure Device. C. Dantsizen, assignor to General Electric Co. Fluid-pressure cylinder operating electrode controlled by current through electrode.

1,158,037. System of Electrical Distribution. E. Evans, assignor to General Electric Co. Device responsive to current in both power and lighting circuits limits current to lighting when combined demand is excessive.

1,158,052. Rheostat. A. J. Horton, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Special structure of lamp dimmer.

1,158,060. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Double push-button snap switch.

1,158,064. Electric Elevator Door-Operating Device. C. D. Lawrence, Youngstown, O. Electromagnets operating doors and latch are controlled by switch on car.

1,158,081. Electric Pocket Lamp. J. Stock, assignor to Interstate Electric Novelty Co., New York, N. Y. Special arrangement of battery, lamp, circuit-closer, etc., in tubular flashlight.

1,158,083. Direction-Indicator. H. E. Stout, Toledo, O. Particular structure of selective switch.

1,158,086. Circuit-Interrupter. J. A. Vahey, Boston, Mass. Variable by connecting one or more segments of commutator in circuit by plugging to collector ring.

1,158,091. Electrical Transformer-Controller and Distributer. F. L. Wiltshire, assignor to Martinsville Ignition Co., Martinsville, Ind. Particular structure for engine ignition systems.

1,158,103. Party-Line Ringing System. C. C. Bradbury, assignor to Kellogg Switchboard & Supply Co. Arrangement of cord circuit, ringing key, supervisory relay, etc.

1,158,105. Insulating Tube. E. F. Callender, assignor of one-half to L. B. Callender, Galesburg, Ill. Porcelain tube has tapered body with head at small end and tapered fins extending from head to middle of tube.

1,158,112. Detector for Oscillating Currents. W. E. Beakes, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Comprises contact joint between antimony and ferro-silicon.

1,158,113. Electroller. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. For securing on end of conduit and comprising central circuit-distributing structure and pull switches controlling lamps at ends of radial arms.

1,158,123. Apparatus for Generating and Receiving Electromagnetic Waves. R. A. Fessenden, assignor to S. M. Kinter and H. M. Barrett. Has tuned antenna and oscillating circuits with provision for simultaneously and equally varying their periods.

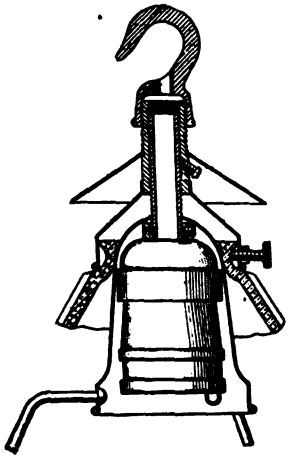
1,158,124. Signaling Apparatus for Aerial Navigation. R. A. Fessenden, assignor to S. M. Kinter and H. M. Barrett. For wireless communication air craft has a number of receiving and radiating-capacity areas, wave-generating apparatus and signal-receiving devices.

1,158,143. Electric Signaling System. C. P. Nachod, assignor to Nachod Signal Co., New York, N. Y. Train-controlled, electromagnetically operated, step-by-step semaphore mechanism in block system.

1,158,145. Electrical Fuse-Plug. N. W. Nutt, assignor to Trenton Electric & Conduit Co., Trenton, N. J. Particular two-part structure.

1,158,146. Electric Burglar, Fire and General Alarm. H. W. Olney, Spokane, Wash. Relay controlling alarm circuit is controlled by normally closed circuit-closers at danger points and has a resetting circuit.

1,158,149. Insulator Support. C. L. Peirce, Pittsburgh, Pa. Insulator-receiving thimble formed by helical wire mounted on end of stem.



No. 1,158,286.—Lighting Fixture.

1,158,171. Method of Cementing Carbon Articles. J. W. Brown, assignor to National Carbon Co., Cleveland, O. Manner of compacting baked carbon with carbonaceous binder consists in impregnating it with tar and causing the particles to flow and be cemented together by placing it under pressure and passing an electric current.

1,158,176. Electric Cooking-Stove. A. O. Christensen, Franklin, N. J. Arrangement of heating coils, connections and heat insulation.

1,158,184. Electric-Fan-Guard Attachment. T. G. Dabney, Clarksdale, Miss. Handle for attachment to central disk or ring.

1,158,191. Indicating Device for Telemeters. O. Eppenstein, assignor to firm of Carl Zeiss, Jena, Germany. Wheatstone-bridge arrangement for operating indicator is adjusted by device for bringing into desired relation two images of object whose distance is to be measured.

1,158,200. Pull Socket. J. G. Girling, assignor to Arrow Electric Co., Hartford, Conn. Smooth, flexible, insulating cord extends from switch through side of porcelain casing and connects to pull chain, insulating the latter and producing smooth, quiet operation.

1,158,203. Under-Contact Rail and Support. A. Gollos, Chicago, Ill., assignor to Gollos Railway Signal Co. of America. Support and protection of inverted third rail.

1,158,205. Process of Treating Hydrocarbon Oils. T. T. Gray, Elizabeth, N. J. Subjected to oxidizing agent in presence of ultra-violet rays from quartz lamps.

1,158,215. Roller-Bearing Current-Collector. R. E. Hewitt, Alameda, and W. W. Whitmore, Oakland, Cal. Roller-bearing mounting of cylindrical shell on shaft with special lubricating provisions.

1,158,221. Party-Line Telephone System. H. Hovland, assignor to Automatic Electric Co., Chicago, Ill. Parties on line may call each other by currents of different characters, with ring-back.

1,158,222. Spark Plug. H. M. Howard and J. A. McHardy, Providence, R. I. Grounded electrode is wire loop passing over end of central electrode, the latter being longitudinally adjustable.

1,158,233. Automatic Position-Indicator for Guns. W. D. Kilroy, Chiswick, England. To protect guns from injuring each other, models copy their movements and control electrically operated signal indicating dangerous relative positions.

1,158,243. Transmission Apparatus. A. B. Lakey, South Bethlehem, and E. E. Ross, Philadelphia, Pa. Alternating-current rotor on driving shaft and squirrel cage on driven shaft surrounded by stators having a single squirrel cage.

1,158,253. Process of Dehydrating Oil. F. W. McNear, Menlo Park, and P. E. Bowles, Jr., Reward, Cal. Oil and water separated from emulsion by passing alternating current through, thereby forming short-circuit of water globules and generating steam by heat produced.

1,158,255. Automatic Stop for Elevators. P. L. Manlet, St. Paul, Minn. Frangible device at end of car travel opens motor circuit and sets brake.

1,158,281. Speedometer. A. F. Poole, Chicago, Ill. Sparks associated with pointer rotated proportionally to speed of shaft occur after certain time interval, position of spark indicating speed.

1,158,286. Electric Lighting Fixture. J. D. Raymond, Chicago, Ill. Suspension device for shade-holder, lamp socket, socket cover and bowl hanger. (See cut.)

1,158,303. Internal-Combustion Pump. W. Schafer, San Francisco, Cal. Igniting means controlled by pressure in explosion chamber.

1,158,309. Transmitter for Wireless Telegraphy. C. Schou, Holte, Denmark. Relays retained by residual magnetism and released by relatively weak currents have signal currents from the transmitter distributed to them.

1,158,333. Stabilizer for Aeroplanes. A. B. Thaw, Pittsburgh, Pa. Righting members driven by wind motor, electromechanical connections being controlled by self-leveling circuit-closers.

1,158,346. Outlet Hood for Conduits. W. M. Webb, assignor to H. T. Paiste Co., Philadelphia, Pa. Provides overhang at end of conduit to keep out moisture.

1,158,355. Pedal Switch. W. S. Willis, New York, N. Y. For automobile signal device; mounted under floor and moved by foot-operated plunger.

1,158,376. Submarine Telegraphy. K. C. Cox, Norfolk Island. Selenium relay has selenium cells, inductance, resistance, etc., arranged on Wheatstone bridge plan.

1,158,397. Automatic Time Lighting Mechanism. H. E. Warren, assignor to Lombard Governor Co., Ashland, Mass. Circuit-closer operated by clock-driven cams.

Patents Expired.

The following United States electrical patents expired on November 1, 1915:

613,248. Incandescent Electric Lamp Holder. G. W. Cook, Jr., Bloomfield, N. J.

613,293. Mechanism for Supporting Electric Arc Lamps. W. A. McCallum, Avondale, O.

613,301. Yoke for Railway Conduits. F. S. Pearson, Boston, Mass.

613,309. Electric Ignition Device for Internal-Combustion Engines. L. W. Ravenez, Paris, France.

613,348. Printing Telegraph. A. Wirsching, New York, N. Y.

613,357. Suspension for Electric-Railway Motors. W. Cooper, Cincinnati, O.

613,367. Electric Rotary Cutter. F. Gardner, Chicago, Ill.

613,406. Electric Car Lighting. W. Biddle, New York, N. Y.

613,418. Electric Railroad. C. L. Kemery, Pittsburgh, Pa.

613,420. Electric Vehicle. K. Knudsen, Chicago, Ill.

613,433. Electric-Railway System. L. E. Watkins, Springfield, Mass.

613,533. Telephone Box or Cabinet. I. Sparks, Santa Fe, N. M.

613,567. Block-Signaling Apparatus. T. T. Fogel, Allentown, Pa.

613,594. Electric Fuse-Wire Holder. W. D. Packard, Warren, Pa.

613,612. Electric-Railway System. L. E. Watkins, Springfield, Mass.

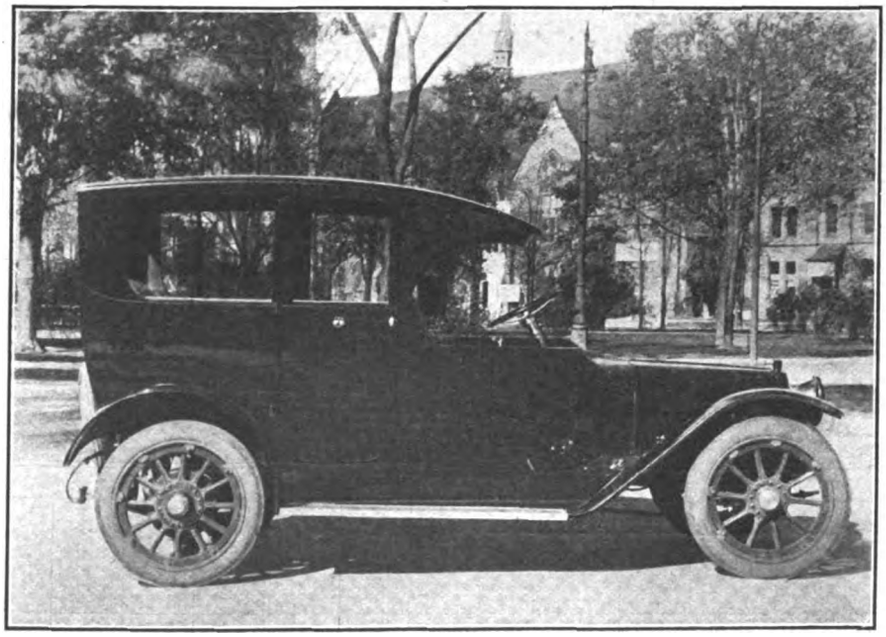
613,647. Insulator for Incandescent Electric Lamps. C. W. Brown, Boston, Mass.

Digitized by Google

Electric Vehicle Section

Electric Taxicabs in Detroit Reduce Operating Costs 40 Per Cent.

To the average patron of taxicab service the usual rates in effect, if not exorbitant, seem sufficiently high to net the operating company a very liberal return on the capital invested. As a matter of fact, however, there seems to be a well defined feeling among the taxicab companies throughout the country that unless some radical means of reducing the present high operating costs can be found, there will be no incentive to remain in the business.



One of a Fleet of Electric Taxicabs Used in Detroit.

It is perhaps not realized that the life of a well made gasoline car, costing from $2,000 to $2,500, is seldom over five years in taxicab service. This means that a company must replace its equipment every five years. Also, experience throughout the country has shown that from 40 to 50 per cent of the distances covered by the vehicles in regular service constitutes empty mileage. These conditions, together with other expenses inherent in gasoline-car operation has led to serious consideration on the part of taxicab companies of the electric vehicle.

In Detroit an electric service is being operated with remarkable results. The Detroit Taxicab & Transfer Company about two years ago experimented with the electric vehicle, and the results were so satisfactory that 12 cabs of this type were placed in service, and today the gasoline cars are being replaced as rapidly as the electric machines can be manufactured.

I. S. Scrimger, an executive of this company, in a paper before the recent convention of the Electric Vehicle Association of America, commented on his company's experiences as follows:

"In Detroit, we get 70 cents for our first mile and 40 cents for each additional mile; single-tariff meters being used. In other words, it doesn't make any difference as to the number of passengers carried, whether one or four—the capacity of the cab—the rate is the same. Comparative figures established between the Detroit Taxicab & Transfer Company and other companies in the United States show that the cost of operation per mile is between 30 and 35 cents. Taking the 30 cents per mile cost as the basis for figuring, if a cab covers two miles we receive $1.10. If the cab returns empty, we have covered a distance of 4 miles for which we have received $1.10. The cost per mile being 30 cents shows that we have lost on this run, and the history of the taxicab business throughout the United States is that from 40 to 50 per cent of our distances covered are empty mileage. The revenue obtained from service rendered in Detroit is about 33 cents a mile. You will, therefore, see that very little profit is to be made with an expense of between 30 and 35 cents a mile and an income of 33 cents a mile. It, therefore, became necessary that we obtain equipment that could be operated more cheaply than gasoline cabs.

"About two years ago we decided to build one electric cab as an experiment. Our first car was placed in service at the Hotel Pontchartrain at 2 o'clock in the afternoon, June 25, 1914, and up to the present time has been in continuous service about a year and three months.

"No advertising was done, nor an announcement of any kind made when this cab went into service. We thought it best to start the electric service, and allow the public to judge whether or not the electric cab would meet all requirements. It was only a short time when we commenced to receive letters of approval, and the cab met with such a signal success that we decided to build eleven more. These additional eleven electric cabs went into service last December and January, and have, therefore, been in service about eight months. We have just completed 15 additional electric cabs, and we have 20 more under way, which will be in service about the first of January. This will give us an equipment of 47 electric cabs.

"The public in Detroit has taken very kindly to our electric equipment; so much so, that we have had people wait from a half hour to three-quarters of an hour for the return of an electric cab, when we had gas cabs standing, which they might have used. We found, when trying to get an expression from the public before installing our electric cabs, that the public was not very favorably disposed toward the electric service. The most of the persons consulted seemed to have only a very meager idea as to how well an electric cab could be made to perform. I heard one gentleman say that he thought electric cars were designed and built for old ladies, and had he known our car was an electric before getting into it, would have declined to use the electric service. This same gentleman said we had not only converted him to the electric, but he was going to buy one for his wife if he could obtain

Digitized by Google

a car that would give as satisfactory results as the one we were building.

"All of our 12 cabs now in service are being operated 24 hours a day with two drivers; each man working 12 hours. To enable us to operate our electric cabs 24 hours a day we have had installed at the edge of the sidewalk at the Hotels Statler, Tuller, Griswold House, and Pontchartrain charging boxes, and our cabs, while standing idle, are on charge. The Edison Illuminating Company of Detroit has cooperated with us in every way possible, and has given us power wherever it was possible to do so.

"We feel that we have constructed for our service a thoroughly up-to-date, practical electric taxicab. Some eight years' experience with the gasoline car taught us the weak points of the gas car, and we have tried to overcome them with our new construction.

"Our cab has a 121-inch wheel base, and the interior of the cab body proper has a space about 68 inches long and about 50 inches wide, which enables us to carry from four to five passengers very comfortably. Our experience taught us that the limousine type of body was preferable to the landaulet type, and could be operated with less expense. Our operating cost per mile up to the present time has not exceeded 20 cents a mile. This cost includes drivers' wages, overhead, tire expense, garage expense, depreciation and every expense, in fact, which is incidental to the operation of the taxicab business. The only point on which we are uncertain is the life of the car. We feel that the car has been so well made that we may be able to depreciate this car over a period of ten years. This, of course, is a problem which time alone will tell whether or not we are correct."

A view of one of the Detroit cabs is shown in the accompanying illustration. The battery equipment used comprises 59 cells, Edison A-6 battery and a speed of 24 miles per hour can be attained. Each vehicle averages from 75 to 100 miles per day.

Operating Costs of Industrial Electric Trucks.

The accompanying tables gives all labor and operating charges on 212 industrial trucks in the service of the Pennsylvania Railroad, during the year 1914. These data, which were presented by T. V. Buckwalter before the recent convention of the Electric Vehicle Association of America, are arranged in two sections devoted to total charges for all trucks at each installation and averages per truck month for each installation.

There is naturally a wide variation in some of the charges, due to difference in current cost, ranging from 5 mills to 10 cents per kilowatt-hour, to the number of trucks in the installation, and the character of the work performed.

The shop trucks include labor charges of drivers, but the baggage trucks do not include these charges for the reason that the trucks are driven by the baggage porters.

The installations are given an efficiency standing based on saving on shop trucks and on cost of operation on baggage trucks. The former is computed on saving because these trucks handle work formerly done by manual labor, and the saving is readily computed. However, the figures do not represent the total saving, as, for instance, increased efficiency of the shop due to having material handled on a regular and prompt schedule does not admit of calculation. The old practice of helping out the labor gang with machinists is also to a great extent avoided.

The saving effected in baggage service is considerable, and some figures are available but were not considered sufficiently complete to be presented at this time. This saving is difficult of calculation. The character of the service has changed considerable since the introduction of electric trucks. The parcel post, formerly non-existant, is now a large and important part of the work. The labor force has not, generally speaking, been decreased, but on the other hand, the business has increased.

Rush periods can now be handled without borrowing untrained men from other departments. A better class of men continue in service, as compared with the rapidly changing force in the old days.

ELECTRIC TRUCKS—SUMMARY OF OPERATING DATA, YEAR 1914.

SHOP TRUCKS.

Shop	Average monthly data all trucks: No. of trucks	Labor: Driver	Labor: Truck repairs	Labor: Battery repairs and charging	Material: Truck	Material: Battery	Material: Tire	Kilowatt-hours	Current cost	Total cost	Averages per truck month: Total cost	Current cost	Saving	Percentage (See note 2)
Harrisburg	1	48.98	2.62	1.76	1.89	4.40	5.39	209	5.43	70.47	70.47	5.43	154.80	100.0
Verona	1	59.96	5.30	2.74	1.55	1.09	3.48	587	8.81	82.94	82.94	8.81	154.65	99.8
Trenton	1	32.48	5.72	2.84	8.36	1.56	6.35	792	9.90	67.20	67.20	9.90	134. 9	87.0
Juniata	2	76.64	13.23	11.82	5.36	11.42	1.73	1,426	11.14	131.33	65.66	5.57	109.15	70.5
Altoona car shops	3	116.96	12.52	18.26	21.96	12.54	—	1,251	8.57	190.81	63.60	2.85	96.12	62.0
Renovo	2	92.95	2.84	12.35	1.63	8.28	—	1,168	18.05	136.10	68.05	9.02	93.61	60.4
Mt. Carbon	1	32.36	0.39	2.39	0.40	1.13	—	272	8.80	45.47	45.47	8.80	93.22	60.2
Altoona machine shops	9	560.42	88.96	35.89	45.79	13.72	29.77	2,342	14.06	788.61	87.62	1.56	92.22	59.5
Pitcairn	4-5	168.46	44.48	30.24	22.07	22.64	20.81	789	4.05	212.75	67.99	0.88	89.64	57.9
South Pittsburgh	1	42.35	1.83	1.76	0.22	0.51	—	392	4.60	51.27	51.27	4.60	64.04	41.3
Meadows shop	1	—	2.85	1.06	0.74	0.08	—	734	29.40	34.13	34.13	29.40	21.75	14.0
Sunnyside yard	10-14	—	40.89	14.32	22.29	3.21	12.80	4,938	38.86	132.37	12.73	3.74	—	—
West Philadelphia	1	10.27	1.68	0.08	0.01	0.06	—	208	1.44	13.54	13.54	1.44	—	—
Jersey City Pier L	3-5	—	30.10	30.93	22.18	35.05	9.38	1,340	45.77	173.42	51.00	13.46	—	—

BAGGAGE TRUCKS.

Station	Average monthly data all trucks: No. of trucks	Labor: Truck repairs	Labor: Battery repairs and charging	Material: Truck	Material: Battery	Material: Tire	Kilowatt hours	Current cost	Total cost	Averages per truck month: Total cost	Current cost	Saving	Percentage (See note 3)
Baltimore	2	6.54	6.02	1.30	0.62	1.53	953	11.50	27.50	13.75	5.75	—	100.0
Philadelphia	34-35	87.55	96.36	128.52	12.30	8.19	6,821	88.66	421.58	16.93	3.56	—	81.2
Pittsburgh	17-28	158.50	136.98	128.90	40.07	3.43	6,731	34.96	503.13	17.97	1.25	—	76.1
New York	64-66	198.11	172.03	248.73	475.38	23.64	5,016	66.63	1,184.48	18.08	1.02	—	55.3
North Philadelphia	4-10	23.29	33.28	15.09	32.76	6.11	1,534	43.56	154.09	24.85	7.03	—	54.4
Washington	18	90.46	58.17	67.59	37.91	114.72	11,810	85.88	455.00	25.28	4.77	—	46.5
Jersey City	3-5	40.88	17.66	16.24	21.48	—	956	19.12	115.38	29.58	4.90	—	20.6
Harrisburg	1	10.44	4.17	0.96	39.02	—	588	12.01	66.60	66.60	12.01	—	

1. The efficiency standing of each truck installation is indicated on a percentage basis. 2. Shop truck efficiency is based on saving in labor effected. 3. Baggage truck efficiency is based on cost of maintenance per truck month. 4. In each case the best showing is indicated as 100% efficiency.

Digitized by Google

Why The Electric Truck Finishes Strong

There is so much noise about automobiles in general that the Electric truck suffers to some extent just because it is an Electric—hence quiet and rather unostentatious. Electric delivery expands yearly on the solid economic basis which characterizes the growth of Electric lighting power, traction, etc. In comparison with its more spectacular co-worker, the gasoline truck, the Electric may seem to be slow and to "trail" its betters, but don't forget the finish of the race.

The economic fields of the two types are rapidly becoming recognized. Firms who discarded the early Electrics for gasoline trucks are going back to the modern Electric which has all the economic advantages of a machine electrically propelled, plus far better batteries and other improvements. The great city fleets of our corporations are nearly all Electric and other city fleets soon will be.

The more scientific delivery becomes the more Electrics will be used. The Electric excels in three essentials—*long life* which means low depreciation—*dependability* which means fewer breakdowns and—*economy of operation* which means fewer parts replacements, lower wages for driver, low insurance rates and so on. These things the ledger shows in black and white (sometimes red also) and the firms who heed, credit the Electric at the tape.

With nearly 5000 G.V. Electrics in daily operation we offer you six models representing by far the most substantial progress in Electric road transportation. Let us send you our handsome and instructive catalogue.

General Vehicle Company, Inc.

Long Island City, N.Y.

New York, Chicago, Boston, Philadelphia

Copyright, 1915

2521

Digitized by Google

COMPARISONS BETWEEN HORSE, GASOLINE AND ELECTRIC DELIVERY COSTS.

Summary of Electric Vehicle Study by Massachusetts Institute.

The fourth and final paper on the economics of motor trucking vs. horse-drawn haulage, summarizing the results of an extensive investigation covering three years, has been issued by its author, Harry F. Thomson, late of the Electrical Engineering Research Division, Massachusetts Institute of Technology, Boston. The investigation was suggested by Charles L. Edgar, president of the Boston Edison Company, and financed by this company. Bulletin I, issued in March, 1912, dealt with "The Economical Transportation of Merchandise in Metropolitan Districts;" Bulletin II, with the "Cost of Motor Trucking," and III embraced "Observations on Horse and Motor Trucking." The first two publications are out of print, but were reviewed to some extent in THE ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, at the time of issue.

The current bulletin discusses (1) delivery and trucking conditions in large American cities, (2) reviews important data collected during the study, and (3) presents estimates of relative expenses of performing various classes of delivery work by the three agencies.

Under the head of "City Hauling Condition," Mr. Thomson points out that the average daily travel of a horse is about 15 miles at four miles an hour. This means that he is actually moving 3.75 hours and standing 6.25 hours of each 10-hour day.

Thus, the prevailing arrangements at freight houses, warehouses and yards are such as to favor horse operation, in that the waiting periods correspond to the amount of time required by nature for rest.

The coming of the motor truck has shown the entire inadequacy of railroad and warehouse arrangements for loading and unloading. The conditions which make motor operation more efficient than horses for this class of service are lacking at present, but should be given attention by transportation experts. With more doors, better assorting of goods to be hauled and the use of detachable bodies, transportation by motor will be greatly facilitated. To illustrate the handicap put upon efficient haulage, observations were taken of 179 loads, which were hauled from a factory, the average wait for turn at the loading platform being 34 minutes, while it required only 17 minutes to load.

Suggestions offered for the more successful operation of motor trucks are:

(1) Cars should be routed so as to avoid idle standing time and unnecessary retracing of route.

(2) Motor trucks should be kept moving; they represent greater investment, and earning power, than horses.

(3) Cars should be inspected weekly and a written report made to the superintendent.

(4) Cars should be overhauled at least yearly.

(5) Overspeeding and overloading should be prohibited.

(6) Drivers should be interested in the condition of their cars; each should have his own machine, if possible.

(7) Accurate records of cost and performances should be kept; this will stimulate the driver, and be valuable as a basis for discussion with manufacturers.

The daily performance of 63 vehicles in trucking and delivery service was observed for eight months. A tape record of distances and speeds was obtained, and data collected on stops, loads, etc. Cost data was obtained from 32 companies operating 780 electrics, 41 operating 401 gasoline, and 54 operating 5,787 horses. Maintenance expense, the relative merits of Edison versus lead batteries, and of solid versus pneumatic tires, and the consumption of "fuel" or feed, were examined carefully.

Some of the results arrived at were:

The reliability of electric trucks is about 95 per cent of working days (290 days out of a possible 305), while gasoline trucks show about 90 per cent reliability, or 275 days a year.

For parcel delivery, the cost per delivery was estimated as follows, in cents per package:

COMPARATIVE COSTS PER PACKAGE.

Zone.	One-Horse.	Gasoline 1,000-Pound Car, Gasoline at 12 Cents.	Electric 1,000-Pound Car, Electricity at 2 Cents.
Within 2 miles..	5.8	6.4	5.75
Within 4 miles..	6	6.4	5.75
Within 10 miles..	7.75	7.9	7.15
Within 13 miles..	12	10	...

The two-mile zone represented three trips a day from the store; the four-mile zone, two trips, and the outer zone one trip. The conclusion was drawn that the economic zone for horse delivery is within a two-mile radius, for electric cars between 2 and 10 miles, and for gasoline cars beyond 10 miles. This corresponds roughly with the present layout of delivery systems of some large New York department stores.

Estimates for bulk-goods delivery, such as coal, stone and lumber, show that for hauls of two miles or less the cost by horse wagon is cheapest; for hauls between two and six miles, the electric truck is cheaper than either horse wagon or gasoline truck, and for hauls of more than three miles the gasoline truck is cheaper than the horse wagon, but not so cheap as the electric, at least within the six-mile radius. Delivery costs per load, comparing two-horse truck up to two-mile haul, and three-horse truck for greater distance, with five-ton electric and five-ton gasoline trucks, were as follows:

COMPARATIVE COSTS PER LOAD.

Vehicle.	1 Mile.	2 Miles.	4 Miles.	6 Miles.
Horse-drawn truck	$1.00	$2.00	$3.90	$6.00
Gasoline truck	1.50	2.50	3.70	4.62
Electric truck	1.25	2.05	3.15	4.25

As in the table on parcel delivery, gasoline at 12 cents and electricity at two cents is assumed.

The author of the bulletin points out that the cost of "fuel," i. e., gasoline or electricity, bears a small relation to total operating costs. For reasonable distances traveled, and for gasoline at 16 cents or electric current at three cents, the cost of fuel is only 6 to 10 per cent of the total operating cost. Labor is a large item. In parcel delivery, the expense for driver and helper ranges from 36 per cent of the total, for the long-haul gasoline car, to 63 per cent for the short-haul horse wagon, with labor expense for electrics midway of the two.

Conclusions as to the economical zones of operation are: For both light and heavy service, the electric truck can operate within a zone of short haul, covering dense territory, at about the same unit delivery cost as for horse wagons; for longer runs, within mileage limits practicable with a single battery charge, the electric is cheaper than either competitor; while for runs beyond the convenient daily capacity of a storage battery, the gasoline truck is the most practicable.

These zones, as already indicated, are roughly, two, 6 to 10, and more than 10 miles, respectively, from the center of operation. "Representative values of the difference in delivery costs in favor of the electric over the gasoline machine in the medium-haul zone," says Mr. Thomson, "range from 8 to 20 per cent, and over the horse wagon as high as 30 per cent, with the horse entirely eliminated, in some classes of service, because of physical limitations."

The field of economic operation of the electric may be extended by recharging facilities at desirable points and by the use of a second set of batteries for a truck which is to cover a greater daily mileage than a single charge will permit. Either of these methods may increase the effective radius of the electric so as to make its unit delivery cost lower than that of the gasoline machine, for the longer runs.

Mr. Thomson points out that there are other considerations besides cheap-

Digitized by Google

A Letter from Ensign Fitzhugh Green of the U. S. Navy Relating Some of His North Polar Experiences

Here are a couple of paragraphs of a most interesting letter written by Ensign Fitzhugh Green, U. S. N., a member of the Crocker Land Expedition, which is on an exploration trip in the North Polar Regions. This letter, written from Etah, Greenland, the headquarters of the expedition, and dated August 1st, 1914, only recently reached us.

One Paragraph Reads:—

"Our wireless has failed so far, due principally to the unfortunate position of our headquarters. We were unable to locate in Flagler Fiord owing to the heavy ice. The papers will have an account of our work to date, as McMillan is sending in a dispatch by this mail."

Another Paragraph Says:—

"At Etah we were forced to land over the ice and rocks. Putting up the house required nearly three weeks and the motor generator meant another week's delay before we finally got at the batteries early in October. Filling the jars and giving the whole a good overcharge, we switched over to our lights which we had wired throughout the house. There was a blaze of light. The Esquimos gathered for the occasion were wild with delight. It was great!"

The battery referred to in the above paragraphs was an "Ironclad-Exide" If ever a battery saw hard service, rough usage and had to operate under the most unfavorable conditions, this was it. Such a test proved without doubt the reliability of the "Ironclad-Exide" Battery.

We have had facsimile copies made of the entire letter of which the above paragraphs are only a part. The letter contains many interesting facts and incidents. We will be glad to send you a copy on request.

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of

The "Chloride Accumulator", The "Tudor Accumulator"
The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

New York Boston Chicago Washington **PHILADELPHIA, PA.** Denver San Francisco Seattle St. Louis
Cleveland Atlanta Pittsburgh Detroit **1888-1915** Rochester Los Angeles Toronto

Digitized by Google

ness—reliability, appearance, rapidity of deliveries, cleanliness and advertising value of electric service. The time may come when the use of horses will be forbidden in the largest cities, thus removing cause of filth, flies and disease.

Under "Prospect for the Future," the investigator remarks that while the use of horses has reached a highly developed state, after generations of application, the habits of truck users have not adjusted themselves to the most efficient application of the machines. Improvements in construction and in the conditions surrounding their operation will result in increasing superiority.

Electric Vehicles in Concord.

The town of Concord, Mass., which operates a municipal lighting plant, has 60 miles of street lighting. This includes every public road in the town. The uniform lighting unit is the 50-watt incandescent, and there are about 1,000 of these lamps, with simple metal reflectors.

The efficiency of electric vehicles in operating the plant has been fully demonstrated. Manager A. W. Lee says they are practically indispensable. The plant owns a Bailey electric roadster which is used for patrolling, and a one-ton G. M. C. truck for all highway work. The latter gets hard service, being on the road all day, every day in the year, with scarcely time to allow its being painted. With the use of this vehicle four men are able to perform all the line work, including new construction and renewals. Just at present the gang is engaged, during available time, in the concrete reinforcing of poles. About 200 have been reinforced thus far, by the Orr system. Poles which are approaching the end of their usefulness are excavated about, the decayed portion removed, and forms set in place which are filled with concrete, making a base about 15 inches in diameter and extending 8 or 10 inches above ground level.

Garage Topics Discussed by Chicago Vehicle Men.

The functions of an electric vehicle garage, caring for either passenger or commercial cars, were discussed at the meeting of the Chicago Section, Electric Vehicle Association of America, on November 2. R. Macrae, of the Commonwealth Edison Company, led in the discussion, abstracting his paper on this subject presented at the recent Cleveland convention of the Association. He pointed out the poor load-factor of private charging stations, and the lack of facilities for giving the battery and vehicle the care it requires. He concludes that "in order to get the best that is in the electric vehicles out of them we must operate them from large and properly equipped garages."

Comparative Development of the Commercial-Power and Electric-Vehicle Loads.

The prevailing impression that the progress of the electric commercial vehicle propaganda is slow is justified only as it relates to those cities where endeavor in this direction has been discouraged or where no attempt to introduce these machines has been made at all; for, as a matter of fact, wherever any systematic endeavor to promote the use of electric vehicles has been made, not only has progress resulted, but that progress has been relatively as rapid as have similar gains in other fields of electricity merchandising.

To prove this statement H. H. Holding and Stephen G. Thompson presented some interesting data before the Electric Vehicle Association of America, selecting for comparison the records of three years' development of the commercial-power and electric-vehicle loads in Public Service Electric Company's territory in New Jersey, during which period similar systematic exploitation of these two fields of electricity selling was employed. These three years are selected because they represent a period in which business conditions were nearly normal and free from the industrial disturbances which have occurred since 1913.

From these records charts shown in

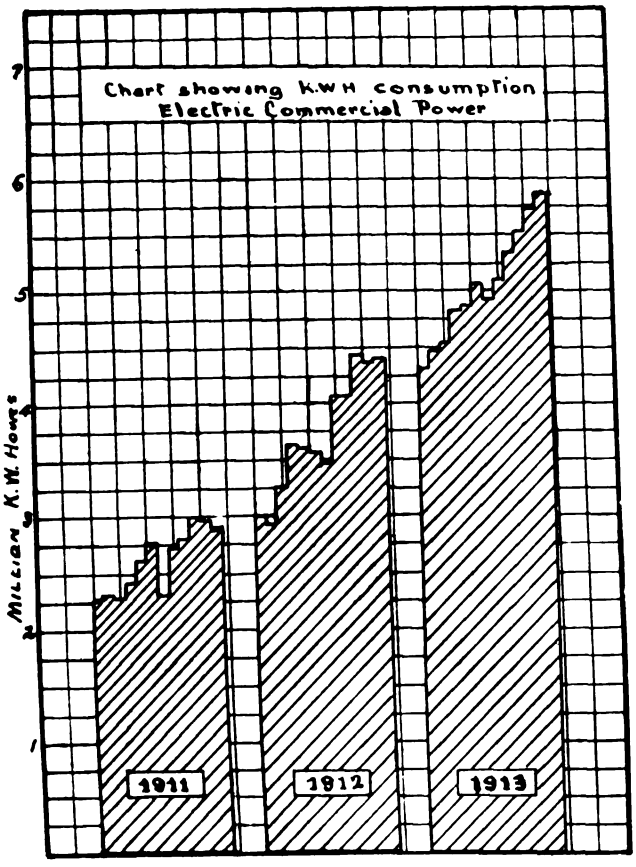


Fig. 1.—Commercial Power Consumption in New Jersey.

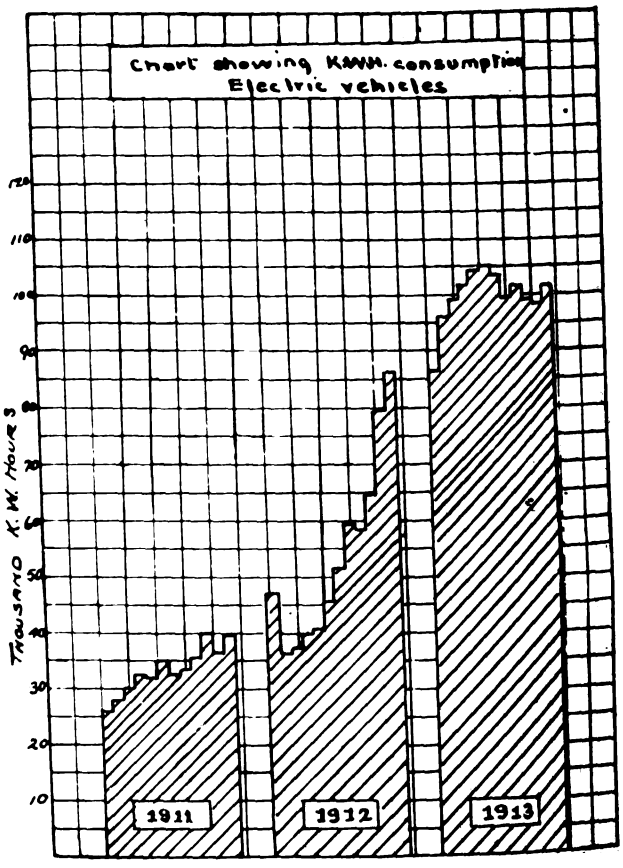
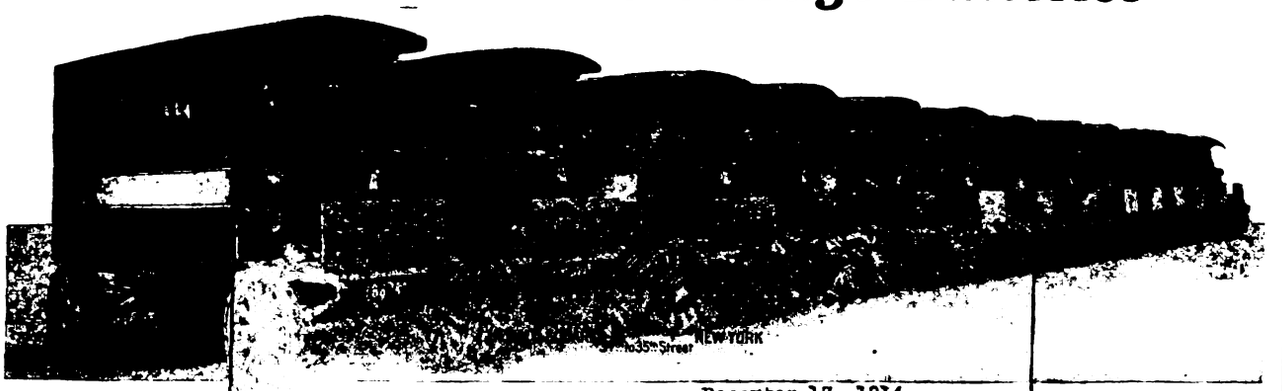


Fig. 2.—Battery Charging Energy Consumption in New Jersey.

Digitized by Google

A Striking Testimonial to the High Service Efficiency of Edison Alkaline Storage Batteries



December 17, 1914.

Edison Storage Battery Co.,
Orange,
New Jersey.

J. Kelly, Branch Manager.

Dear Sir:

In answer to your inquiry of December 16th as to the life of the Edison A-6 Storage Batteries in our Delivery service, I am pleased to inform you that the eighteen A-6 Batteries which we put in service in 1909-10 under a guaranteed life of three years, have given from four years to four years and six months continuous service, in every case.

This means every working day at an average mileage of thirty-five miles per day. As these batteries exceeded their guaranteed life by such a large margin, I feel you are entitled to this information from.

Thos. Brennan

B/M Chief Engineer.

Four and one-half years' continuous service, *"every working day"*—no expensive repairs; no lost time; no disarranged delivery schedules.
The Edison non-acid, steel-encased, nickel-iron Storage Battery is used in over one-third of all the Electric Trucks and Delivery Wagons in the country.

Write for Bulletin 500 on Commercial Vehicle Batteries.

EDISON STORAGE BATTERY COMPANY

Factory and Main Office, Orange, New Jersey

Distributors in

New York Boston Chicago Detroit Washington
San Francisco Los Angeles Portland, Ore. Seattle

Digitized by Google

Figs. 1 and 2 have been plotted, in which the kilowatt-hour consumption for the years 1911, 1912, and 1913, for both power and electric vehicles are comparatively shown.

In considering these charts, due allowance for the different scales used must be made, otherwise they will be misleading, as the areas shown are not comparable at all in the relation of vehicle to power load, but only in their relation to one another in the same chart. In fact, the purpose of the charts is to show the increase in kilowatt-hour consumption in each field and to compare this growth in substantiation of the statement that the electric-vehicle load has developed as rapidly as has the power load in the same period. Therefore, a proper use of the charts would be a comparison of the power load consumption for 1911 and 1913 and of the electric-vehicle load for the same period, which will indicate that the relative increase in business in the two fields has been in the neighborhood of 100 per cent for the power load and 200 per cent for the vehicle load. This more rapid development of the electric-vehicle load is probably due to its relative size as compared with the total power load, and therefore the percentage relations are not parallel; still it is noticeable that the curve of increase follows the same general line, as indicated by the upper portion of the plotting.

During the three years covered by the charts a relative amount of effort was expended in each field of electricity selling, that is, the effort was made commensurate with the gross amount of business already developed and the probable increase in each field.

With these and similar evidence from other localities, it is rather surprising that the prevailing adverse attitude toward the electric machine should be found so generally existing in the ranks of those most interested in the ultimate gain of the goal indicated by the slogan of the central-station interests, "Do it Electrically." The fact that this attitude actually exists at all is probably due to error in the selection of the reference point when comparing the electric-vehicle development with that in other lines. All values in life are relative, whether there is rest or motion, depending upon the location of the reference point, the proper selection of which will place the electric vehicle in an entirely different light and indicate that it presents a potential field for the sale of electricity comparable with the present commercial power field.

Heretofore the reference point which seems to have been universally used in determining the progress of the use of the commercial car electrically driven, is the commercial car gasoline driven. This conception is entirely wrong.

That the electric motor in the factory is displacing other forms of power transmission, no one can deny. Let us see what has been the rate of progress of electric power transmission in the factory. Turning to the United States census reports we discover that in the ten years from 1899 to 1909 the manufacturing industries of the country increased their product 83 per cent in value. To produce this added output over eight million horsepower was added to the power used in the factories. Of this amount two million horsepower was in electric motors, the remaining six million being in other forms of transmission, mostly steam engines with belt drive.

During that entire decade the electric motor was a demonstrated commercial success, yet by no means was it able to monopolize the market for power transmission in the factory.

Census figures further show that in five years from 1899 to 1904 the increase in electric drive was but 7.1 per cent, while in the five years from 1909 to 1914 the increase was 21 per cent.

If we use the history of the popularity of the electric motor in the factory for reference, the rate of adoption of the same motive power for the transportation of the product of the factory is in comparison highly complimentary to the latter.

The change of conditions in this country has created a large demand for vehicular transportation of merchandise, and the demand has been partially met by the use of the most accessible substitute for the horse, namely, the gasoline vehicle. That such a vehicle is the "best" does not follow as a conclusion more logically than did the use of steam with belt transmission indicate the superiority of such transmission in the decade referred to above.

As the central station has been an accelerating factor in the promotion of the use of the motor for industrial power transmission, so even in a greater degree its influence through its sales organization will prove to be a mighty power in bringing into "its own" the electric commercial vehicle.

Electrical Manufacturer Builds Garage for Employees.

In line with the modern tendency in manufacturing establishments, to provide every possible convenience and comfort for employees, the Robbins & Myers Company has recently completed a garage to house the cars of the employees at its large motor and dynamo factory, Springfield, Ohio.

Exterior of Employees' Garage at Robbins & Myers' Plant.

Interior of Garage—Battery Charging Facilities Are Provided.

The building is of brick and steel construction. The brick is stuccoed, giving a very attractive appearance to the exterior of the building. The floor and also a large driveway extending the entire length of the front of the building are concreted. Daylight illumination is obtained both from windows in the side walls and from skylights. Night illumination is obtained by high-wattage Mazda lamps with metal reflectors.

The building is 84 by 64 feet and will house between 30 and 40 cars around the walls without using any of the space at the center of the floor, enabling every car to run in or out without moving any other car. The floor is marked off and each employee who drives a car has been assigned a position which belongs to him permanently, thus avoiding any confusion among the drivers as they enter.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 20. CHICAGO, SATURDAY, NOVEMBER 13, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.
E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER SERVICE THE SOCIETY FOR ELECTRICAL DEVELOPMENT INC. DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
Accurate Estimating for Proposals.....879
Public Policy Advertising.....880
The Sale of Energy to Municipalities.....881
Intensive Cultivation of Central-Station Business.....881

DEPARTMENTS:
Commercial Practice 889
Electrical Construction 894
Public Service Commissions.....897
Questions and Answers.....899
New Electrical and Mechanical Appliances.....906
Latest Approved Fittings.....912
Current Electrical News.....913
Record of Electrical Patents.....917

LEADING ARTICLES:
Electricity in Harvesting Works.....883
The Sale of Current to Municipally Owned Distributing Systems by Central Stations.—By W. Rawson Collier.....890
The Temperature of Field Windings.—By H. M. Phillips.....894

MISCELLANEOUS:
Formation of N. E. L. A. Technical Section.....882
Constructive Activities of Kansas City Electric Club.....882
Election Results Affect Utilities at Toledo, Cincinnati and Detroit 882
Lighting of Office Buildings.....882
Electricity Used for Lighting Monster Birthday Cake.....889
Suggestions for Central-Station Advertising Managers.....889
Texas Company Encourages Dealers to Form Christmas Club to Stimulate Appliance Business.....893
Electrical Installation in Seattle Warehouse.....895
Installation Rules for Gas-Filled Incandescent Lamps.....896
Repairing a Motor.....896
Among the Contractors.....896
Submarine Batteries Discussed at Court Martial.....898
Generating and Distribution Statistics of Pacific Power & Light Company 901
Extraordinary Telephone Development in Chicago.....901
Railway Electrification at Sydney, Australia.....902
Institution of Electrical Engineers.....902
Causes of Electrical Accidents in English Collieries.....903
Novel Features to Characterize Electrical Prosperity Week in Many Cities.....904
Milwaukee to Have Electric Show During Prosperity Week 904
Steel Electrically Produced Direct from Ore.....904
Massachusetts Municipal Electric Plants.....905
Resistance of Radiotelegraphic Antennas.....905

Copyright, 1915, by Electrical Review Publishing Company, Inc.

ACCURATE ESTIMATING FOR PROPOSALS.

Inspection of the bids submitted by electrical contractors in a great many cases discloses a surprising variety in the amounts bid for exactly the same work. It is not easy to believe that such wide variations exist in the actual carrying out of the work by different firms if it is done according to the specifications. It may be that the diversity in the amounts bid is greater in cases where specifications are not definite, but even in cases where the specifications leave no doubt as to the work to be done very wide ranges in the amounts of bids are frequently to be noted.

In some cases the contract for electrical construction work is not given to the lowest bidder, but to one who can be expected to do the best at a reasonable price. In a majority of cases, however, the work does go to the lowest bidder if he is regarded as a responsible party who can be depended upon to carry the execution of the work to a finish. The result is that contracts frequently go to electrical contractors who carry out the work at a loss, and frequent failures of men engaged in this business are the well known result. It is of interest to inquire why such big differences should exist between different bidders for doing identical construction work.

In any case where there is a variety of bids it is probable that while some are below the actual cost of doing the work others are much higher than actual cost and represent an extortionate profit. In either case the condition may not be a deliberate one upon the part of the bidder, but may represent his ignorance as to what will be the cost to him of carrying out the specified work. In other words, his bid is nothing more than a fairly good guess. In other cases estimates have been made of the cost but the estimating has been done so poorly that the result is not even a close approximation of what the cost will turn out to be. Poor estimating is therefore a frequent occurrence.

The necessity for accurate estimating of jobs of electrical construction cannot be too strongly emphasized. Two things are necessary for an accurate estimate. One is that all of the work to be done should be included and none of it overlooked. The other is a knowledge of the unit costs for different kinds of work. To insure that a complete list of the material required should be drawn up, it is of great value to have blank forms on which all possible requirements are listed, and the filling out of one of these blanks will safeguard against overlooking any important items.

Digitized by Google

Such blanks can be drawn up in different forms for different classes of work. To estimate labor costs accurately it is necessary to have an accumulation of data from previous installations. This points to the importance of keeping records of time and costs on all work done and of summarizing these in such form that they are available for reference and for application to future jobs. The successful man in this, as in most other lines of business, is the man who knows his unit costs.

Next to accurate estimating of the cost of material and labor comes the inclusion of a proper allowance for overhead expenses. A few years ago this was a much neglected item of cost but so much emphasis has been laid upon it by the associations of contractors and others that it would seem doubtful that any contractor could fail to make some allowance for it. However, in many cases ignorance of the actual value of the overhead expense prevents the making of an accurate allowance and here again accuracy depends upon the existence of proper records in the bookkeeping department. It should be recognized that overhead expenses vary from time to time with conditions of work, with the volume of business transacted, etc., and that percentages that apply at one time to one firm do not necessarily fit another time or another firm. Accurate cost keeping is necessary for the contractor to know just where he stands in this respect.

It must be admitted, however, that all low bids are not due to ignorance as to costs, but that they sometimes result from a deliberate purpose to cut under the bid of other contractors for the sake of securing the contract, even though this may be done at a loss. This is not only as a rule poor business, but it often represents a low standard of ethics as well. The loss on a certain job may in some cases be regarded as an advertising expense, but it is very questionable as to whether this is the most desirable form of advertising. A reputation for cheap work is not nearly so valuable as a reputation for first-class work. In other cases it may be expected that by skimping in material or in work it will be possible to get by at the figure quoted by not strictly adhering to the specifications. This of course is a form of dishonesty and should not be considered by any reputable contractor. Another motive which applies in certain cases is that although no money may be made upon the main contract, there will be extra work not covered by the specifications for which a high enough price may be charged to let the contractor come out not only without a loss but perhaps with a substantial profit upon the entire job. This is not only poor business but it is also very risky. It frequently occurs that high estimates on the extras result in this part of the work going to a different contractor and the original bidder is thus left in the lurch. Each job of work and each part of a job should be taken only on the basis of a price which will pay for its own cost and leave a little margin for the contractor. The hope of getting additional work on the basis of a job done at a loss often proves a will-o'-the-wisp.

PUBLIC-POLICY ADVERTISING.

There hardly seems a need to emphasize the importance and value of public-policy advertising to central-station companies as it is quite generally recognized that the good will of the public is the most valuable asset of a utility. However, experience has demonstrated that without educational stimulus the public is prone to accept the activities of the central station towards rendering good service as a matter of course and without any special appreciation.

Public-policy advertising does not necessarily mean the use of big space in the newspapers or a continual harping on the excellence of the company or its methods. In fact, this style of advertising frequently leads to the belief that the company is seeking to defend itself from some attack or agitation which it has reason to fear. The education of the public is really the goal to be reached. Central-station companies are in business to make money. There should be no juggling of words to give the impression that the sole reason for the existence of the utility is to build up the community or serve the people. It necessarily follows that the central station can only be successful and earn a profit by serving the public adequately and this is the fact that should be emphasized, not only in newspaper advertising but by actually giving good service. Frankness and honesty are the two prime requisites in a public-policy campaign. The average citizen cannot be educated to an intelligent understanding of the technicalities of the electricity supply business. Moreover, he is not interested. But he must be brought to a realization that the utility is doing a legitimate business in a legitimate manner.

Central stations in small towns have felt that they could not afford public-policy advertising, and yet municipal ownership and municipal competition make the greatest strides among the smaller communities. The utility is not always at fault, but in many instances such action could be averted if the public were educated to a proper appreciation of the company serving the community. It is not necessary to segregate public-policy advertising in newspapers and thus double the expenditure in this direction. Every advertisement, whether devoted to house-wiring, power or appliances can be made to carry a message to the public which will do its share in molding favorable sentiment.

Unfortunately many companies do not give public-policy advertising a thought until confronted with an organized movement for confiscatory rates or municipal ownership. With the company placed in the position of defending its very existence, it is extremely difficult to convince the public and in several notable instances lavish expenditures in this direction have proved of no avail. Public-policy advertising should be considered much in the same manner as fire or liability insurance and action should be taken before circumstances arise which force an issue.

Digitized by Google

THE SALE OF ENERGY TO MUNICIPALITIES.

The subject of the sale of energy to municipally owned distributing systems by central stations, while a comparatively new one, is nevertheless assuming important proportions and must be given serious consideration. It is well known that the tendency in central-station development is towards centralized generating plants with transmission lines radiating in all directions, forming a network of correlated lines. In Connecticut, Illinois, Montana, and sections of the South, there have already been effected important mergers and rehabilitations looking to this end. As these transmission companies gradually extend their lines they are confronted with the difficulty of being unable to sell their product in towns where municipal lighting plants and municipally owned water-works systems are in operation, on account of the fact that the cities owning these plants are usually unwilling to grant the power companies a general franchise to enter the town for fear that they would prove a serious competitor. The only alternative is to sell energy to these municipally owned distributing systems, and where such activity has been undertaken the success has been extremely gratifying. In Georgia, for instance, of 35 municipally owned plants within easy access to transmission lines 26 are operated with energy purchased from hydroelectric companies. It is reported that in every instance the purchase of electricity has proven a good investment to the town, and in almost every case the citizens are more than well pleased with the service that they are obtaining.

On other pages of this issue there appears an article on this subject by Mr. W. R. Collier, which contains a considerable amount of important data which are well worth the attention of central stations confronted with the necessity of interesting municipalities in the purchase of power. Fortified with this information, Mr. Collier found it comparatively easy to convince city councils that by the non-use of their steam plant throughout the greater portion of the day they will actually be losing a great deal of money and that this loss would be considerably lessened if energy were purchased from a central-station, as the latter sells its energy as a finished product at the switchboard. The situation is exactly parallel to that of interesting managements of industrial plants in purchasing power, and should be undertaken with the same conviction of success that has been largely responsible for the enormous power loads now enjoyed by central stations throughout the country.

From the point of view of revenue and average rate this type of business is extremely profitable. The commercial cost in serving municipalities is extremely small, as an entire community is represented by one meter, one bank of transformers and one account. As a general rule the bills are paid promptly, there are few complaints and the cost of holding the business after it is once signed is nil. It also follows that where energy is furnished to municipalities the supply company is often able to obtain a satisfactory unlimited-term franchise which, while prohibiting competition with the municipal plant, often permits of securing large power business, say in amounts of 50 horsepower and over.

INTENSIVE CULTIVATION OF CENTRAL-STATION BUSINESS.

The Boston Edison Company is completing an exhaustive canvass in its territory which was undertaken to determine first, the exact conditions in every building in the territory supplied by the Boston Edison Company, and secondly, to increase the uses of electricity of every existing customer, and, finally, to secure the greatest number of prospects for additional uses of the service, as well as prospective new customers. Sufficient progress has been made to furnish conclusive evidence that the expense of this undertaking is justified by the data that have been obtained. The new-business department now has available a vast amount of pertinent information that will permit of more intensive cultivation of business among existing customers which, as is well known, is in many cases more profitable than entirely new business which makes necessary line extensions and transformer and meter installations.

A canvass such as that mentioned involves rather heavy expenditures and principally for this reason may seem to apply only to the larger companies. However, if the actual collection of such data were combined with an inspection of a customer's installation, a notation of damaged or worn out equipment, or perhaps the repairing of such damaged equipment at the time of the representative's visit, a service would be rendered that would mean much toward holding the good will of the customer and insuring the greatest possible utilization of his installation.

In the desire to acquire business central stations too often have ignored existing customers, and thus have not only passed by opportunities for increasing the revenue with a minimum expenditure of capital, but, what is of greater importance, have developed the impression that when once a contract is signed the company forthwith loses interest in the customer.

Many progressive managers have so fully appreciated the necessity of periodic visits for inspection of customers' installations that a separate department has been established to carry on this work. If such visits would combine a tabulation of the opportunities for extending the installation, adding equipment, or in other ways increasing the customer's use of energy, such as accomplished in the Boston canvass, the sales departments would be provided with excellent lists upon which to concentrate their energies and the good will of the customers would be greatly enhanced.

Digitized by Google

Formation of N. E. L. A. Technical Section.

A meeting of the Executive Committee of the proposed new Technical and Hydroelectric Section of the National Electric Light Association was held at the Engineers' Club, New York City, on November 3. The Committee had been requested by President E. W. Lloyd, in accordance with the recent authorization by the national Executive Committee, to organize the section.

The following officers were elected: chairman, Holton H. Scott; vice-chairmen, P. M. Downing, J. T. Hutchings, R. J. McClelland, Charles Ruffner; secretary, S. A. Sewall.

These officers will constitute the governing body of the Section until the regular election of officers by the Section itself at the next annual convention.

All of the technical members of the association automatically become members of the new section and new members will be added to the section on their personal choice. The technical membership of the Association is by far the largest group and the new section will consist of several thousand members. It will take under its jurisdiction nearly all of the technical committees, such as Overhead Line, Prime Movers, Electrical Apparatus, Meters, Underground Construction, Grounding Secondaries, Electrical Measurements.

It was proposed by Mr. Torchio that a new committee be constituted to study and report on the newer industrial applications of electricity from the technical side, so as to be of use in furnishing data and information to member companies and the Commercial Section. This proposition was very favorably considered.

Steps were taken to formulate a constitution for the section and a variety of interesting business was discussed.

Constructive Activities of Kansas City Electric Club.

The Jovian Electric Club, of Kansas City, at its annual meeting and banquet on the evening of November 2, elected the following officers: President, H. F. Lang, Missouri & Kansas Telephone Company; vice-president, J. D. Todd, Western Electric Company; second vice-president, A. P. Denton, Denton Engineering & Construction Company; third vice-president, A. N. Richardson, general superintendent Kansas City Electric Light Comany; fourth vice-president, W. S. Blue, Westinghouse Electric & Manufacturing Company; secretary and treasurer, C. W. McDaniel, Missouri & Kansas Telephone Company. Board of Control (four members elected), F. M. Bernardin, P. Lloyd Lewis, R. D. Obermeyer and F. B. Uhrig. Following the entertainment features of the meeting, several members were called upon to outline the possibilities of work for the club. Edward E. Ingels suggested a study of all public movements, particularly legislative, that would affect the electrical industry, and the closest sympathy and co-operation between all the various phases of the industry. He made the suggestion that a ways and means committee be appointed to outline a plan of work for the club. E. G. Jacques, as representative of manufacturing interests, urged that the entire industry, in all its phases, get busy at once in planning work that will take the place of the war outlets when the war is over. He urged individual enthusiasm concerning the club activities.

E. S. Cowie spoke as representing the contractors, saying that the contractors were at point of contact with more different interests than any other branch, and they provided the contact with the purchasing public. Mr. Cowie said that because of this situation the contractor got enough business and also he was an important factor in the trade, and should have a larger share in the work of the Jovian Electric Club. He urged the officers to give the contractors work in the club, and to insist on the attendance and membership of that branch.

A. N. Richardson spoke as a representative of the central station, mentioning the increase in customers from under 10,000 five years ago to more than 40,000 in November, 1915. He said that he knew the club and the electric company were eager to do all possible in the further development of electrical usage. A resolution was adopted providing that a committee be appointed to carefully outline a program of work for the club.

Election Results Affect Utilties at Toledo, Cincinnati and Detroit.

Despite the frank, outspoken, advertising campaign which was personally conducted by Henry L. Doherty in the interest of a new railway franchise for the Toledo (Ohio) Railways & Light Company, the voters of that city on November 2, defeated the project by referendum vote.

At Cincinnati, the 8.5-cent electric-rate ordinance was carried by a substantial plurality. By the terms of this law the rates of the Union Gas & Electric Company are to be established by the Ohio Commission and the attack of an organized body of citizens on the ordinance, based on a demand for a six-cent rate, is ended.

At Detroit, the voters defeated the proposition to purchase the car lines.

Lighting of Office Buildings.

On the evening of Thursday, November 4, the Chicago Section of the Illuminating Engineering Society held its first meeting of the current season in the Edison Building. Chairman E. W. Lloyd presided and there were about 200 persons present. The paper of the evening was by W. A. Durgin and J. B. Jackson, entitled "Semi-Direct Office Lighting in the Edison Building of Chicago." Mr. Durgin presented the paper, which was illustrated by lantern slides, and described the units used in lighting the offices of the Commonwealth Edison Company, as well as the work of investigation and test which led to the adoption of the units chosen. This is the same paper which was presented at the annual convention of the society in September.

The paper was discussed by Albert Scheible, James R. Cravath, C. A. Luther and J. B. Jackson. The discussion brought out that the Committee on Glare has set a limit to the relative brightness between lighting unit and background at 100 to 1 to avoid glare. The values in these offices are in the ratio of three to one. Cleaning of the bowls is necessary only on the inside. Lack of cleaning results in a decrease from the original illumination to 75 per cent of its value in three weeks.

New England Vehicle Association Elects Officers.

At the recent annual meeting of the New England Section, Electric Vehicle Association of America the following officers were elected for the ensuing year:

Chairman, J. T. Day.
Vice-chairman, Albert Weatherby
Treasurer, L. L. Edgar.
Secretary, C. H. Miles.

Executive Committee, E. S. Mansfield, W. A. Blachford, R. B. Daggett, George H. Hudson, F. M. Kimball, F. J. Stone, C. A. White and Frank H. Smith.

National Fuel Conservation in England.

A committee consisting of representative chemists, engineers, and technologists from all the principal industrial areas in England has been appointed to consider and report upon the question of fuel economy, especially its national bearing. Both the utilization of coal and smoke prevention will come within the compass of the inquiry which is being made as the outcome of a discussion which took place at this year's meeting of the British Association. William Bone, of the Imperial College of Science and Technology, London, is chairman of the committee.

Digitized by Google

Industrial Power Series—Article No. 144.

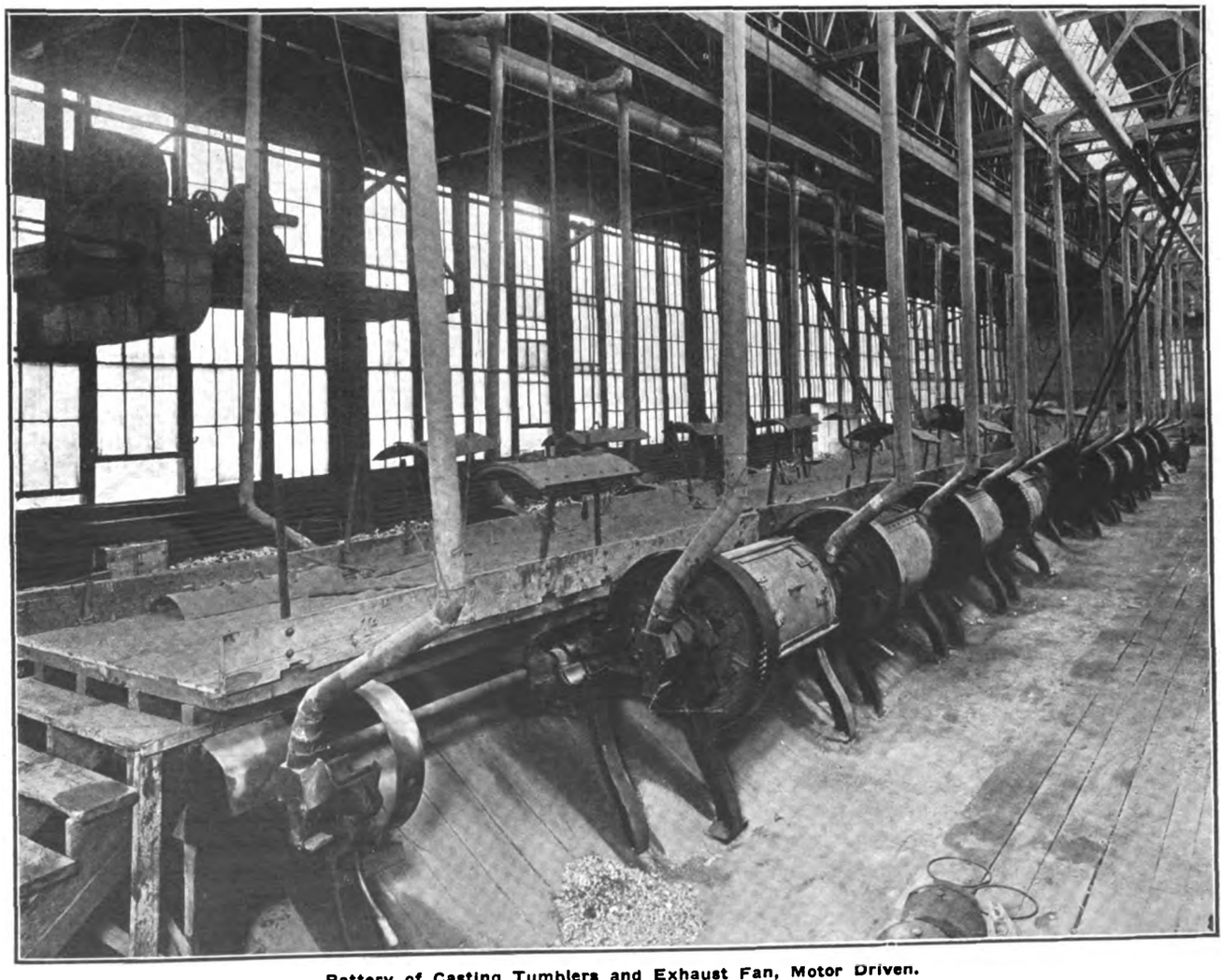
ELECTRICITY IN HARVESTING MACHINE WORKS.

This article deals with the electrical installation in the plant of the International Harvester Works devoted to the manufacture of tillage implements. It is in a way supplementary to the article describing a similar plant of this company which appeared in the issue of October 23, 1915. The installation comprises 1079 horsepower in motors and all energy is purchased from the Empire Gas & Electric Company.

This article relates to the No. 2 works of the International Harvester Company at Auburn, N. Y. The No.'s 1 and 3 works have already been described in previous issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. The No. 2 works are devoted to the manufacture of tillage implements including harrows and cultivators. The harrows are made in several styles, the disk harrow consisting of a series of slightly conical disks mounted on a shaft with the axes parallel to the earth. The disks are supported and actuated by a single mechanism, all of which are mounted on a two-wheeled truck designed to be drawn by horses. The disk shaft is divided at the center so that the two sets of disks may be thrown at an angle with each other by suitable hand levers. The harrow is drawn over the ploughed field and reduces the chunks of earth left by plowing. There are forgings, castings and numerous machined parts entering into the construction of the harrow. There are also toothed harrows of several styles which are intended to be drawn over the soil to reduce it to a still finer state.

Cultivators have the general appearance of a plow but are provided with a series of teeth and shovel-like blades. These implements are used for loosening the soil around vegetation and some types automatically throw up the earth around the stalks forming hills.

The No. 2 works consist of a malleable-iron foundry, shear and punch shop, harrow shop, paint mills, warehouses, etc. There are 44 induction motors in operation aggregating 1079.5 horsepower, and a number of direct-current motors. The majority of the motors are 25-cycle, three-phase machines operating at 2300 volts, although there are a number of 220-volt direct-current motors for the operation of cranes and elevators. The malleable-iron foundry is the principal

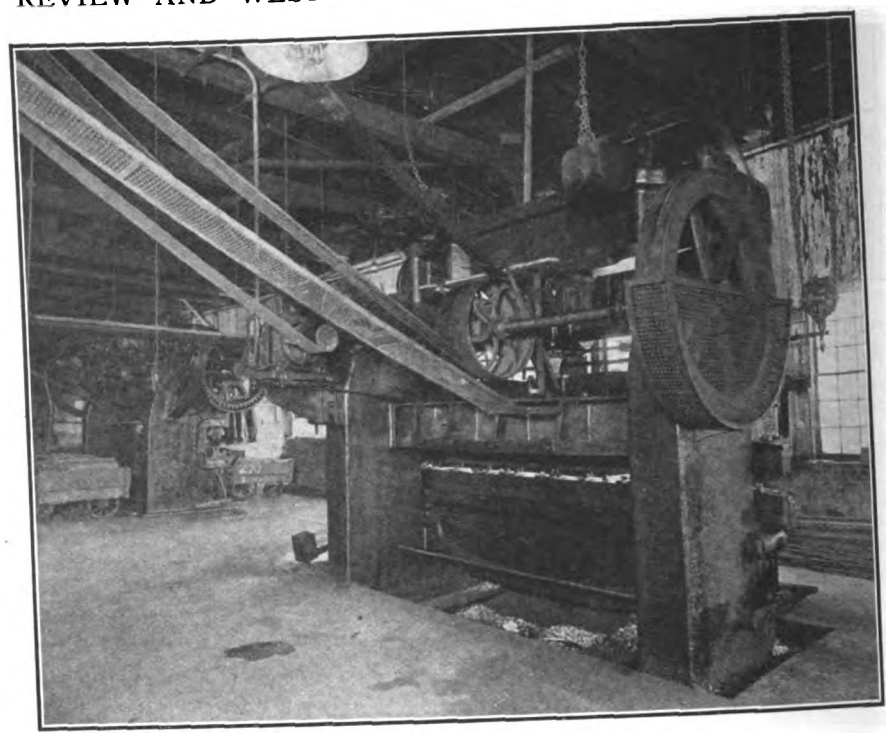


Battery of Casting Tumblers and Exhaust Fan, Motor Driven.

Digitized by Google

feature of interest and is one of the largest and finest equipped foundries, if not the largest in the United States. The processes carried on here would, of course, be applicable to any industry using malleable-iron castings. In connection with the foundry there is such machinery as tumblers, grinders, drop hammers, dust collectors, fans, etc.

In the article describing the No. 1 plant of the International Company the general advantages of electric power in harvesting-machinery works were discussed. In the malleable foundry where there are many thousands of small castings made daily it is necessary to have some means at hand to quickly handle the work. Electric cranes and electric telphers materially aid and facilitate the various processes. There are three malleable-iron furnaces in this plant, each of 20 tons capacity. Two are located centrally in the foundry with the stack for the escaping gases in the center between the two furnaces. The third furnace is located at the extreme end of the building. The furnaces consist of horizontal brick structures with a furnace at the end farthest from the stack where melting coal is burned. The furnaces are hand fired and use forced draft from motor-driven fans. The balance of the structures outside of the furnaces contain the iron to be melted. Over this section the top is composed of removable sections made up of fire brick and steel. The tops are removed by the cranes while the furnaces are being charged. The molten metal collects at the bottom of the furnace where provisions are made for drawing it off into ladles. Fires are lighted at 3:30 a. m. and a heat taken off at 10:30 a. m. when the furnace is again charged and a second heat taken off at 4:30 p. m. At the present time but two furnaces are used and these on alternate days, one being relined while the other is in use.



Motor-Driven Punches and Shears.

Group of Motor-Driven Machines in Wood Shop.

To make the processes carried on in the malleable foundry clearer to the reader it may be well to outline the manufacture of malleable iron and give some of its characteristics. There are four great classes of work for whose requirements malleable cast iron, commonly called malleable iron, is especially adapted. These are agricultural implements, railway supplies, carriage and harness castings, and pipe fittings. Beside these main classes there are innumerable other unclassified uses.

Malleable castings seldom exceed 175 pounds in weight, three feet in length and three-fourths of an inch in thickness and the large majority of heavy castings do not exceed ten pounds. Malleable cast iron when properly made has a tensile strength of from 42,000 to 48,000 pounds per square inch with an elongation of five per cent in two inches. Much malleable iron for various reasons falls short of these figures and will fall as low as 35,000 pounds per square inch which is sufficient for pipe fittings, hardware specialties, etc. A tensile strength as high as 63,000 pounds per square inch has been reached but this high tensile strength is not desirable as the softness of the casting is sacrificed, and its resistance to continued shock is lessened. For the repeated stresses of severe service the malleable casting ranks ahead of steel, and only where high tensile strength is essential must it be replaced by that metal.

The process of making malleable iron may be summarized as follows: The proper cast irons are melted in the fur-

Digitized by Google

Group of Motor-Driven Drop Hammers in Forge Shop.

naces and when cast into molds must chill white or not more than a little mottled. After removing the sand from the hard castings they are packed in iron scale, or other materials containing iron oxide, and subjected to a red heat of from 1250 to 1350 degrees Fahrenheit for over 14 hours. The castings are then cooled slowly, cleaned from scale, chipped or ground and straightened. When hard or just from the sand, the composition of the iron should be: silicon from 0.35 up to 1.00, depending upon the thickness and the purpose for which the casting is to be used; phosphorus not over 0.225, manganese not over 0.20 and sulphur not over 0.05. The total carbon can be from 2.75 upward, 4.15 being about the highest that can be carried. The lower the carbon the stronger the casting is subsequently. Below 2.75 there is liable to be trouble in the anneal, the blackheart structure may not appear, and the castings remain weak. A casting one-inch thick would necessitate silicon at 0.35, and the use of chills in the mould in addition, to get the iron white. For a casting about one-half inch thick, silicon about 0.60 is the proper limit, except where great strength is desired, when it can be dropped to 0.45. Above 0.60 there is danger of getting heavy-mottled if not gray iron from the sand molds and this material when annealed the long time required for the white castings, would be ruined.

Malleable furnaces have already been described, but it may be said that heat treatment of the metal during the metal process has an important bearing upon the tensile strength, elongation, etc., and excessive temperatures promote the chances of burning. Iron is burnt mainly through the generation in the melting furnace of higher temperatures than those prevailing during the initial casting at the blast furnaces and an excess of air in the flame which may cause the choicest iron to turn out poor material.

Shrinkage of the hard castings is about one-fourth of an inch to the foot, or double that of gray iron. In annealing, about half of this is removed, hence the net result is the same as in ordinary pattern practice. The effect of this great shrinkage is to cause shrinkage cracks or sponginess in the interior of the casting. As soon as the liquid metal sets against the surface of the mold and the source of supply is shut off, the contraction of the metal in the interior as it cools causes the particles to be torn apart and to form minute cavities or cracks.

After the castings have been chipped and sorted they are packed in iron annealing pots, holding about 800 pounds of iron, together with packing composed of turnings, borings, etc. The turnings, etc. were formerly treated with a solution of salammoniac or muriatic acid to form a heavy coating of oxide, but such a treatment is now considered unnecessary. The effect of annealing is to oxidize and remove the carbon from the surface of the casting and to a greater or less degree below the surface, and to convert the remaining carbon from the combined form into the amorphous form, sometimes called a temper carbon. The heat in the annealing process must be maintained from 5 to 7 days, depending upon the thickness of sections of the castings and the compactness with which the castings or annealing boxes are placed in the furnace. An annealing temperature of from 1,550 to 1,600 degrees Fahrenheit is often used, but it is not essential, as the annealing can be ac-

Telpher Handling Load of Ore.

Digitized by Google

complished at 1,300 degrees, but the time required will be longer than that at higher temperatures.

After annealing, the castings are cleaned by tumblers and carefully examined for defects and if sprung or out of shape are hammered or forced into the proper shape. Such parts as are produced in great quantities are placed in a drop hammer and one or two blows will insure a correct form. They may be drop forged or even welded when the iron has been made for that purpose. Malleable castings must never be straightened hot, especially when thick. In the case of thin castings there is some latitude, as the material is so decarbonized that it is nearer a steel than genuine malleable cast iron. For general purposes it is not desirable to have malleable iron very high in tensile strength, but it should be high in transverse strength with especially good deflection.

The International malleable foundry is divided into several departments consisting of moulding room, hard room, annealing room, core room, pattern room and laboratory. The iron is poured into the molds from hand ladles. When cold the castings are removed with the aid of an electric traveling crane. There is a five-ton crane in the foundry and a crane of the same capacity in the annealing room. In explanation it may be said that the cranes consist of a bridge with the bridge motor only. There is a telpher system running from a single rail on both sides of the principle departments, the telphers, three in number, having a lifting capacity of five tons. The telpher hoists are operated by 10-horsepower, 220-volt direct-current motors and the traveler or means of propulsion by six-horsepower motors of the same characteristics. The crane bridges are operated by a similar type motor of 10 horsepower. By a combination of switches and turn tables the telphers are able to run out on the cranes and backward and forward between departments. There are four turn tables each operated by a 3-horsepower 220-volt, direct-current motor; the track switches are operated by motors of the same size and characteristics. There is a system of underrunning contacts adjacent to the telpher rails, also on the crane bridges so that all motors are under the control of the telpher operator.

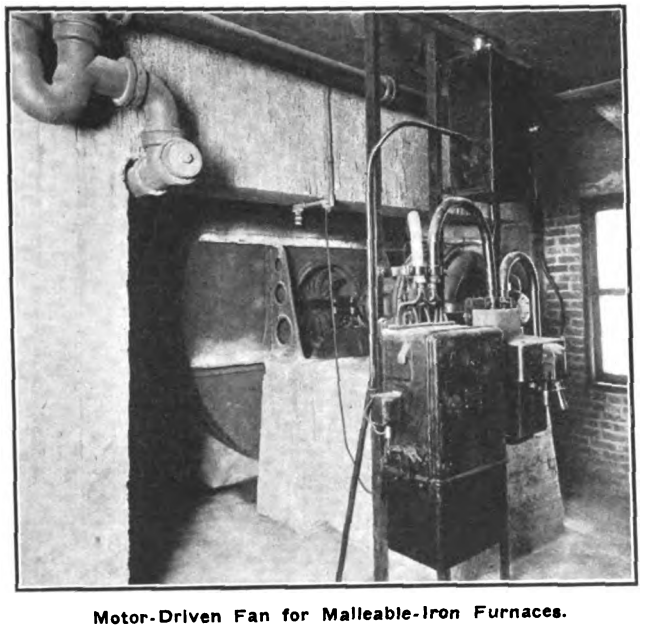
Draft for the malleable furnaces is furnished by two No. 13 Sirocco blowers, each direct-coupled to a 35 horsepower, 2,300-volt, induction motor of the squirrel-cage type operating at a speed of 750 revolutions per minute. At one end of the foundry there is a group of machines consisting of two wet slag tumblers and a magnetic separator driven by a 10-horsepower motor with the same characteristics as the fan motors. This group of machines is used for recovering the iron from refuse the same as in the No. 1 plant.

From the moulding room the castings are taken to the hard room where they are tumbled to free them from sand and the burrs and rough edges are ground off. In the hard room there are sixteen large tumblers, and six small tumblers group driven by a 35-horsepower 2,300-volt, squirrel-cage type induction motor operating at 750 revolutions per minute and equipped with a 13-inch pulley. The grinding equipment consists of four emery wheel stands with two wheels each, group driven by a 10-horsepower 220-volt motor of the same characteristics operating at 1,500 revolutions per minute and equipped with an 8-inch pulley.

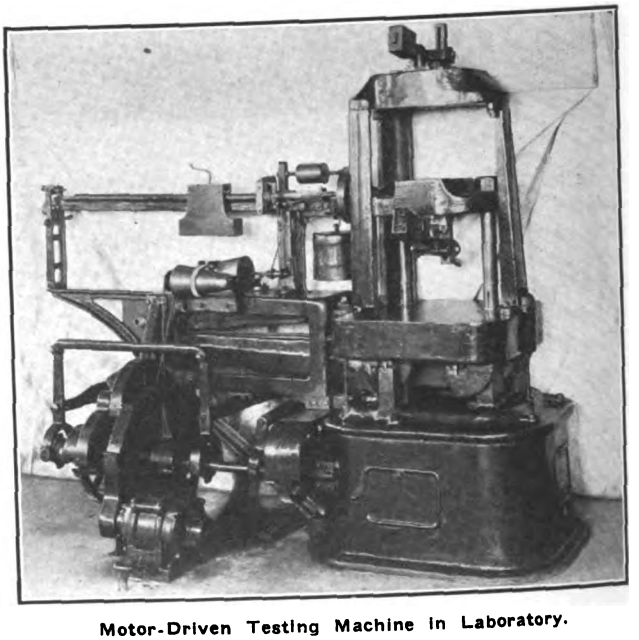
Considerable attention has been paid to dust removal in the various departments. For the removal of dust in the hard room there is a five-foot exhaust fan direct-coupled to a 35-horsepower, 2,300-volt squirrel-cage type motor operating at 750 revolutions per minute. The dust is drawn through pipe connections from the tumblers and emery wheels to a large rectangular iron tank in which there are several cloth screens for collecting the dust. At stated intervals these screens are agitated by what is called a knocker, which is belt-driven by a one-horsepower, 220-volt induction motor.

From the hard room the castings are transferred to the annealing room where there are six annealing ovens with a capacity of 40 tons each. The ovens are heated by coal furnaces at the rear and use natural draft. The front doors of the ovens are composed of fire brick and steel, weigh approximately four tons each and are handled by the crane. The castings are packed in annealing pots as previously described and loaded into the ovens with a steam-driven loading truck. After annealing, the castings are again tumbled, straightened and chipped.

For tumbling, straightening and grinding the annealed castings there is a group of machines composed of one broaching press, one small bulldozer, one punch press, one two-wheel emery grinder, twelve 36-inch tumblers and two small tumblers. This group of machines is driven by a 35-horsepower, 2,300-volt, squirrel-cage, induction motor operating at 750 revolutions per minute and equipped with a 13-inch pulley. The broaching press is similar in construction to a punch but uses a tool similar to a round-headed mandrel and is used to correct irregularities in cored out holes in the castings. A second group of machines for further straightening castings is composed of four drop



Motor-Driven Fan for Malleable-Iron Furnaces.



Motor-Driven Testing Machine in Laboratory.

Digitized by Google

Harvesting Machine Manufacture Data—Sheet No. 1.

International Harvester Company (Osborne Works). Manufacture tillage implements.
Total connected horsepower, 1,079.5. Total number of motors installed, 44. Average kilowatt-hours per month, 143,952. Average kilowatt-hours per month per horsepower connected, 133.3.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 25 cycles, 2,300 volts and 220 volts, direct current. The direct-current motors which are used for cranes, elevators and telphers, are not enumerated herewith. Motors are of the squirrel-cage induction type unless otherwise mentioned.

No.	H.P.	Kind of Drive	Voltage	Speed R.P.M.	Pulley Size, Inches	Application
2	35	Direct	2300	750	..	Each driving a No. 13 Sirocco blower for furnaces.
1	10	Group	2300	1500	8	Molding Room.—Two wet slag tumblers; one magnetic separator.
1	35	Group	2300	750	13	Sixteen large tumblers; six small tumblers.
1	10	Group	220	1500	8	Four emery wheel stands, two wheels each.
1	35	Direct	2300	750	..	Hard Room.—Exhaust fan for dust collecting.
1	1	Belt	220	..	..	Hard Room.—Dust collector knocker for agitating screens in dust collector.
1	35	Group	2300	750	13	Annealing Room.—One broaching press; one small bulldozer; one punch press; one two-wheel emery grinder; twelve 36-inch tumblers; two tumblers.
1	20	Group	2300	750	10	Four drop hammers; two punches.
1	35	Direct	2300	750	..	Annealing Room.—Exhaust fan for dust collecting.
1	1	Belt	220	..	..	Annealing Room.—Dust collector knocker for agitating screens in dust collector.
1	5	Direct	220	1500	..	Core Room.—Fan for ventilating core ovens.
1	5	Belt	220	1500	8	Core Room.—Sand sifter.
1	5	Group	220	1500	8	Pattern Room.—One drill press; one small shaper; one emery wheel; one wood saw.
1	1	Group	220	..	..	Laboratory.—One small engine lathe; one paint grinder; one small drill press.
1	2	Gears	220	1500	..	Laboratory.—Olson 100,000-pound testing machine.
1	0.5	Belt	220	..	..	Laboratory.—Ventilating fan for chemical cabinet.
1	20	Group	2300	750	10	Two 12-foot punches; one 10-foot double punch; eight small punches.
1	35	Group	2300	750	10	One six-foot punch; two 10-foot punches; one 12-foot punch; five small punches; two straightening machines; one scrap shears; one drill press; two small shears; two medium punches; one header.
1	35	Group	2300	750	10	Five drop hammers; one welding machine; three spoke setting machines; one testing machine; two annealing furnaces; one drill press; one upright bulldozer; three bulldozers; one punch; one small drop hammer.
1	20	Group	2300	750	10	Three trip hammers; two eye benders; three punch presses; one drop hammer; one tire welder; one upsetting machine.
1	50	Direct	2300	750	..	Slip-ring motor driving Sirocco blower for furnaces.
1	50	Group	2300	750	13	Three punches; eight small drill presses; one riveter; two emery wheels; one threading machine.
1	75	Group	2300	750	..	Slip-ring motor driving eleven stands of two-wheel emery grinders.
1	20	Direct	2300	750	..	Driving 48-inch exhaust fan for removing dust from emery grinders.
1	50	Group	2300	750	16	Slip-rig motor driving two stickers; one wood riveting machine; one boring machine; one drop hammer; one band saw; one spoke machine; one sandpaper machine; one saw.
1	35	Group	2300	750	13	Two planers; one automatic feed rip saw.
1	20	Group	2300	750	10	Six cross-cut saws.
1	35	Group	2300	750	10	Two cross-cut saws.
3	35	Direct	2300	750	..	Three combinations of two 48-inch fans for removing shavings and sawdust.
1	35	Group	2300	750	13	Miscellaneous small woodworking machines.
1	15	Group	2300	750	13	One multiple-spindle boring machine; two single-spindle boring machines; one boring machine.
1	35	Group	2300	750	Special	Pole machine.
1	20	Group	2300	750	10	Three wood shapers; one special rip saw.
1	20	Group	2300	750	10	Two roll turners; two wood lathes; three cross-cut saws; two drill presses; three wood lathes.
1	15	Group	2300	750	10	One wood boring machine; one wood riveter; one tumbler barrel for small castings.
1	15	Group	2300	750	10	Four large paint grinders; two small paint grinders.
1	3	Gears	220	..	..	Pipe-threading machine.
1	35	Group	2300	750	13	One wood planer; two drill presses; one rip saw; one cut-off saw; miscellaneous small tools.
1	23	Direct	2300	720	..	Thirty-five-kilowatt direct-current generator 250 volts for cranes, telphers and elevators.
1	23	Direct	2300	720	..	Thirty-five kilowatt generator for 22-flaming arcs.
1	30	Belt	220	..	..	Slip-ring motor driving elevator in warehouse.

Digitized by Google

hammers and two punches. This group is driven by a 20-horsepower motor of the same characteristics as the former motor and is provided with a 10-inch pulley. It may be said that in some castings it is cheaper to punch certain holes than to core them out and the punch presses in this latter group of machines are used to a certain extent for this purpose. For collecting the dust from the various machines there is a duplicate equipment of that installed in the hard room.

Cores are placed in the molds to produce recesses, irregular shapes and holes in castings that would be impracticable to mold in the soft sand used in molding work. The cores are composed of hard sand and an adhesive mixture baked in ovens. The cores are as a rule formed in wood molds. In the core room of the malleable foundry there is a 5-horsepower 220-volt squirrel-cage induction motor direct-coupled to a ventilating fan for removing the gases from the coke in the furnaces and such gases as may be given off from the cores in the process of baking. Before making up into cores the sand has to be sifted and this is accomplished by a rotary sand sifter, belt driven by a 5-horsepower, 220-volt induction motor operating at 1,500 revolutions per minute and equipped with an 8-inch pulley. Brass patterns are principally used and the pattern room has an equipment of one drill press; one small shaper; one emery wheel, and one wood saw driven by a five-horsepower motor with the same characteristics and the same size pulley as that driving the sand sifter.

There is a fully equipped laboratory in connection with the malleable foundry for the testing of raw and finished products of all kinds, not only chemically but mechanically. The equipment includes one small engine lathe; one paint grinder, and one small drill press, group driven by a one-horsepower, 220-volt squirrel-cage induction motor. For testing the tensile strength of metals there is an Olson 100,000-pound testing machine geared to a two-horsepower, 220-volt, squirrel-cage induction motor. There is also a one-half horsepower 220-volt induction motor direct-connected to a small exhaust fan for exhausting the fumes from the chemical cabinet. The electrical equipment of the malleable foundry is concluded with an Otis push-button control elevator operated by a 10-horsepower, 220-volt, direct-current motor. This elevator is used for carrying the patterns to the pattern storage on the upper floors of the foundry building.

The shear and punch shop next demands attention. Here the parts of the frames and the tires of the wheels for some of the machines are punched. The tires are first flat strips of metal and the multiple punches make all the holes for receiving the spokes, and punch the required number of holes in part of a frame at one operation. There is one group of two 12-foot punches; one 10-foot double punch and eight small single punches driven by a 20-horsepower, 2,300-volt, squirrel-cage induction motor operating at 750 revolutions per minute with a 10-inch pulley. The large punches are provided with a number of punches and dies for the simultaneous punching of a number of holes. The seemingly small power requirements for such large machines is explained by the use of heavy fly-wheels on the punches. These fly-wheels have sufficient momentum to smooth out what would under ordinary circumstances, be a series of severe peaks on the load curve. There is a second group of punches and shears and some miscellaneous machines for carrying on the operations of punching holes, cutting up the material in desired lengths, etc. This group is driven by a 35-horsepower, 2,300-volt, squirrel-cage motor with a 10-inch pulley and operating at 750 revolutions per minute.

In the harrow shop, as the name implies, the various parts of the harrow are made. It will be unnecessary to enumerate all of the machines in this department as they are given in the accompanying table. Some of the machines possess more than ordinary interest, however, such as the machine for welding the wheel spokes into the tires and hubs. Each spoke is heated at the ends in a furnace and placed in the proper position in the wheel when the machine automatically upsets the heated ends and in reality rivets the spoke in place. The harrow teeth are of several shapes, some are in the form of large spikes. The heads on this style of teeth are made from the stock itself by means of the upsetting machine. The harrow disks, that is the parts that cut up the earth, are received from an outside steel company but are ground in one of the harrow shop departments. The grinding is performed on eleven stands of two-wheel emery grinders. The motor drive for these grinders is novel from the fact that the motor is direct-coupled to the line shaft driving the grinders. It is rated at 75 horsepower, is the slip-ring type and operates at 750 revolutions per minute. For removing the dust from the emery grinders there is a 48-inch exhaust fan direct-coupled to a 20-horsepower, 2,300-volt, squirrel-cage motor operating at 750 revolutions per minute.

The forced draft for the heating furnaces is furnished by a Sirroco 8-foot blower direct-coupled to a 50-horsepower, slip-ring, 2,300-volt motor operating at 750 revolutions per minute. A 35-, a 20- and a 50-horsepower motor all rated at 2,300 volts and 750 revolutions per minute make up the balance of the motor equipment in this department.

In the wood shop all of the wood parts of the various machines are turned out. The building is four stories in height, three of the floors being occupied by the woodworking machinery and the fourth by the painting department. There are 12 motors in the wood shop with the same general characteristics as those in the other departments, as shown on the motor data sheet. All refuse from the machines is removed by motor-driven exhaust fans and deposited in a separate building.

All paint used by the International company in this plant is made in the paint shop which has an equipment of four large and two small paint grinders. These machines are group-driven by a 15-horsepower, 2,300-volt, squirrel-cage induction motor with a 10-inch pulley and operates at 750 revolutions per minute. There is a repair shop and a plumbing shop with a miscellaneous equipment of machines for general repair and maintenance work all of which are group driven with the exception of a pipe-threading machine which is geared to a three-horsepower motor.

Louisville Electric Sign Combines Weather Forecast with Advertising Message.

An electric display which is attracting a good deal of favorable attention in Louisville is a weather-forecast sign which is in use in front of the Newman Drug Company. It is a shield-shaped sign, red enameled, with the name of the company and the word "Drugs" set out in 12-inch lamp-studded letters.

Just below, arranged in three columns of two, are the words, "Fair," "Rain," "Warmer," "Colder," "Wind," and "Snow." The weather is indicated by a lamp burning in front of any of these words.

Each day the company receives the official forecast from the Weather Bureau and indicates the weather probabilities by lighting the proper lamp or lamps by means of switches, one to a lamp.

Civil Service Examination.

The Civil Service Commission of the state of New York has announced an open competitive examination to take place on December 11 for filling positions in the state, county and village service. Among the positions for which examinations are to be held are junior engineers at salaries of from $1,200 to $1,500, junior assistants in the engineering department at salaries from $900 to $1,200, junior draftsmen at $900 to $1,200 and structural draftsmen at $1,200 to $1,500.

Digitized by Google

Commercial Practice Management, Rates, New Business

Electricity Used for Lighting Monster Birthday Cake.

Lighting of a birthday cake is a novel use of electricity made at Columbus, O. The cake weighed almost half a ton. It was baked in celebration of the thirty-fifth anniversary of the opening of Max H. Rieser's store, a ladies' ready-to-wear establishment. This custom has been followed by Rieser's for several years, the cake being made larger for each occasion. This year electric candles were substituted for wax, in the interest of cleanliness and safety. Steel conduit for carrying the wires was baked into the top of the cake, and covered with icing. Attachment to the supply source was made through the regular electric fixtures in the show window where the cake was placed on exhibition. Thirty-five candles, the symbolical number, were used, connection being made through sockets ornamented with icing. The candles were about five inches high, with perpendicular frosted globes. The cake was 4.5 feet high, 15 feet in circumference and 3 feet thick. Materials required in its creation were: One barrel of flour, one barrel of sugar, 1,000 eggs, three tubs of butter, 50 quarts of milk, one quart of lemon flavor, one quart of vanilla flavor, 225 pounds of icing. The cake, which required the services of six men to bake, was hauled by motor truck from a Columbus pastry shop to the store, accompanied by the six bakers, over a parade route, October 30, and placed on exhibition. On Saturday, November 5, the mayor of the city cut the cake.

Birthday Cake Illuminated by Electric Candles.

Suggestions for Central-Station Advertising Managers.

That the average central station has about reached the turning point in its economic development, and henceforth must depend as much upon a judicious use of a sufficiently large advertising appropriation as it has heretofore depended upon the careful investment of its resources in equipment and operation, was the opinion voiced by J. J. McManus in a paper before Southern central-station men at a recent convention.

In order to show what might be done preliminary to establishing an advertising policy, in launching a continuous campaign for the future, the author gave the following outline of suggestions that might be profitably followed out by the central-station advertising man.

(1) Analysis of the city as a whole as to races, classes, incomes, class of business, etc.

(2) Dividing city or territory into districts according to above classifications.

(3) An estimate of the possible business to be derived from each district.

(4) Possibilities of extending new service.

(a) Unwired houses—number in the city, possible income from each.

(b) New buildings contemplated, number, etc.

(5) Possibilities of obtaining greater saturation on present lines.

(a) Analysis of light load.

(b) Analysis of power load.

(c) Analysis of heating devices load.

(d) Comparison of these three loads and the relation to the total load curve and the advisability of increasing the saturation along any one or all lines.

(e) Study of revenue received from present customers compared with the possible revenues they could afford, providing they could be induced to use more current.

(6) Investigations and compilation of active mailing lists.

(a) For customers—divided as to lighting customers, power customers, devices customers and combinations of these three.

(b) For those not customers—divided as to possibilities for lighting and devices, and for power.

Commercial Laundries Boost Electric Irons.

Appliance dealers in Louisville, as well as elsewhere, report that they are getting some support in their sales of electric irons from a source that was regarded as inevitably hostile. It would naturally be expected that the owners of laundries would oppose any device that would tend to make washing of clothes at home easier. On the other hand it has developed that the laundry owners are in favor of the electric iron and credit a good deal of increased business to this appliance, which has furnished a contrast with the laborious methods of washing clothes. So in numbers of cases the housekeepers are ridding themselves of a weekly bugbear by sending their work to the laundries to be returned "rough dry," finishing it up at their leisure.

Digitized by Google

THE SALE OF CURRENT TO MUNICIPALLY OWNED DISTRIBUTING SYSTEMS BY CENTRAL STATIONS.[1]

By W. Rawson Collier.

The subject of the sale of current to municipally owned distributing systems by central stations is a comparatively new one, at least in the southern section of the country. Two facts have tended to make this class of business an extremely important one durthe past few years. First, the very rapid growth of hydroelectric distributing systems, and, second, the large number of municipally owned electric light plants and water-works systems. As the hydroelectric companies gradually extended their transmission lines, they were confronted with the difficulty of being unable to sell their product in towns where municipal lighting plants and municipally owned water-works systems were in operation, on account of the fact that the cities owning these plants were unwilling to grant the power companies a general franchise to enter the town for fear that they would prove a serious competitor, in the electric lighting and the electric power situation. The only way that the power company therefore could possibly sell its products to the citizens of the town was through the municipally owned systems, and for this reason the business was approached from this standpoint.

In Georgia today there are approximately 80 municipally owned electric lighting plants and practically all of the towns in the state own and operate their water-works systems. Of these approximately 35 are within reach of the transmission lines of the four large hydroelectric companies operating in Georgia and 26 of those within reach of the lines are now being operated electrically with energy purchased from the hydroelectric companies. In every case the purchase of current has proven a good investment to the town and in almost every case the citizens are more than well pleased with the service that they are obtaining.

In one case, a town that had lost $17,000 in operating its steam-electric generating station for three years, began to show a profit as soon as the current for lighting and operating its electrically driven pumps was purchased and today shows a profit of between $600 and $800 per month on the operation of its municipal lighting lines and electrically operated water-works system. Another town in question was losing money at the rate of approximately $3,600 per year in operating its steam generating station, and this loss was changed to a profit of approximately $3,000 per year by abandoning the steam station and purchasing current from a hydroelectric company.

In studying the question of selling current to municipally owned electrical distributing systems and municipal water-works systems, the writer has found that it is extremely hard to determine exactly what the requirement of one town will be by comparing the town under question to other towns on which exhaustive data have been obtained. The accompanying plots illustrate to a very great extent the irregular characteristics of various towns in so far as the kilowatts connected, maximum demand and kilowatt-hours use per year, per 1,000 white population is concerned. For general information, however, they serve for comparison, and as submitted herewith will be found of considerable interest and also of considerable value in figuring with prospective customers. The data cover twelve towns, and the general characteristics of the town under discussion are as follows:

TABLE I.

Town.	Population.	General Characteristics.
A	6,600	Resident town. Little power sold.
B	4,900	Competitive situation. Water works machinery electrically operated. Considerable other power sold.
C	4,800	Water works machinery electrically driven. Considerable small power sold. A live town.
D	4,670	Water works machinery electrically operated. Very little small power sold.
E	4,250	Water works machinery electrically operated. Considerable small power sold. A live town.
F	3,000	Water works machinery electrically operated. Only a small amount of power sold.
G	2,000	Water works machinery electrically operated. Considerable small power sold. A live town.
H	1,870	Practically no small power sold. Only lights.
I	1,200	Water works machinery electrically operated. Very little other power sold.
J	1,200	Water works machinery electrically operated. Some small power sold. A live town.
K	935	A residential town. Practically no power sold.
L	650	Practically no power sold. Lights only.

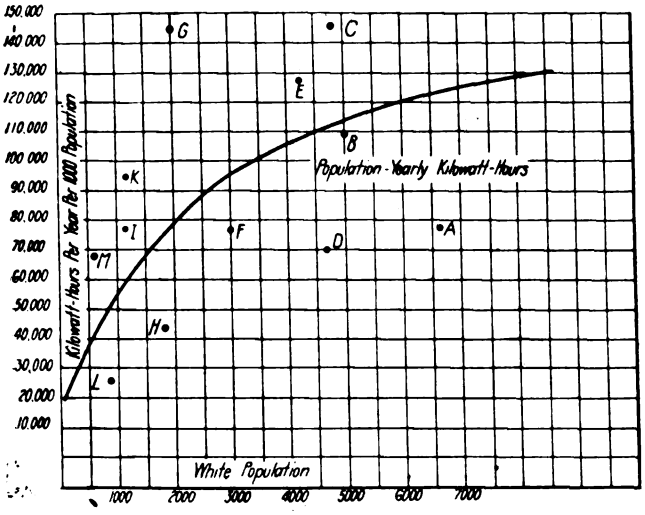


Fig. 1.—Kilowatt-Hours Per Year According to Population.

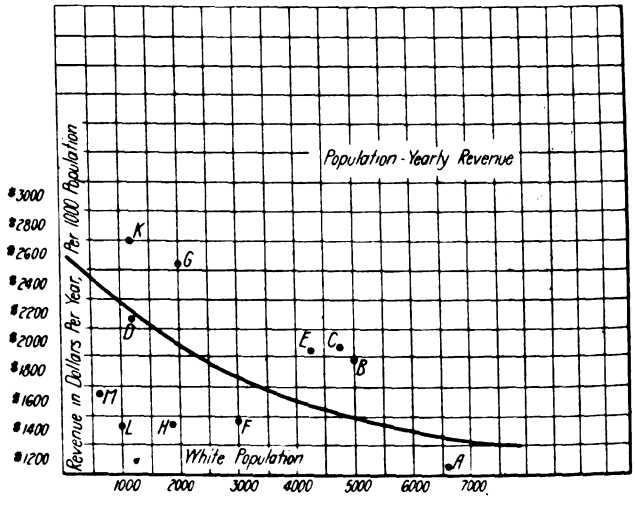


Fig. 2.—Yearly Revenue According to Population.

By referring to Fig. 1 it will be seen that towns A, D, F and H are well below the average line. In none of these towns does the superintendent of the municipal lighting system make any very good attempt to solicit power business and a study of their daily load curves shows that there is practically no demand for power between the hours of 1 a. m. and 3 p. m., practically all of the load being caused by the lighting demand, which comes on at about three o'clock and in the afternoon laps with the pumping load until about one o'clock in the morning.

The town E, which it will be noted, is considerably above the average line, is a town where the operating superintendent has worked up very considerable power business, and where a great deal of time has been spent by him in

[1] From a paper presented at the recent convention of the Southeastern Section, N. E. L. A.

Digitized by Google

soliciting heating devices, such as flat irons, etc. It will be noted in this plot that the town B practically falls upon the average curve. This town, although it represents a competitive situation where a privately owned plant is competing with the municipally owned plant still represents a very healthy condition. A large amount of power has been obtained by the superintendent of the municipal plant in this town, and in addition to the ordinary small manufacturers' load, the town carries two or three cotton gins through the ginning season. This town's consumption per year is also increased by the fact that it is necessary for it to obtain its water from a number of driven wells, and it is necessary to operate a large air compressor often for as many as ten hours per day, during the dry season. This town in question charges against itself all operating expenses of the water-works system at actual cost, and its books show a handsome profit on the sale of water after all operating and overhead expenses are deducted at the end of each month.

Fig. 3 is an extremely interesting study if taken in connection with the table and in connection with Fig. 1 before mentioned. By studying this plot the effect of exclusive lighting customers can quickly be observed. Take, for instance, the town A in Fig. 1, it will be seen that the yearly kilowatt-hours for 100 population is well below the average, while by studying Fig. 3 it will be seen that the kilowatts of maximum demand per 1,000 population is above the average line. This is due to the fact that town A is practically a residence town. It has a very high peak, and the average load-factor is extremely low. The same is true of the town F, which is below the average curve in Fig. 1, but above it in Fig. 3. It has been found that the town with a large amount of small power and with a considerable lighting and pumping load—that is, a town with a poor diversity-factor, such as towns G and C, can be expected to show up above the average line both in kilowatt-hours per year per 1,000 population and in kilowatts of maximum demand per 1,000 of population. This on account of the fact that it is often necessary for the superintendent to operate the water-works pumps and the air compressor at the same time that his regular power customers are operating their factories, gins, etc.

Fig. 4 shows the results of a very careful study on the operating costs of the various municipal plants using their steam generating station and the operation of these same municipal plants after they had begun to purchase current from a central station. It will be noted that the two curves are very similar, and that they remain approximately the same distance apart throughout their entire range. The central-station operation shows a little greater advantage as the towns grow larger and the number of kilowatt-hours per year increases. It might be mentioned that these curves represent the total cost of current at the switchboard in each case.

Fig. 5 shows the variation of the average cost per kilowatt-hour per year with the yearly load-factor, and illustrates very closely the very great advantage held out to the local superintendent in increasing his load-factor by the addition of small power, heating devices, etc., and by the proper operation of his electrically driven pumps and air compressor with a view of keeping down the peak and increasing the daily load-factor. The lower figure in Fig. 5 shows the decrease in cost per kilowatt-hours to the customer with the increase of yearly kilowatt-hours. This curve it must be noted is only an average curve, due to the fact that the yearly load-factors of the various towns vary considerably, and, therefore, it is possible for two towns that are using the same number of kilowatt-hours per year, but with different load-factors, to have a different average cost of current per kilowatt-hour.

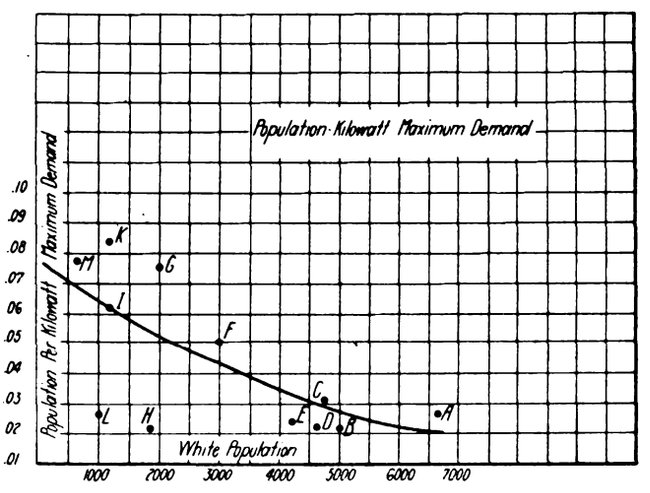


Fig. 3.—Population Per Kilowatt of Maximum Demand.

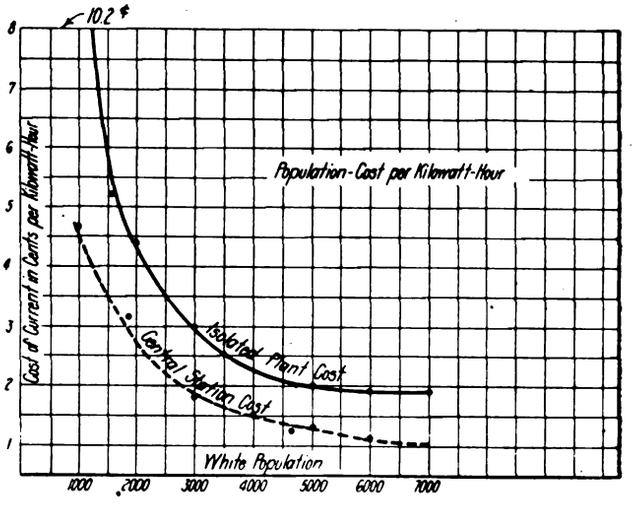


Fig. 4.—Unit Costs Per 1,000 Population.

In order that this article may be of some assistance to the various companies in the soliciting of the business of furnishing current to municipally owned lighting systems, it will be interesting to make a slight study of conditions as they may exist at present in typical plants in the northern section of Georgia. Fig. 6 shows a typical daily load curve of three somewhat similar towns. These towns are practically of the same size, but vary considerably in general conditions. Town A has a fair amount of residential and commercial lighting, a very good system of street lighting, electrically driven water-works pumps, electrically driven air compressors and obtains its water supply from seven driven wells. These wells have given the town a great deal of trouble and during the dry season the supply of water is very

Fig. 2 shows the relation of the yearly revenue to the population (white) of the towns as mentioned in Table I. It will be noted that many of the towns appearing above the average load line in Fig. 2 are those which appear above the average line in Fig. 1, with the exception of town M, which has only been in operation less than one year and previous to the making of the contract with this town, no electric lights were furnished to its citizens at all. It has been found that Fig. 2 is very nearly accurate, and this plot has proven extremely valuable in figuring on the advisability of taking on the business in certain towns, as it has given a very fair estimate of the revenue to be expected if a certain amount of money has to be expended for lines, transformers, etc., in order to make the necessary connection.

Digitized by Google

limited. For this reason it is found necessary to often operate the air compressors during the night and for four or five hours during the morning. It will be seen by a study of the load curve covering this town that the air compressors operated from 9 p. m. until approximately 6 a. m. This town has a small amount of commercial power, but this business has not been fully worked up. Town B represents a somewhat similar case; that is a town with a good residential and commercial lighting load, a very fair street-lighting load and both electrically driven water-works pump and electrically driven air compressor, the supply of water being obtained from driven wells. In this town trouble has also been experienced with obtaining a sufficiently large enough supply of water from the driven wells and here also it becomes necessary, as may be seen from the load curve, to operate the pumps through the night and the compressor from 9 a. m. until 2 p. m., and frequently during the summer the compressors have been operated from 10 p. m. until 10 a. m.

Town C well represents the average town in Georgia getting its water supply from a creek or river, using electrically driven water-works pump and supplying a fair residential and commercial lighting load with a small amount of power. In this town the water-works pump is operated only between midnight and four o'clock, and the load as shown from 6 a. m. until approximately 1 p. m. represents small printing presses, dental motors, fans, ice cream freezers, etc., operated from the municipal system. The daily load-factor could be considerably increased in this town by the proper soliciting of power business by the superintendent in charge and the increase of this load-factor would decrease the average cost of current to the town per kilowatt-hour. This town could easily increase its load-factor from approximately 30 per cent to approximately 45 per cent by the addition of the proper power load during the day and by this increase could decrease the average cost of current from approximately 1.92 cents per kilowatt-hour to approximately 1.65 cents per kilowatt-hour.

TABLE II.

Average demand (kilowatts)	26
Kilowatt-hours per day at average demand	624
Kilowatt-hours per day if maximum demand used 24 hours	2,424
Load factor (per cent)	25.7
Horsepower maximum demand	134
Value of machinery	$6,700
Interest and depreciation (17 per cent)	1,139
Loss in interest and depreciation account idle-factor	846
Interest and depreciation charge per kilowatt-hour actual	.005
Interest and depreciation charge per day	3.13
Coal, fireman, incidentals, interest and depreciation, per kilowatt-hour	.0268

In soliciting the business of municipally owned electric light plants it has been found by the writer that the average city councils or the average city superintendent has never taken into consideration or did not desire to take into consideration the enormous loss to the city of idle investment due to low load-factor, this being particularly true in steam generating plants.

By means of data in Table II, it was found that it was a comparatively easy matter to bring home to the city councils the fact that by the non-use of their steam plant throughout the greater portion of the day, they were actually losing a great deal of money, and that this loss was no where nearly as great if they purchased power from a central station, as the central station sold its current as a finished product at the switchboard. In a number of cases this plot has practically been the argument that has decided the city council in favor of the purchase of current rather than the manufacture of it, and no doubt this scheme can be used to a very great advantage by companies, not only in the soliciting of business of steam-driven municipal plants, but also in the soliciting of isolated plants throughout their territory.

One serious drawback has been found in selling current to municipally owned distributing systems in the South. The Southeastern Underwriters Bureau gives a certain credit to a town for maintaining steam under the boilers at all times, so that the steam fire pumps can be operated at a moment's notice in case of a serious fire. The association considers that with an electrical pump it is necessary for the town to also maintain, at all times, a reserve unit in the shape of a steam-driven pump, with banked boilers. The only substitute that the Underwriters' Association will accept in lieu of a banked boiler and an Underwriters steam pump is a duplicate line from the generating plant of the hydroelectric company to the substation of the town and one overhead and one underground connection to the electric fire pump from a pole placed a considerable distance from the pumping plant, if the cut in wires parallel and are close to any building that would constitute a fire hazard, also the lines from the company's step-down substation to the pumping plant must be a duplicate, if the substation is not a fireproof structure. There are only a very few cases where this duplicate line can be built by the hydroelectric company, on account of the expense, therefore it has been found necessary in a number of cases to have the town maintain its boilers and keep them banked at all times, although it was purchasing all of its energy from a hydroelectric company. In some cases the expense of banking the boilers has been borne by the town and in other cases the expense is borne totally or in part by the hydroelectric company selling current to the town.

It has been found that the average cost of coal for banking boilers in the small towns in this territory is approximately $1.35 to $1.50 per day. No labor is charged against this item, as it is generally desired to have a man on

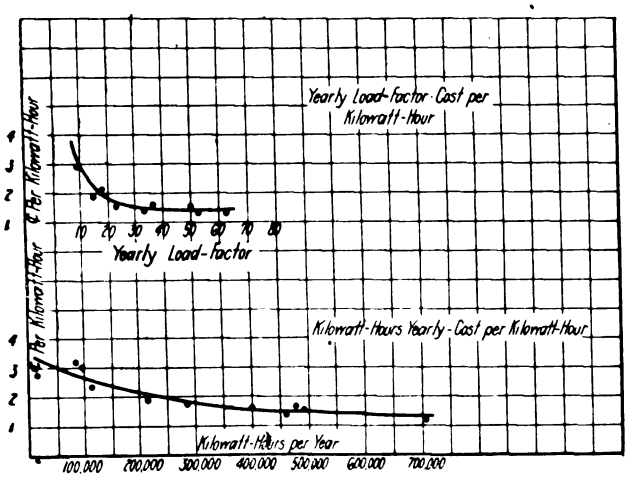


Fig. 5.—Curves of Yearly Load-Factor and Cost Per Kilowatt-Hour.

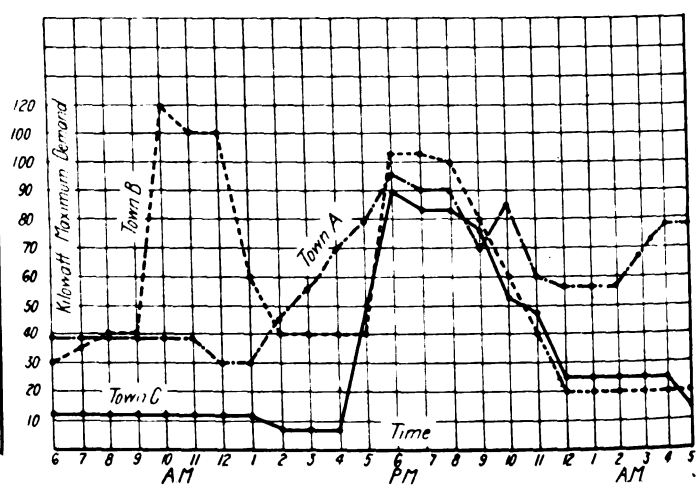


Fig. 6.—Composite Curves of Maximum Demand in Typical Towns.

Digitized by Google

duty at the plant at all times, with the view of regulating the voltage, operating the service pump and the air compressor, and in case of need, operating the electrically driven Underwriters pump. It has been suggested that an auxiliary pump, operated either by a gasoline engine or an oil engine, be used in place of banking the boiler, but to date such a substitute has not been approved by the Underwriters' Association.

The company with which the writer is connected has been operating municipal plants now, in approximately 20 towns, for 18 months, but so far there has never been a single failure in the operating of the Underwriters electrically driven fire pump in case of an emergency. The writer therefore feels that the rule, as passed by the Underwriters, works a hardship, not only on the town in question, but on the company furnishing current to the town, and it is hoped that within a few years the hydroelectric companies can show such a clean record in the way of continuous operation that the rule as it now exists will be entirely done away with.

In passing, it might be stated that the Georgia Railway & Power Company sells energy to municipally owned distributing systems in the shape of 2,300-volt, three-phase, 60-cycle energy delivered at the switchboard. The company furnishes the necessary step-down transformers generally from 22,000 to 2,300 volts, the necessary lighting protection and disconnecting switches and brings the 2,300-volt connection to the customer's board. The customer provides an incoming panel with suitable instruments mounted thereon and the necessary 2,300 oil-switch controller panel for the arc circuit, the commercial circuit and the operation of the electrically driven pump and compressor. The cost of such equipment to the town is comparatively low and varies to a very great extent with the demands or desires of the town.

As a general proposition, it is often necessary for the town to buy electrically driven fire pump and an electrically driven service pump, together with electrically driven compressors, but in several towns where a complete change has been made it has been found that the total cost to the town, including the compressor, service pump, fire pump and necessary switchboard with all necessary pipings and foundations, did not exceed $3,000. In some cases, on account of line regulation, it becomes necessary for the hydroelectric company to furnish and install in the customer's station an automatic regulator, and in this case the cost of installing the regulation is borne by the company furnishing the current and the losses in the regulator are then automatically deducted from the customer's monthly bill.

Two Views of Electric Show Held by the Benton Harbor-St. Joe Railway & Light Company.

Texas Company Encourages Dealers to Form Christmas Clubs to Stimulate Appliance Business.

The Texas Power & Light Company is sending out to all contractors in its territory the following circular letter together with a proposal on a special iron exchange for "Electrical Prosperity Week."

This Christmas Club idea is one which should prove popular to the buying public and when coupled with "Electrical Prosperity Week" is sure to make an impression and sell a great many appliances.

Many times you have heard of the Christmas saving club plans which many banks have used with good success in getting deposits and starting new accounts.

You have a chance right now to take advantage of this lession which the banks have taught us, by starting an "Electrical Appliance Christmas Club" in your own store.

By starting this club on the first day of "Electrical Prosperity Week" you can make it last four weeks. The following plan is outlined as being applicable to your business:

A payment of 50 cents each week for the four weeks will entitle the customer to a $2.00 appliance during Christmas week. A 75-cent payment each week will entitle the customer to a $3.00 appliance during Christmas week. A $1.00 payment each week will entitle the customer to a $4.00 appliance during Christmas week, and a $1.25 payment will entitle the customer to the choice of any $5.00 appliance during Christmas week, or if you prefer you can offer a small bonus and give the customer a little bit more than they pay for during the four weeks, that is, you could give the customer making a 50-cent payment each week a $2.50 appliance, the one making a 75-cent payment each week a $3.50 appliance, etc.

It would add to the publicity end of this club if you would offer a prize of some kind, say an electric percolator to the person purchasing the most appliances during the month of December. This would stimulate action, and would undoubtedly bring most of the trade to your store.

Think this over, and decide to put the plan in action.

Get up an attractive window display announcing this Christmas club plan.

If you want any assistance or further ideas on this proposition we will be glad to supply same.

Electric Show in Benton Harbor.

The accompanying illustrations show two views of the electric show recently held in Benton Harbor, Mich., under the auspices of the Benton Harbor-St. Joe Railway & Light Company. In addition to the central station, several manufacturers maintained exhibits, the total space so used aggregating over 5,000 square feet. The attendance exceeded expectations by several thousands and it is believed by J. A. Cavanaugh, superintendent of light and power, who planned the exhibition, that the show will give decided impetus to electrical development locally.

Digitized by Google

Electrical Construction

THE TEMPERATURE OF FIELD WINDINGS.

By H. M. Phillips.

Why is it that a manufacturer of electrical apparatus, specifically dynamos and motors, apparently prefers to bid on specifications, or to so write his guarantees that a competitor with a decidedly inferior line of goods is placed on terms of equality with himself? This does not appear to be a reasonable condition of affairs, but it is the essential fact in more than one particular, notably in regard to temperatures and particularly the temperatures of shunt-field windings.

Examine the bulletins and other printed matter issued by the leading manufacturers: two points can hardly escape attention; they deal almost entirely in generalities, and are all very much alike. There will be one or more cuts that give a more or less accurate idea of the external appearance of the machine, but the reading matter might very well be condensed into one sentence, "We build motors," which, after all, is probably about all the information they are intended to convey. The salesman will go much further, particularly with verbal information, but when asked for written "performance guarantees" the similarity of the various makers is again very pronounced. The writer has heard (it may not be true) of one manufacturer who showed originality by obtaining the efficiency guarantees of a competitor, and without further ado made his own two per cent higher on his entire line of motors.

The temperature of electrical apparatus is a vital point, and the guarantee almost invariably corresponds very closely if not exactly with the limiting temperature recommended in the Standardization Rules of the American Institute of Electrical Engineers. Now there can be no possible doubt that in the majority of cases a motor, or generator, that runs considerably below the limiting temperature is decidedly preferable to one that goes up to the limit. Why is it that a manufacturer who knows that his motor will run cool will give no better temperature guarantee than one who knows his will run hot?

The latest edition of the Standardization Rules, July 1, 1915, treats in a very instructive manner the taking of temperatures, as well as numerous other essential points in regard to standard electrical machinery; it is well worth reading. In reference to temperatures, directions are given for the use of thermometers and the method of estimating temperature from the increase of electrical resistance. It then assumes that the usual fibrous insulating material, untreated cannot safely be allowed to exceed a temperature of 95 degrees centigrade, but that by impregnating or other special treatment the limit can be raised to 105 degress. This temperature should not be exceeded at the hottest spot in the insulation, and as it is obviously impossible to reach that spot with a thermometer or to measure the change in resistance of that portion of the conductors in immediate contact with that spot, it is assumed that 15 degrees must be added to a thermometer reading and 10 degrees to the value calculated by change of resistance. On the assumption that the temperature of surrounding air is not likely to exceed 40 degrees centigrade, unimpreganted windings are allowed a temperature rise of 40 degrees by thermometer or 45 degrees, by resistance measurements, 10 degrees being added to these figures for impregnated windings. No recommendation is made as to the choice of the two methods of measurement, except that "the resistance method shall not be used on low-resistance coils where joints and connection form a considerable part of the total resistance."

For general purposes these rules are doubtless the best that can be devised at the present time and they are apparently excellent for large motors or medium-size generators of standard construction; but for such motors as are ordinarily used on machine tools and for various "freaks" they are, in the writer's opinion, somewhat inadequate. Why is it that the large majority if not all of the manufacturers specify that temperatures are to be taken by thermometers? In some cases the reason is very evident; the allowable temperatures would be greatly exceeded if measured by the rise in resistance; but why does the manufacturer whose machines could stand this test put himself on the same level with his competitor whose machines will not?

Experience has demonstrated that it is very difficult to measure armature resistances with sufficient accuracy to obtain reliable results in regard to temperature rise and that when this is done the results are generally not more than five degrees higher than the thermometer measurement, which is a very good reason for using the latter. The same is also generally true for the compounding on a direct-current machine and for the winding on commutating poles. It is generally less difficult to measure the resistances of induction motors, but, from the nature of their windings, comparatively thin layers imbedded in iron, the thermometer method is generally sufficiently accurate. The field winding of a series motor may be difficult to measure, on account of its low resistance, but the thermometer is of doubtful accuracy. The shunt motor has a field that is easily measured and on which in very many cases the thermometer is almost useless.

In the shunt field, heat is developed at a practically uniform rate throughout the length of the winding and must, if the run is continued till constant temperature is attained, be carried away from the surface of the coil at the same rate at which it is generated. The surface, where the thermometer is applied, is necessarily the coolest part; some part of the interior has the maximum temperature, on which the life of the insulation depends; while the calculation from the change in resistance gives something approaching an average temperature. It is interesting to examine a few of the cases, for all of which the assumption is made that the hottest spot is 15 degrees higher than the thermometer reading and 10 degrees higher than the temperature calculated from the resistance.

The generator of moderate size has a comparatively thin field coil, or the coil may be wound in concentric sections with ventilating space between; the wire is quite heavy; there are probably not more than three or four layers in a section and the coil has no outer covering. In this case there will probably be less than five degrees difference in the two methods of measurement and it is likely that both are

Digitized by Google

within 10 degrees of the real maximum temperature. Take the 5- or 10-horsepower, 220-volt motor commonly used on machine tools; the field coil is probably as thick as that of the generator previously considered, it is not wound in sections, there are a large number of layers of fine wire, and the heat generated in the center must traverse a considerable mass of insulating material before it reaches the surface of the coil; there it meets one or two layers of insulating tape, or perhaps first a layer or two of stiff paper, before it reaches the thermometer. It is rather surprising that a large number of such motors show only from 6 to 10 degrees higher temperature by resistance than by thermometer; if the tester can introduce the bulb of his thermometer between the outer tape and the winding he is likely to reduce the difference by several degrees. If the same motor is wound for 500 volts, finer wire and more layers must be used, the wire may also be more heavily insulated and special attention paid to tapeing the outside; all of which will increase the difference between the hot spot and the surface.

On the same motor let us consider a compound winding; if the motor is small the manufacturer may not care to go to the expense of a separate coil; the shunt coil will be made with less depth but of still finer wire; it will be taped, with an extra thickness or two of heavy paper added; the series winding will be wound directly on this, and the whole taped once more. If the series winding is liberally proportioned the resistance measurement may show 20, 30 or even 40 degrees higher than the thermometer.

In the preceding paragraphs it has been assumed that the temperatures are measured after the coils have reached constant temperature, which for ordinary motors means a full load run of at least four hours, while some may require eight hours or longer. The majority of machine-tool motors are sold on a two-hour rating, while some are rated for 30 minutes or even 15; this allows a decidedly greater input of energy for the field coils and a corresponding increase in the difference of temperature between the inside of the coil and the surface. There are also numerous and very erratic variations produced by the circulation of air currents from the armature and the amount of contact which the coil has with the surrounding metal frame. There is no possible doubt that many motors would burn out if their fields approached the temperature, by thermometer measurement, allowed by the Standardization Rules and by the makers' guarantees; as the maker desires a reasonable life for his machine, those that show a large difference between the thermometer reading and calculated temperature will generally have a rather low temperature rise by thermometer.

Some manufacturers claim that results obtained by the resistance method are inconsistent, unreliable, and change from day to day. In one instance in the writer's experience tests were cited where on successive days the results differed by 2.5 degrees as a proof of inaccuracy; but two thermometers placed a very small distance apart on the same coil and at the same time showed a difference of four degrees. As a matter of fact, the calculated temperatures are usually much more consistent than the thermometer readings, provided resistance measurements are taken with the moderate degree of care that should be the rule rather than the exception on all test floors. Variations of two or three degrees are bound to occur from day to day, but they are more likely to be on account of some slight change in the ventilation of the room, or to other atmospheric conditions causing a real difference in the temperature of the coil, than to error in the result obtained. Two motors which are supposed to be identical in construction and show the same temperature rise by thermometer, while the calculated temperatures vary by several degrees, might be taken to show the superiority of thermometers; but this does not necessarily follow. If the coils of the two motors take the same current they must radiate equal quantities of heat and their surfaces will be at the same temperature; this will not be materially changed if one coil has a little closer wrapping of tape than the other, an extra sheet of paper under the tape, or a greater amount of varnish in the windings; but such changes may make quite a material difference in the temperature of the interior of the coil. A case has been observed where five tests were conducted on the same machine without in any way disturbing the thermometers from the position in which they were originally placed. On four tests the calculated temperatures checked very closely and on three the thermometers did also; on the fourth the thermometers, four in number, all gave a reading several degrees low; on the fifth test both thermometers and calculated temperatures were several degrees lower than on the three tests that agreed. It is evident that on the fifth test there was a real change of temperature due to atmospheric conditions, but the low reading of thermometers while the calculated temperature did not change apparently indicates an error in thermometer measurements due to some condition that could not be determined at the time of test.

It hardly seems possible that a manufacturer whose motor was so poor as to fail to meet the A. I. E. E. requirements by thermometer measurement would deliberately make it worse; but suppose a motor on a 30-minute or two-hour test showed an excessive field temperature; a few layers of paper or other heat-insulating material placed underneath the tape on the field coils would probably give satisfactory thermometer readings.

Electrical Installation in Seattle Warehouse.

A new warehouse has recently been constructed in Seattle, Wash., by the Seattle Terminal Company for Sears, Roebuck & Company. The electrical work in this building was installed by The White City Electric Company, of Chicago, Lyle D. Grey being superintendent of construction.

The building is 285 by 310 feet in size and nine stories high. There is also a 12-story tower. Reinforced-concrete construction was used, the building being faced with red pressed brick with a white terra-cotta trim.

Energy will be supplied by the Puget Sound Traction, Light & Power Company from a two-phase circuit. A transformer platform has been made a part of the building and is erected over an outdoor loading platform. The switchboard is located in the basement beneath this. A specially designed pull box incloses the service entrance wires and the busbars above the switchboard. This presents a finished metal surface both front and back.

The A G Electric Company, of Seattle, constructed the six-panel switchboard, as well as 72 safety panels and 42 back-connected power panels, all according to the designs and specifications of The White City Electric Company.

Special lighting fixtures were installed and there are 4,500 General Electric lock sockets which are hung upon reinforced drop cords. Sherarduct was used for the conduit work and 2,500 deep Adaptiboxes were mounted in the concrete. These boxes were nailed to the form after the knockouts and back were removed. No offsets in the conduit were necessary nor was it necessary to run the pipe under the reinforcing rods. All parts of the work by this method are open to inspection up to the time the cover is put in place. The back is firmly locked in place by tightening two screws.

Provision has been made for future decorative lighting by installing three 00 risers to the roof and installing

Digitized by Google

boxes and switches. At the present time an ordinance of the city of Seattle prohibits the use of a roof sign.

An unusual feature of this installation from the contractor's standpoint was the inclusion of an automatic telephone system. The telephones, 85 in number, were supplied by the Automatic Electric Company, of Chicago, and provision has been made for an ultimate capacity of 200.

Seven Otis electric elevators were installed for passenger and freight service. Other motors are used for driving sewing machines, shoe machines, jewelry machines, conveyors, blowers, etc. The present connected load is about 500 horsepower.

A complete bell and buzzer system was installed and burglar alarms were fitted to all outside doors. There are 48 ten-inch Faraday signal bells operated from the dismissal box at the main entrance. Signal bells are also provided for calling department heads, superintendents, etc.

Installation Rules for Gas-Filled Incandescent Lamps.

Owing to the increased use of gas-filled incandescent lamps, the Department of Electricity, San Francisco, Cal., has adopted revised regulations for installation, superseding the restrictions embodied in Section 1, Ordinance No. 2582, as well as all other rules previously issued pertaining to this type of lamp.

The new rules, following the recommendations of the National Fire Protection Association, provide for the installation of gas-filled lamps for interior service in indirect and other ceiling fixtures, and are as follows:

(A) To be so grouped that not more than 660 watts, nor more than 16 sockets or receptacles, are to be dependent on one cutout, except that in cases where wiring equal in size to No. 14 B. & S. gauge is carried directly into keyless sockets or receptacles, the location of which is such as to render unlikely the attachment of flexible cord thereto, the circuits may be so arranged that not more than 1,320 watts, or 32 sockets or receptacles, will be dependent on the final cutout. Where a single socket or receptacle is used on a circuit, the limitation of watts permissible on the final cutout shall be the maximum capacity for which such socket or receptacle is approved.

(B) Must not be used in show windows or in other locations where inflammable material is liable to come in contact with lamp equipment, except where used in connection with approved fixtures where temperature of any exposed portion of same does not exceed 200 degrees Fahrenheit (93 degrees centigrade).

(C) Must not be used in connection with medium-base sockets or receptacles if of above 200 watts nominal capacity, nor with mogul-base sockets or receptacles if of above 1,500 watts capacity. Must not, if provided with a shade, reflector, fixture or other inclosure above the socket, be used in fiber-lined or similar sockets or receptacles of either medium or mogul-base types if of above 100 watts.

(D) Fixtures within buildings must be wired with conductors of approved slow-burning or asbestos covering where the temperature to which wire is subjected at any point exceeds 120 degrees Fahrenheit (49 degrees centigrade). Where fixtures are placed outside of buildings approved rubber-insulated wire is required.

Repairing a Motor.

A small motor trouble that came to my notice recently is one that is liable to be encountered at any time with small clutch motors and is apt to be difficult of solution unless the trouble has been met before.

The motor in question was a small motor with a friction clutch that grasped an outer race and thereby mechanically fastened the rotor to the shaft by friction when the machine was up to speed. The motor started up all right, but when the load was thrown on the motor gave a shrill whistle like a siren and the pulley then stood still. On disassembling the machine it was found that through wear the clutch pieces had worn down just enough so that the rotor would let go of the shaft when any where near the full loading was attempted. The motor was repaired by sweating in hard brass strips in the outer race and turning the inside rough to give sufficient grasp when the worn clutch was thrown in.

H. E. Weightman.

Reppell Electric Company Sells Out.

The stock and fixtures of the Reppell Electric Company, Thirty-first and Summitt Streets, Kansas City, Mo., were sold at bankrupt sale to John J. Magee, manager of the Federal Sign System, at Kansas City. Mr. Magee was with the Federal Company several years, in Kansas City and elsewhere. He is now operating the Reppell Company without changing its name; it has done general contracting, and had a fair business in residence work.

Oklahoma City Record in Electrical Construction.

The largest permit for electrical construction ever applied for in Oklahoma City has just been granted by the city building inspector to the officials in charge of construction work on the new $350,000 Ford assembling plant.

Among Contractors.

Charles J. Sutter & Company, electrical contractors and engineers, are installing the electric light and power system, telephones, clocks, alarm systems and automatic calls in the Oklahoma State Capitol building now in process of construction.

The Nunn Electric Company, of Amarillo, Tex., has completed arrangements for immediate establishment of a jobbing house in Oklahoma City, occupying three floors and basement of the building at 215 West First Street, on which a lease for five years was secured. A full stock of meters, transformers, motors and general electrical stock will be carried.

R. W. Keck & Company, of Allentown, Pa., one of the best known electrical contracting firms in eastern Pennsylvania, has recently moved into commodious and very attractive quarters in the heart of the business district, the change being made largely on account of the rapid expansion of the business and partly for the improved facilities offered to the retail trade in the new location. A well appointed display room stocked with a full line of appliances, greets the eye of the customer on entering the establishment. Within easy access of the display room is the supply division in the rear, while in the basement are located the shops, where all repair and heavy construction work is executed. This firm has been signally successful in the handling of large contracts involving the application of motors to various manufacturing processes. Among the contracts now being fulfilled are the supply and installation of a motor-generator set for the State Insane Hospital at Rittersville, Pa., and an ultimate installation of 280 horsepower in Wagner motors for the Gallia Silk Company, at South Bethlehem, Pa.

A new electrical concern has opened a store in the Cannon block, 192 High Street, Clinton, Mass. The members of the firm are Samuel Mahan and Emil Schmidt, two young men who have recently taken the examination given electricians, and formed a partnership. Both have had considerable experience. The store is the most up-to-date and best equipped in Clinton. The back part of the store has been partitioned off. Here fixtures are suspended and connected with different switches.

The firm plans to do all kinds of work incidental to gas and electricity. Mr. Mahan has for some time been working with Ernest P. Howe, while Mr. Schmidt was formerly employed by the Clinton Gas Light Company.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

IDAHO.

The Sandpoint Water Company Case.—The petition of the city of Sandpoint was before the Commission for some time, the decision being withheld until certain points involved in other cases before the Supreme Court of the State could be finally determined. The decision of the Commission contains important holdings on questions involved in valuations and rate-making cases.

Accrued Depreciation Not to be Deducted.—The question of whether or not accrued depreciation should be deducted is discussed at length, and the Commission, following the rules of the Supreme Court of the State as laid down in the Pocatello Water Company case (ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, July 17, 1915, p. 112), finds that no deduction should be made in this case, "as the testimony shows conclusively that defendant's plant is in first-class operating condition without any actual or tangible signs of depreciation."

The opinion by Commissioner Ramstedt further discusses the matter, as follows: "The adoption of the cost-of-reproduction-new as a basis of value in this case we believe to be just and equitable. It must be remembered that the defendant made the investment in this enterprise for as long time as the business would be in existence, and had been conducting such business up to the enactment of the Public Utilities Act in 1913, without state regulation, and in the absence of rules under which annual allowances for depreciation would be charged as operating expenses. We do not say that in case of replacements not being made when reasonably necessary, or in case of obsolescence, or in case of a utility operating and having operated under State regulation, the rule of cost-of-reproduction-less-depreciation is not the correct general rule to be applied. However, neither the Pocatello case nor this case comes within the class of utilities operating in the past under such regulation.

"Included in the defendant's capital investment are certain items of physical property which are subject to decay or will wear out and be replaced from time to time during the conduct of the business. In order to compensate the investor for loss in the public service, of property through wear and decay, and to enable him to make necessary replacements from time to time, an allowance is made him for depreciation, which allowance should be treated as an operating expense. As the different parts of the plant wear out they must be replaced, and the original investment is thus kept intact. What concerns the public is the value of the service. It is impossible to keep the plant 'brand new.' To do so would be the rankest kind of waste. If a portion of the plant is partly worn out but in condition to render the same efficient service as when the plant was new, the public has lost nothing. The loss belongs to the investor, unless he has been allowed a sufficient amount to offset the depreciation. To depreciate the capital investment and consequently reduce the earning power of the investment by reason of the fact that replacements, which are not at the time in question necessary, have not been made, would in effect be confiscation. Suppose the investor has issued bonds on the property in order to make the investment. How can he pay the interest on the bonds if the earning power of the property is decreased? He could do so only by reducing the indebtedness to the extent of depreciation, which would vary from time to time. The absurdity of such a proposition from a practical standpoint would be apparent. If the rule of depreciating the investment by the amount of depreciation should become the established policy in this State, we can see very little inducement for the investment of capital in Idaho."

Allowance for Future Depreciation.—The Commission finds that an annual allowance of three per cent of the value new of the depreciable physical properties should be made for future depreciation.

"While no deduction will be made for accrued depreciation we realize that certain physical properties begin to deteriorate from the moment they are put into service, and unless replacements are made from time to time, such properties will gradually become unfit for service. Notwithstanding the fact that defendant's plant is in first-class operating condition, without any actual or tangible signs of wear or decay, we know that depreciation has constantly been going on since the very beginning of its life, and it is only a question of time when certain items of physical properties will have to be renewed. For the purpose of showing the true condition of the plant as well as to protect the life of the plant there should be established a Depreciation Reserve account to which the cost of renewals shall be charged in accordance with the Uniform System of Accounts prescribed by this Commission."

Services Paid for by Consumers.—The engineer for the complainant made no allowance for the item of "consumers' connections" on the ground that it had formerely been the practice of the defendant to charge to the consumer this cost of making service connections.

"The records show that prior to 1908 the cost of such connections was assessed against the property owners, and that subsequent to that time, following a decision of the State Supreme Court, the cost of such service connections has been borne by the defendant. * * * There is nothing in the record to show that persons who paid the cost of service connections are now patrons of the defendant or that the premises with which such service connections were made are now held by the property owners against whom the cost of such connections was assessed. The adjustment of any claims on account of charges made for service connections in the past is, in the opinion of the Commission, a question for determination by the courts rather than by this Commission. All mains and service pipes of the system laid in the streets and alleys of Sandpoint should be owned by, and placed in positions at the expense of, the defendant."

Overhead Charges.—While it appeared that all the interest during construction which was actually paid was received from operating revenue, and while there was no evidence tending to show that the defendant ever paid out any amount as brokerage fees, the Commission found that an allowance of 15 per cent of the value of the physical properties would be just and reasonable.

Going Value.—The Commission stated that, in arriving at the value of defendant's water system, it took into consideration the earnings of the defendant in the past, the cost of reproducing the present earnings, as well as developing the business and the cost of furnishing free service to the complainant and "while the Commission makes no definite findings as to the going value, it has considered defendant's plant as a going concern, in actual successful operation."

Property Paid for Out of Excess Earnings.—The decision says: "The records indicate that a considerable portion of defendant's system has been paid for out

Digitized by Google

of what might now appear to be excessive earnings, due, as claimed by complainant, to excessive rates in the past. The Commission, however, will make no deduction to offset any real or fancied excessive earnings in the past in view of the fact that the defendant was then operating in the absence of State regulation and protection now afforded it under the Public Utilities Act, as well as in view of the unknown future prosperity and development of the territory served, at the time the defendant embarked in the enterprise now under investigation."

Rate of Return.—The Commission allows a return of eight per cent, but says: "This Commission will not be placed in a position of stifling ambition and effort in the development of public utility enterprises by adopting a fixed per centum as the rate of return which a utility shall be allowed on its investment. The rate of return will be determined in each individual case, giving due consideration to efficiency and economy in management, and thus afford a stimulus for the utility to increase its business, to reduce its operating expense and thereby reduce the cost of commodity to the consumer. If a public utility can by efficient management reduce the operating expenses below the ordinary amount, or if it can by the application of a broad and public spirited policy develop a community and thereby develop its business and increase its earnings, it is certainly entitled to share in the increased earnings directly resulting therefrom. We believe that the application of this policy will create an incentive to greater and more efficient effort on the part of the investor and that it will redound to the benefit of the community served as well as of the entire State."

ILLINOIS.

St. Clair County Gas and Electric tablished rates for gas in the city of Belleville vs. St. Clair County Gas and Electric Company, in which the Commission made a valuation of the property and established rates for gas in the city of Belleville, the following table of overhead expenses in percentage as used by the Commission staff is given.

Items included in overhead expenses	Land	Transmission and distribution	Buildings and structures	Plant equipment	General equipment
Omission in calculations and inventory	..	1	1	1	1
Engineering and architecture	2	4	5	4	..
General supervision and wear on tools	..	4	4	4	2
Interest during construction	6	4	3	3	2
Insurance, fire and liability	..	0.5	1	1	0.5
Organization	..	1	1	1	..
Legal and taxes	2	0.5	0.5	0.5	0.5
Contingencies	..	1	0.5	0.5	..
Totals	10	16	16	15	6

The decision says: "The percentages found by the engineering staff, when weighted, produce a composite overhead charge equal to 15.39 per cent of the staff's valuation of the tangible property. In addition to the 15.39 per cent, the engineering staff testified that not less than 10 per cent had been allowed in its valuation to cover contractor's profit on all items of construction which were entitled to such surcharge."

The Commission allows 7.25 per cent as a rate of return on the value of the gas property, plus an allowance of 3 per cent per annum to cover "depreciation, obsolescence, inadequacy, etc."

Submarine Batteries Discussed at Court Martial.

Trial by court martial of Rear-Admiral William N. Little, U. S. N., retired, on charges of neglect of duty in recommending the acceptance of battery tests on the submarine K-2 while under construction at the Fore River (Quincy, Mass.) shipyard, was conducted at the Charlestown Navy Yard during the week of November 1-6, by a board composed of seven rear admirals. The accused was inspector of machinery at the time the vessel was being built.

Testimony showed that while evidences of imperfect workmanship had been found and corrected in about 15 cells of the boat's storage batteries, the batteries as a whole performed on their trials all the work required of them by the contract. The prosecution contended that the inspector should have required a general overhauling of the batteries, and that he exceeded his authority in securing an agreement of the company to stand behind the equipment.

The specific defect in the battery was the finding of lead drops in a number of the cells. Chief Electrician Henry G. Grube, of the K-2, said he had never found lead drops in batteries until he saw them in the cells of the K-2. He considered their presence the result of imperfect workmanship.

R. A. Fessenden, for 30 years a student and experimenter on storage batteries and for three years head chemist for Thomas A. Edison, appeared in behalf of Admiral Little, and testified that unless lead drops caused short-circuiting sufficient to indicate at once on a voltmeter, no impairment of the battery's life nor other injurious effect would result. In cases where a battery is kept floating across busbars there might, however, be some effect on life, but none in the present instance.

Asked as to the cause of active material forming on the separators and producing shorts, Professor Fesseden answered that every time a battery is charged the volume of chemicals is different. A shelf on a plate might prevent the active material dropping to the bottom unless bubbling counteracts it. The renewal of a certain per cent of pasted plates is inevitable after about two years' service, owing to active material being deposited on warped or deformed plates. The presence of lead drops is not necessarily harmful. At the time the K-2's battery plates were burned in, even the best workmanship could not have prevented drops. Now, however, special apparatus is employed, which obviates this occurrence.

Stephen A. Gardner, Quincy manager of the Electric Boat Company, Groton, Conn., said it was customary to charge batteries soon after a submarine is launched; and until turned over to the government the battery is in constant use. In the K-2 case, 15 to 20 cells appeared abnormal before delivery. These were corrected and a three-hour discharge test was run, as required by contract, which showed the boat capable of a 8.5-miles-per-hour speed, submerged.

Joseph Starkenstein, representing the battery company, explained an appliance designed to prevent lead dropping. He stated that he personally directed the burning in of the submarine's battery. After each group was burned a magnet test was made to determine whether there was any electrical connection between plates of opposite polarity. If any appeared the elements were removed and the cause of the connection eliminated.

Admiral Bowles, president of the Fore River Shipbuilding Company at the time of the K-2 construction, testifield that Admiral Little was a very exacting inspector.

Long-Distance Telephones Along the Lincoln Highway.

The Lincoln Highway tourist across Nevada is to have another convenience at his service. It is planned to run a double-copper telephone wire along the Lincoln Highway from Salt Lake City to Ely, and thence to Reno. Cut-in stations will be established one mile apart along the way, and by means of these stations no traveler could ever become stranded at a greater distance than a half-mile from a telephone station from which he could call for relief.

A traveler will be able to procure an instrument at either end of this route by paying a small deposit on it, just sufficient to insure its return in proper condition when he reaches the station at the other end of his journey. Certainly the so-called terrors of desert travel are rapidly being shorn of their terrors.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 314.—Talking Signs.—What means are used in electric "talking" or word-spelling signs to prevent injurious arcing at the contacts where the current is continually changed from lamp to lamp?—A. F. B., New York, N. Y.

No. 315.—Motor-Driven Motion-Picture Machines.—About what percentage of our large cities having over 100,000 population permit the use of motor-driven motion-picture machines?—S. P. L., Topeka, Kans.

No. 316. — Protecting Lightning Grounds.—What is the best method of protecting lightning rods and the ground wires of lightning arresters where the wires are exposed to injury near the ground? I understand that iron pipes are objected to by some authorities.—L. F. B., Wilmette, Ill.

No. 317.—Wiring for Electric Ranges.—In wiring an apartment building for electric ranges, each of which has a maximum possible load of two kilowatts, what is the best arrangement of the special range circuits so as to economize wire and reduce the voltage drop to the minimum? Meters to be in the basement.—D. A. T, Chicago, Ill.

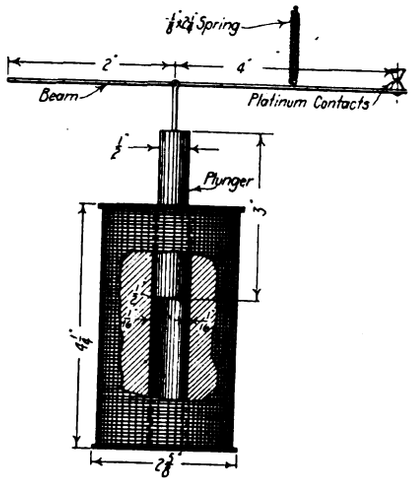
Answers.

No. 309.—Automatic Cutout.—It is desired to keep an electric water heater taking 550 watts in circuit as continuously as possible. A few other devices and lamps are also on this circuit, but are turned on for short intervals only. Is it possible to devise some automatic means for temporarily cutting out the heater while the other load exceeds one ampere? The device must reconnect the heater as soon as the other load is cut off or reduced to less than one ampere.—V. B., Milwaukee, Wis.

The ordinary current-limit relay is unsuitable for the conditions imposed. It is built to open the circuit or close it, as the case may be, at a predetermined maximum current, which it will do, but it will not reset at the same value as it kicked out at, but at a much lower value. Therefore to fully meet your conditions it is necessary to use a floating-plunger relay with spring suspension, as shown.

This type of relay will automatically reconnect the circuit when the load comes back to normal. But if a heavy current is to be handled, a contactor should be used, and the relay employed to close the contactor-coil circuit; otherwise arcing at the contacts would soon destroy them.

Should you desire to build your own relay, the dimensions given on the diagram are correct. The spring should be made adjustable, and the plunger should be about two-thirds way down in the coil. The spring can be made of 36 turns of No. 20 B. & S. brass spring wire. The



No. 309.—Automatic Cutout.

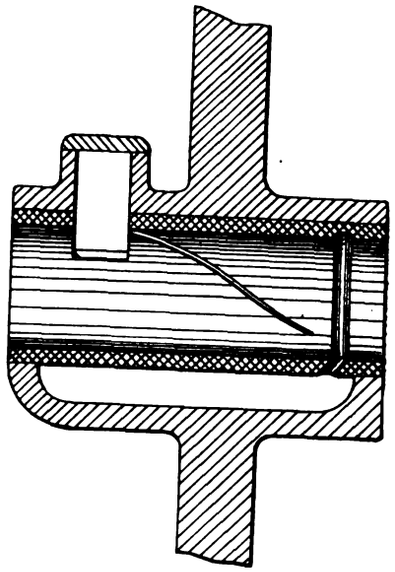
coil should be wound with 290 feet of No. 15 double-cotton-covered copper wire. —J. H. McI., North Sharon, Pa.

No. 310.—Cleaning Commutators.—I would like to know of something which may be safely used around motors and dynamos for cleaning gummy commutators, etc. We have been using gasoline, but have had trouble from sparks from the brushes igniting the gasoline.—A. S. N., Plymouth, Mass.

The cause for the commutator becoming gummy should be looked into and investigated rather than a method determined for cleaning the same after it has reached this gummy stage. This commutator is lubricated, apparently, by some oil, paraffin, or similar substance, which is not dry and which accordingly attracts and collects dust and dirt. This oil may be present in the form of a vapor, oftentimes caused by a crankshaft splashing in oil, especially noticeable on direct-connected engine-driven generator sets. More likely, however, the brushes used on the commutator are impregnated with paraffin or some other grease or oil, a method used by some manufacturers to reduce the brush friction. These brushes, when used on a commutator which has a high peripheral speed or when they are subjected to a high current density, due either to design or overload, bake and the lubricant is forced out of the brush, collecting on the commutator which causes the so-called gumming.

The remedy in either case is to purchase a set of high-grade dry brushes of fine, dense texture, which are truly self-lubricating. They consist of finely pulverized carbon with which is mixed a certain percentage of plumbago or graphite for lubrication, and in case of flush mica a small percentage of abrasive material to take care of the mica. These brushes, being of dense texture, will not absorb oil and being mixed with graphite are not only self-lubricating, but also dry. The use of brushes described above will prevent gumming of the commutator. Brushes of this quality, while manufactured abroad, can be obtained in this country. They are broadly advertised.—W. H. C., New York, N. Y.

I have perused with interest the several suggestions put forth in the issue of October 23 regarding the cleaning of commutators, which are very good, but why not get to the root of the evil? I have found 99 times out of a possible 100 that the gumming of commutators may be traced directly to the oil bearing on the commutator side, the cause being that there is oil leaking, or rather creeping, along the shaft to the commutator and thence to the brushes. Now if these brushes are soft carbon or more especially the ordinary self-lubricating brush they will gum the commutator badly; if a hard carbon this will not occur so readily, but the oil will cause sparking and cause the mica to carbonize in weak places, pro-



No. 310.—Drain to Keep Oil from Commutator.

ducing short-circuits between bars with the natural result of burning out a coil or coils, if not caught in time. Now, a remedy is this: Most bearings of later-day motors or dynamos have a groove about one-eighth inch deep cut in them, about one-fourth inch from the commutator end and, also from pulley and armature end, when they are trued up in the lathe or boring mill, with a hole bored through the bottom emptying into the oil well. See accompanying sketch, which

Digitized by Google

represents commutator-end bearing. Inspect your bearing on commutator end, clean groove of dirt, see that the hole to oil well is free or, if none is found, have a groove cut in with hole to oil well and your trouble will cease.—R. A. D., Lake Mills, Wis.

No. 311.—Simple Rate System.—Has any system of rates for residence customers of a central station ever been devised which, though based on actual or assumed maximum demand and including primary and secondary rates for, say, 30 hours' use of this demand, can be fully explained to any customer without using the words "30 hours' use," "demand," "maximum demand," or even "kilowatt-hours"? If such a simple system is as yet too ideal, what is the nearest approach thereto that has been attained?—W. H. T., Ann Arbor, Mich.

It seems to the writer that the ordinary user of electric power has no knowledge of the electrical terms or their values while he does know that he has an electric light of a certain power and can figure that when this is used a certain number of hours he will have to pay a certain amount. He can also realize that, after he has used this light for this certain time, he will get a longer time for the same money for longer use of this light.

Why not, therefore, drop the use of the electrical terms (as the writer has learned to do in the last 15 years) and tell the story in hours of light used (not "lamp-hours," as this is a technical term). One can show the customer that he will in ordinary use turn on a certain number of lamps every evening and use them for some time. This will constitute his demand, although he will not know as such. Further tell him that, if he uses these lamps for less than an average of one hour each night, he will pay for the light used at the rate of one cent times the number of hours, thus dropping discussion of the 30 hours of demand and also reference to kilowatts or kilowatt-hours. It is also better to state the case to him in candlepower of a certain lamp and connect this with the proper wattage. This is the same as telling the customer that, if he does not use his maximum demand for 30 hours per month, he will be on a certain X rate.

Further it will be plain to the customer that, if he is to use more than his average of one hour per night of a given number of lamps, he will get two rates. One as before stated and the excess will be at the rate of Y number of hours use of the given size of lamp for one cent. This Y is naturally larger than X by the ratio of the second rate over the first.—W. M. P., Seattle, Wash.

No. 312.—Connection of Bell-Ringing Transformer.—Recently I was called to correct some trouble in a door bell rung from a bell-ringing transformer. I found that the push-button was arranged to close the primary circuit of the transformer, the secondary being connected directly to the bell. The contacts of the push were burned from arcing, which did no further damage because it was in a non-combustible case. It was explained that this connection had been insisted on to save the small current that the transformer would take continuously. Is there any provision in electrical construction rules to prohibit this connection?—E. S., Atlanta, Ga.

From the Underwriters' point of view there is no objection to connecting a push-button in the primary circuit of a transformer designed for bell ringing, when the primary voltage of same does not exceed that of the ordinary lighting circuit of 110 volts, providing, however, that all parts of the circuit in question are wired in accordance with Class C, as stated in the latest edition of the National Electrical Code rules 16 to 19, pages 30 to 34. From the foregoing it will be noted that the construction must be the equivalent of that used for lighting, and would necessarily be much more costly than that commonly used for bell work when less than 10 volts are employed. There is no approved bell push-button for the voltage desired, but a standard quick-break door switch with slight modifications may be used for this.

As the iron loss in many of the small transformers designed for this class of work is practically negligible, in fact, so little that it does not register on a three-ampere integrating meter unless same is not properly adjusted to prevent "creeping," it would be better to connect the push-button in the secondary than in the primary circuit. This will insure better operating conditions and service, less tendency to arc, and cheaper and safer construction. This is the standard practice.—M. K., Passaic, N. J.

No. 313.—Trouble Near Wireless Stations.—Why is it that in residences in close proximity to wireless stations watt-hour meters frequently burn out and lamps and lamp sockets become short-circuited? Is there any danger to life or from fire? How do central-station companies overcome the difficulty?—C. F., Chicago, Ill.

When a conductor is cut by an electromagnetic field an electromotive force is induced in that conductor, the magnitude of this electromotive force depending, amongst other things, upon the length of the conductor and the strength of the field of flux. In wireless telegraphy the antennas are charged and discharged very rapidly at a high potential with the result that electrical energy is radiated into space. The amount of energy thus radiated is very considerable in the case of the large high-power stations, and even with the smaller ones belonging to amateurs may sometimes be sufficient to blow fuses, burn out the potential coils of watt meters, etc. The nearer the secondary conductors, which in this case are the house wiring and the overhead leading-in wires, are to the wireless station the greater the amount of energy induced in them, the higher the induced voltage and the greater will be the likelihood of trouble. The voltages induced in circuits in close proximity to stations may sometimes be high enough to cause sparks of 0.25 inch to jump to earth, and to occasion severe shock in many cases. While these shocks may be serious enough to cause painful blisters they usually do nothing more than bring temporary discomfort, although the muscular contractions following a shock may easily result in a person releasing his hold and falling to his death.

There are several ways in which disturbances from wireless stations may be overcome. One way is to place all wires in a metallic sheath, which in turn is grounded at frequent intervals. This method is not always feasible, for example, with overhead wires. Another way is to shunt a high resistance (noninductive) from lines to ground, so that the charge may leak away. This method is inexpensive where the amount of energy to be dissipated is small, but is unsatisfactory for other than the smallest stations. A third way, and one which is in all respects satisfactory, so far as protection is concerned, consists of installing aluminum type lightning arresters from lines to earth. Unfortunately, this type of arrester if left permanently connected to an alternating-current circuit requires rather frequent attention and renewal of the electrolyte, on account of the comparatively rapid deterioration of the latter. This is not a serious matter where skilled labor is available, as would be the case round high-power stations, but the complications and maintenance costs preclude its use in general for protecting residences. The fourth method, which is applicable to all residences, etc., consists of connecting a vacuum-tube arrester between all lines and ground. This arrester, which has been developed especially for the protection of residences, consists of a gap comprising a disk electrode operating in an exhausted tube.

Many central-station companies have rigid rules covering the connection of wireless outfits to their mains, although these rules cover the protection of the company's system and apparatus rather than the house wiring, which may be a very different thing. No one should be allowed to connect a wireless outfit to a distributing system without a permit from the central-station company, and many companies have such a ruling. Notwithstanding this, an enthusiast will now and again install an outfit, but it makes itself known by causing flickering of the lights, blowing fuses, etc.—K. R., Chicago, Ill.

Digitized by Google

Generating and Distributing Statistics of Pacific Power & Light Company.

The Pacific Power & Light Company, operating in Oregon and Southern Washington, has recently compiled an interesting schedule of kilowatt-hour statistics covering a complete record of generation and distribution on its various interlocking systems for the year ending June 30, 1915. These figures afford a comprehensive analysis of the activities of the different steam and hydroelectric stations, and respective operating territory of the company, indicating an average loss in distribution of seventeen per cent.

YAKIMA-WALLA WALLA SYSTEM.

Station	Generated Kilowatt-Hours
Drop	937,700
Naches (Steam)	1,339,925
Naches (Water)	17,557,521
Fruitvale	1,911,620
Prosser	1,399,679
Kennewick	9,900
Walla Walla (Steam)	159,096
Walla Walla (Water)	11,430,740
Waitsburg (Water)	63,573
Tucannon (10 months)	197,064
Bought from Hanford Irrigation & Power Company	988,614
Total Generated and Bought	35,995,432

City	Distributed Kilowatt-Hours
North Yakima	7,637,860
Toppenish	1,729,580
Sunnyside	784,284
Prosser	882,197
Pasco	7,934,857
Walla Walla	7,789,689
Dayton	607,186
Pomeroy (10 months)	429,207
Pendleton	1,575,214
Sold to Hanford Irrigation & Power Company	9,272
Total Distributed	29,378,346
Loss (18.4 per cent)	6,617,086

HOOD RIVER-TYGH VALLEY SYSTEM.

Station	Generated Kilowatt-Hours
Tygh Valley	3,102,800
Bought from Hood River Gas & Electric Company	231,260
Total Generated and Bought	3,334,060

City	Distributed Kilowatt-Hours
Dufur	39,530
The Dalles	2,518,430
Sold to Hood River Gas & Electric Company	105,420
Total Distributed	2,663,380
Loss (20.1 per cent)	670,680

ENTIRE PACIFIC SYSTEM.

System	Generated Kilowatt-Hours
Yakima-Walla Walla	35,995,432
Hood River-Tygh Valley	3,334,060
Astoria	5,675,375
Pomeroy (2 months)	66,808
White Salmon	110,248
Goldendale	292,000
Total Generated and Bought	45,473,923

System	Distributed Kilowatt-Hours
Yakima-Walla Walla	29,378,346
Hood River-Tygh Valley	2,663,380
Astoria	5,236,072
Pomeroy (2 months)	66,808
White Salmon	110,248
Goldendale	292,000
Total Distributed	37,746,854
Loss (17 per cent)	7,727,069

Protection of X-Ray Operators.

The Rontgen Society (London) has recently formulated a set of rules or recommendations for the protection of X-ray operators from the dangers attending the use of X-rays. These will be issued in card form.

Extraordinary Telephone Development in Chicago.

The number of Bell telephones in the city of Chicago has reached the 400,000 mark. With a population of 2,500,000 this gives Chicago approximately one telephone to every seven inhabitants. This development is confined to the city limits and does not include the Chicago Telephone Company's suburban territory. Compared to other large cities in this country this number is significant. New York City has 428,750 telephones, Philadelphia has 150,400 telephones, Boston has 88,100, Pittsburgh has 76,140, San Francisco has 118,217 telephones. These figures cover the metropolitan sections of the various cities only, and do not include any suburban points.

The city of Chicago now has more telephones than the nine countries Italy, Spain, Hungary, Belgium, Portugal, Roumania, Bulgaria, Servia and Greece combined; more telephones than the whole Russian empire and more than twice as many telephones as the whole of Austria. Chicago surpasses by far all European cities in the number of telephones in service. Lodon has 258,895; Paris has 95,033; Berlin has 154,800; Stockholm has 85,641; Vienna has 64,438; Budapest has 27,944; Petrograd has 54,815.

This attainment represents an increase of 1,400 per cent in telephones in the city of Chicago during the last 15 years. In 1900 there were only 26,661 telephones in service. This increased to 104,338 by 1905. In 1910 there were 239,082. In 1900 the average daily number of originating calls in the Chicago exchanges was 324,000. The average number of daily originating calls at present is 2,000,000. The total number of originating calls during the whole year of 1900 was 108,000,000 while the total number of originating calls last year was 607,450,000.

The Chicago Telephone Company was incorporated January 14, 1881. Its first telephone building was erected in 1887 at the corner of Washington and Franklin streets. It was a seven-story building and was considered a skyscraper at that time. The present main office building at 212 West Washington Street is 20 stories high and the largest building in the world devoted exclusively to telephone purposes. In addition to the main office building, the Telephone Company has 39 other buildings throughout the city used for exchanges and supply stations.

The underground and cable system of the Chicago Telephone Company is the largest and most complete in the world; embracing 712 miles of conduit, which contains 3,398 miles of duct, carrying 1,081,704 miles of underground wire. The aerial plant contains 119,527 miles of aerial wire and 1,475 poles.

From a pamphlet of 500 names, the Chicago Telephone directory has grown to a large book, containing more than 410,000 listings. The Chicago Telephone Company is one of the biggest employers in the city; in the city alone, the company has in its service 3,978 male employees and 6,367 female employees, of whom 5,600 are operators. The company spends on an average $6,800,000 a year for construction and wages. It is constantly extending its facilities, enlarging present exchanges and building new exchanges to meet the growing demand for telephone service.

The Chicago Telephone Company not only covers the local field thoroughly, but its affiliation with the American Telephone & Telegraph Company affords its patrons ample opportunity for telephone communication with all points in the United States and Canada. Bell lines reach 70,000 cities, towns and rural communities and extend from coast to coast.

Argentina-United States Wireless Concession.

The Federal Holdings Company, of New York, has been granted a concession for the construction of a high-power wireless station in Argentina, near Buenos Aires, for communication with a station to be erected at New York. The *Review of the River Plate* states that the company obtaining the concession owns the Poulsen patent rights in the Americas, and that it is proposed to employ this system for the new wireless service. It is also stated that the stations are likely to be in operation within 18 months.

The concession is for 30 years from the time the plans are approved. The rate between Argentina and the United States, it is required, shall be lower than two-thirds of the telegraphic tariffs in force. State radiograms and those of authorized national representatives are to be accorded preference and to be charged 50 per cent of the ordinary tariff. The company is to transmit, free of charge, the official radiograms of the government and of its agents in foreign countries, and meteorological information in less than 10-word messages between the national observatories which maintain communication with the company.

The right is reserved to impose the requirement that all of the employees shall be Argentine citizens. The operators must have Argentine diplomas identical with those required of operators on vessels flying the Argentine flag. The company undertakes to give facilities to the technical staff of the Argentine navy. It is declared that the present authorization does not imply the granting to the company of the monopoly of radio communication.

Digitized by Google

Railway Electrification at Sydney, Australia.

The American consul at Sydney, Australia, reports that at the present time two schemes for electrifying certain existing lines of urban and suburban railways are engaging the attention of the local transportation departments. The railway service known as the North Shore line, running from Milson's Point (the traffic center immediately opposite the city proper) to Hornsby (13 miles away on the main line from Sydney to the north) is about to be electrified. Already a tunnel is being driven under the harbor for carrying the necessary supply cable. The idea is to supply power for this service from the existing generating station at White Bay on the Sydney side of the harbor. The work is being carried out by the Railway Department of the New South Wales Government.

The second project is much more extensive in conception and is only awaiting the passing of an enabling bill, now in the State Parliament, before being started. The following outline of the proposed improvements has been furnished by an official of the Public Works Department, J. J. C. Bradfield, who is chief engineer of metropolitan railway construction and is in full charge of the preliminary arrangements. Mr. Bradfield recently visited the United States, and it is interesting to know that his experiences there undoubtedly paved the way for considerable American business in connection with the forthcoming enterprise. Mr. Bradfield says:

The electric railways about to be undertaken in the metropolitan area of Sydney include: (a) The immediate electrification of the inner-zone suburban railways, comprising 64 route miles or 200 track miles, and in the near future the electrification of the outer-zone suburban railways radiating some 36 miles from Sydney, an additional length of 200 track miles. (b) The construction of a 16-mile, double-track loop railway around the city of Sydney. (c) The construction of double-track railways to the eastern, western, and northern suburbs, connecting with the existing railways and with the city railway—a length of 37 miles of single track.

The ruling grades will be about 3.5 per cent with the load and 2.5 per cent against the load, while the sharpest curve it 11.5 degrees radius. All platforms will be 520 feet long, and will be placed in shallow subways; access will be generally by steps. Power will be supplied from overhead wires to the train motors at 1,500 volts.

The railways to the northern and western suburbs necessitate long-span cantilever bridges across the harbor, without piers in the fairway; the bridge to North Sydney to be 1,600 feet center span, accommodating four lines of railway, a main roadway 35 feet wide, a motor roadway 18 feet wide, and a footway 15 feet wide. The bridge to Balmain to be 1,350 feet center span, accommodating two lines of railway and the same roadways and footways. The clear headway for shipping under the bridges to be 170 feet at high water.

The total cost of the scheme is approximately £20,000,000 ($97,330,000 at normal rates of exchange). An act authorizing the expenditure of £6,400,000 ($31,145,600) is before Parliament.

The construction of the city railway and portions of the eastern and western suburban railways are to be put in hand and carried out by the firm of Norton Griffiths on a percentage basis, the Public Works Department supplying plant and material.

Institution of Electrical Engineers.

No students' meetings of this institution will be held in England during the season which has just opened. Men of "eligible" age from these sections are either away on military or naval service, or are engaged in connection with war munitions engineering operations. For the same reasons the general engineering societies are making no arrangements for students, and all the great universities and schools have their ranks greatly depleted. The presidential address to the Institution of Electrical Engineers in London was to be delivered by C. P. Sparks, the new president, on Thursday, November 11. The meetings at some of the sections in the provinces will be fewer in number than usual as these are held in districts where war manufacturing is at its height. The following are the matters that are coming before one or another of the meetings in London or the provinces during the next few months:

"Difficulties of Design of High-Speed Generators," by Prof. A. B. Field.

"Design of High-Pressure Distributing Systems," by J. R. Beard.

"Predetermination of the Performance of Dynamo-Electric Machines," by Prof. Miles Walker.

"Possibilities in the Design of Direct-Current Traction Motors, etc.," by N. W. Storer.

"Electric Heating: Its Present Position and Future Development," by G. Wilkinson.

"Distribution and Rise of Temperature in Field Coils," by Prof. Magnus Maclean and D. J. M'Kellar.

"Notes on the Ignition of Explosive Gas Mixtures by Electric Sparks," by J. D. Morgan.

Louisville Jovians Complete Plans for Electrical Prosperity Week.

The night of November 29 has been selected by the Louisville Jovian Committee for the parade which will inaugurate Electrical Prosperity Week in Louisville. The remainder of the week's activities will be centered at the festival to be held in the Armory at Sixth and Walnut Streets. Plans for the celebration in Louisville are going ahead and the members of the committee are looking forward to a celebration which will do much for business.

Big Gun Shuts Off Current in Hoosac Tunnel.

During the passage of a 16-inch gun through the recently electrified Hoosac tunnel, on its way from the arsenal at Watertown, Mass., to the Sandy Hook, N. J., proving ground, the electrical energy was entirely shut off in the tunnel as a precaution against short-circuiting with the overhead wires. The two special cars carrying the gun were hauled by steam.

The cannon is the largest army weapon yet produced in this country, its weight being 113 tons.

Dinner Meeting of Chicago Electrical Engineers.

An innovation in the series of joint meetings of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, will be the dinner meeting to be held at the Hotel Sherman, Chicago, on the evening of November 22. Leonard A. Busby, president of the Chicago Surface Lines, will be the principal speaker, his subject being "Street Railways."

New Officers of Philadelphia Vehicle Section.

At a meeting of the Philadelphia Section of the Electric Vehicle Association of America held on October 26 the following officers were elected:

Chairman, R. Louis Lloyd.

Vice-chairman, Emlen S. Hare.

Secretary, H. H. Doering.

Executive Committee: Walter H. Johnson, F. B. Whitney, A. W. Young, R. L. Heberling, W. A. Manwaring.

Dayton Jovians Will Celebrate.

Jovians of Dayton, O., are planning to hold one of the most spectacular rejuvenations ever seen in that city on December 2, at the Hotel Miami. The rejuvenation proper will be held in the roof garden, and a number of candidates will be initiated. The banquet following is to be the most elaborate ever held by the organization, in honor of a number of distinguished guests.

Digitized by Google

Causes of Electrical Accidents in English Collieries.

One of the British government's inspectors of mines has reported on the circumstances attending four fatal electrical accidents which occurred in the York and North Midland Division. In one case a tipper, while working at the screens, was killed by an electirc shock sustained by touching a bare place in a lighting cable which was by mischance at 500 volts above earth potential. While standing under the lintel of an opening through which the tubs were delivered and through which there passed three ordinary lighting wires, No. 14 gauge, rubber-insulated, tape-wound and braided, he cried out and was found to have hold of one of the wires which was bare for about 0.75 inch. The lamps on the circuit were 110-volt, but the circuit was supplied by current from a 500-volt three-phase system, one wire of the circuit being connected to one of the phases of that system and the other to a tapping taken from the transformer supplying the 500-volt current (which originated from a 11,000-500-volt transformer). The pressure between the line to which the lamps were connected and the tapping point in the transformer winding was 110 volts. In this way, the normal 110-volt circuit was in reality a 500-volt circuit, as an earth on either of two phases would cause the lamp circuit to assume a pressure of 500 volts above earth. Subsequently it was found that one of the phases of the system, other than that supplying the lamps, was faulty, there being an earth in a small meter-transformer in the substation. The man in all probability received a 500-volt shock. Mr. Nelson, the government electrical inspector, recommended that it be made the duty of some particular individual to see to this lamp circuit and maintain it; that only low pressure should be used for lighting; and that some means be provided for indicating any defect in the insulation of the 500-volt surface system, and of every system.

In the second case an oiler was electrocuted at the by-product coke-oven stamp. The motor and gearing driving the stamp were mounted on a traveling platform moving on rails about ten feet from the floor level. The main switch was mounted on the wall of the building and below the traveling platform, and at a height convenient for the operator there was a controller. Three-phase current at 500 volts was supplied through the switch to overhead bare wires, and from these wires rubbing contacts supplied the motor. It was the man's duty to oil the machinery on the platform, but before doing so to switch off the current. He had apparently operated the switch handle for this purpose, as it was subsequently found in the off position, but afterwards by placing his right hand on the bare wire he got electrocuted. When the switch cover was removed it was found that the release mechanism of one knife was broken, thus leaving one phase alive. As shown in the accompanying sketch, the release was controlled by a fine coil spring between the rocking lever and one end of the knife. The other end of the knife at the point *A*, where struck by the rocking arm, was worn away and there was a slight groove worn in the saddle at *B*, so that when the switch handle was moved to the off position it would fail, without the spring, to open the switch. The wearing of these points would put excessive strain on the spring. There was considerable evidence of fusing in the box and all three springs were gone. The British Regulations require that "every switch intended to be used for breaking a circuit, and every circuit-breaker, shall be so constructed that it cannot, with proper care, be left in partial contact. This applies to each pole of the double-pole or multi-pole switches or circuit-breakers." It was said that the switch in this case had worked satisfactorily for four years and was testified by an electrician to be in working order seven hours before the accident; also that the ram driver had hold of the bare wires two hours before the accident. But Mr. Nelson, after examining the switch, held that it had not been properly maintained, and that its failure so soon after inspection indicated neither efficient inspection nor satisfactory maintenance. The switch required renewal and those responsible had failed to attend to it.

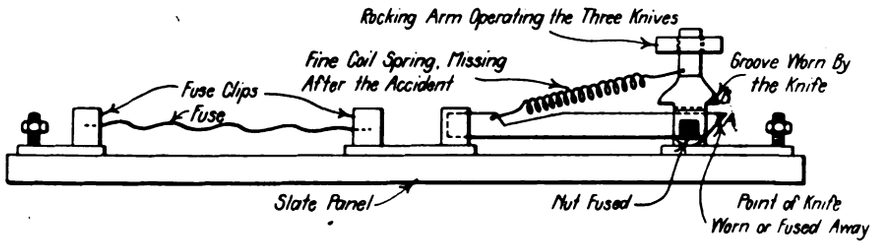

Rocking Arm Operating the Three Knives
Fine Coil Spring, Missing After the Accident
Groove Worn By the Knife
Fuse Clips
Fuse
Slate Panel
Nut Fused
Point of Knife Worn or Fused Away

Diagram Showing Cause of Switch Trouble.

In the third case a coal-cutter machine man working a 25-horsepower bar cutter (440-volt, squirrel-cage, three-phase motor) received a fatal electric shock at the coal face while fitting a rail to a steel tie just in front of the machine. He was found dead with the loose rail in his left hand and a hammer in his right. When the trailing cable was opened out it was found to have two faulty places on the conductors and two breaks in the earth wire. An assistant electrician said he had examined the trailing cable about ten hours before by passing his hand along the leather covering, but the inspector says that by such an examination he could not judge more than that the covering was right. Owing to the way in which the cable was constructed it was impossible to say definitely where the cable was faulty until the leather cover had been stripped off. Only a test would indicate the break in the earth wire. The cable had been in use five years and was naturally in a well worn condition. The break was no doubt due to constant coiling and uncoiling under working conditions. A month is regarded as too long to trust to the continuity of any earth conductor; indeed Mr. Nelson holds that earth conductors of trailing cables should be tested for continuity each day.

The last of this series of accidents was the death of an assistant electrician while he was engaged in splicing an electric cable carrying 550 volts pressure in a gateway in a colliery seam. The man had himself, before proceeding to work, chalked on the junction switch-box cover the warning: "Don't touch this switch!" The current was subsequently switched on by some person unknown. This accident was, of course, quite avoidable and was apparently due to somebody's carelessness in failing to read the notice. It has since been arranged for the switch lever to be locked while repairs are going on between the switch and the coal face. In such cases the key should be in the possession of the individual working on the dead conductors. The inspector (Mr. Mottram) adds: "This appears to be the practice in working on high and medium-pressure mains on the surface, and it is obviously as necessary underground. Clearly no person's life should depend upon a chalked message being observed and acted upon."

Mr. Mottram shows in the course of much statistical and other matter, that the number of portable electric safety lamps in use in the collieries in his district has grown to 38,035 as compared to 25,004 and 4,608 in the two preceding years.

Edison and Tesla Named for Nobel Award.

Thomas A. Edison and Nikola Tesla have been mentioned, Copenhagen dispatches state, as likely recipients of the Nobel award for physics.

Digitized by Google

Novel Features to Characterize Electrical Prosperity Week in Many Cities.

It is now apparent from many indications that the Electrical Prosperity Week celebration which is to begin on November 29 will be no ordinary affair.

Collier's, the well known national weekly magazine will issue a special advance edition to its regular November 27 Electrical Prosperity Week number devoted principally to giving publicity to the celebration and what it hopes to accomplish. This edition by November 15 will go to 25,000 central stations, dealers, contractors and jobbers in addition to the thousands of other readers. It is a significant fact that this is the first time that any of the more widely circulated popular magazines ever gave so much prominence to a trade movement. The edition will contain an editorial; a letter from Thomas A. Edison endorsing the movement; news of what the cities are doing everywhere to participate in the celebration; and many special advertisements from manufacturers.

Many newspapers will also bring out special editions for the Week, among these being the following: *Los Angeles Times, Omaha Daily News, Wisconsin State Journal, Milwaukee Sentinel, Houston Chronicle, Pittsfield (Mass.) Journal, Brooklyn Eagle, Richmond Times-Dispatch, Morning Republican,* Findlay, O.

Electrical shows thus far definitely announced will be held in the following cities: Atlanta, Ga., Cincinnati, O., Dayton, O., Duluth, Minn., Chattanooga, Tenn., Denver, Colo., Springfield, O., Tampa, Fla., Sioux City, Ia., Trinidad, Colo., Fort Wayne, Ind., Tulsa, Okla., Erie, Pa., Louisville, Ky., Milwaukee, Wis., Memphis, Tenn., Richmond, Va., Norfolk, Va., New Castle, Pa., Peoria, Ill., Pittsfield, Mass., Sandusky, O.

A novel feature arranged for the celebration at Trinidad Colo., will be a 20,000-candlepower searchlight mounted where it can play on the business district during the celebration. Other searchlights will be mounted on the nearby mountain tops. An automobile parade has been planned which promises to be the principal event of the Week.

In Birmingham, Ala., it is planned to have the churches, schools, stores and factories burst forth in a blaze of lights each night of the Week. There will also be special demonstrations and an electrical parade.

An especially interesting feature of the celebration at Cincinnati, O., will be an electric fountain, 28 feet high on the Fountain esplanade. The falling water will be represented by sparkling electric lights.

In Findlay, Ohio, Main Street is to be a blaze of light. Great festoons of red and green bulbs are to swing across the street every hundred feet from the C. H. & D. Railroad on the north to Hardin Street on the south. Electrically lighted pageants, the like of which have never been seen in Findlay are to feature the evenings. A Mardi Gras carnival is planned for one night. A great electric sign proclaiming Findlay's prosperity is to be erected above the Main Street bridge. It will extend entirely across it.

The electrical exposition to be held at Denver, Colo., is arousing widespread interest on account of the prominence which it will give to electrical mining machinery and the use of hydroelectric power.

A miniature mine will show the electric hoists, rotary diamond drills, coal cutters and all the machinery used in an up-to-date coal mine. Already students from the School of Mines and other universities of the state are planning to attend the exposition in bodies, to study the various phases of electrical development, and the professors are showing a vast amount of real interest, encouraging the students in every way to save the Week for the exclusive study of electricity in its myriad forms demonstrated at the exposition.

There will be working demonstrations also of water power in its millions of forms, showing the force which for years went to waste in Colorado, now being used as the mightiest power and the most economical means of moving the vast machinery of the state.

According to the plans as thus far developed, it seems certain that features will be offered in many cities which have not before been seen. The public cannot fail to see electricity in a new light and to be brought more closely to its many possibilities.

Milwaukee to Have Electrical Show During Electrical Prosperity Week.

One of the main features of Electrical Prosperity Week in Milwaukee, Wis., will be an electrical show. For this purpose the Milwaukee Electric Show Association has been incorporated by men representative of the various electrical industries of Milwaukee. The incorporators are: H. P. Andrae, of Julius Andrae & Sons Company; Philip Polachek, of Charles Polachek & Brother; Charles L. Benjamin, of Klau, Van Pietersom, Dunlap, Incorporated; E. L. Burdick, of the Electrical Contractors' Association; H. L. Meyer, of Vaughn, Meyer & Sweet; R. M. Van Vleet, of the Cutler-Hammer Manufacturing Company; S. B. Way, of The Milwaukee Electric Railway & Light Company; H. O. Seymour, of the Wisconsin Telephone Company. The officers of the association are R. M. Van Vleet, president; Philip Grossman, vice-president; P. C. Burrill, treasurer; S. J. Gates, secretary.

The electric show will be staged on the first and second floors of the University Building. The first floor will be devoted to the heavier apparatus, such as motors, power-plant equipment, etc.; the second floor will be devoted to fixtures, household appliances, etc. The show will be open on Saturday, November 27 from 7 until 11 p. m., this to be somewhat of an exclusive night, only those having invitations being permitted to enter. The show will be formally opened to the public on Monday, November 29 and will be open each day of that week, Electrical Prosperity Week, from 10 a. m. to 11 p. m. Tuesday will be Housewives' Day; the following successive days will be Illumination Day, Wisconsin Day, Industrial Power Day, and Children's Day.

No admission will be charged, but the exhibitors will be provided with tickets for distribution. Numerous prizes will be given throughout the show. The entire show, both interior and exterior, will be brilliantly and attractively illuminated. The entire block between Wisconsin and Mason Streets will be specially lighted; arches and flood lights will brighten up the front of the exhibition building.

Special advertising is being undertaken in the newspapers and by means of a large number of bill-boards in Milwaukee and vicinity. Electrical firms will advertise the show liberally by means of various mailing schemes. A series of electric booster trips is to be made on interurban cars to adjoining towns during the ten days preceding the show. One of the cars on the booster train will be a large flat car provided with canopies to house various electrical exhibits suitable for a traveling show.

Most of the space in the Milwaukee Electrical Show has already been contracted for, although the undertaking is barely a week old. Philip Grossman, of the Electrical Engineering & Equipment Company, is chairman of the committee on arrangements.

Steel Electrically Produced Direct from Ore.

United States Consul Felix S. S. Johnson, of Kingston, Ont., Canada, has reported on the electric smelter at Belleville, near Kingston, which produces steel of all grades, including tool steel, direct from the ore. An unusual feature of the process is the use of a preheater that utilizes the heat from the waste gases produced during the smelting of the ore. The preheater consists of two wrought-iron pipes 8 feet long, increasing regularly in diameter from 14 to 18 inches, to allow the charge to slide easily down the heated portion. These pipes are

Digitized by Google

inclosed in the preheater stack, which has firebrick linings and baffle plates with openings arranged in such a manner that the heated gases circulate about the preheater pipes.

The furnace is charged from the upper floor into the preheater, the charge consisting of iron ore, limestone, and charcoal, crushed to pass through a one-inch mesh. The furnace is operated on two-phase current, the transformers being connected by the Scott connection. The electrodes are three inches in diameter, threaded so that they can pass down continuously, and are used up entirely, there being practically no loss from short ends.

The plant was in operation for about two months, and demonstrated that steel can be made in this manner directly from ore containing 7.5 per cent of titanium. A quantity of high-carbon steel was made, the ingots being perfectly sound and free from blowholes. The company intends to erect shortly a three-ton furnace, with a view to making high-carbon tool steel and steel castings.

Massachusetts Municipal Electric Plants.

Annual returns of the municipal electric lighting plants in Massachusetts, rendered to the Gas and Electric Light Commissioners for the year ending June 30, 1915, indicate a substantial growth in kilowatt-hour output and in the number of commercial customers. There are 36 municipal plants in the state; 18 generate their own electricity and 18 purchase energy from companies in other cities or towns.

The largest municipal plant, that of Holyoke, had an output of almost 14 million kilowatt-hours, of which about 10 million were sold to commercial and residential customers.

The returns filed with the Commission are practically identical in form to those required of private corporations. The law in Massachusetts now prescribes that the excess of the estimated annual expense (which includes gross expense of operation, maintenance and repair, depreciation, interest on debt created to pay for the plant, sinking fund or debt requirements, and loss in operation the preceding year, if any) over and above the estimated income from sales to private customers shall be included in the municipality's appropriation for maintenance and in the tax levy. For this excess, which it must raise by taxation, the city receives its street lighting, the custom being to charge regular rates for energy furnished public buildings.

In some instances, specific appropriations are made for street lighting, in which case direct appropriation for plant maintenance is relieved by so much. The Gas and Electric Light Commission, in its most recently published report, for 1914, gives the estimated cost of street lighting to the several cities and towns having municipal plants. The figures are based on the theory that for its expenditure the municipality is getting only its street lighting and the income from the commercial business, and that the cost of street lighting is the difference between the income and the cost of carrying on the business. The following is the range of prices for the various sized incandescent units, time of operation ranging from 5.1 to 10.9 hours a night, 27.2 to 30.4 days per month:

SIZE AND TYPE OF LAMP	COST PER LAMP PER YEAR
40-watt incandescent	$1.19 to $11.43
50-watt "	3.47 to 24.56
60-watt "	3.27 to 16.75
75-watt "	2.24 to 18.45
100-watt "	2.98 to 21.26
250-watt "	14.73 to 66.96
350-watt "	20.67 to 55.72
1,200-cp. arcs	15.75 to 56.83

A number of municipal plants, which simply own their pole lines and do a distributing business, purchased energy from hydroelectric sources, at about 2.5 cents a kilowatt-hour.

Connecticut Company's Transmission Voltage Changed Without Interruption to Service.

The Connecticut River Power Company, of New Hampshire, which operates a 30-mile transmission line connecting the Vernon generating station with the plant of the Fall Mountain Electric Company at Bellows Falls, Vt., recently changed over its transmitted potential from 19,800 to 44,000 volts pressure without interference to the power requirements of any of the customers supplied. The line was constructed to carry 66,000 volts, and is of wishbone construction. Formerly the transformers at the Bellows Falls generating station were fed from the local plant at 2,300 volts, from the Vernon station at 19,800 volts, and energy was usually transmitted thence north to the Colonial Power & Light Company's system at Springfield, Vt., at 44,000 volts. Now the Connecticut River Power Company's system is at the higher potential throughout the 46 miles.

Three new 1,500-kilowatt transformers were installed at the Vernon station specially for the new voltage, and three pole-type disconnecting switches were installed at the Bellows Falls station. In making the change-over, the 19,800 volt taps were removed and the connection made to the 44,000-volt taps. This occupied only a part of one Sunday and involved a shut-down of the line for but a few hours.

It is expected that construction of a new generating station of large capacity at Bellows Falls will be begun shortly.

Resistance of Radiotelegraphic Antennas.

The resistance of a radiotelegraphic antenna may be divided into three parts: first, the true resistance of the wires; second, the so-called radiation resistance; and third, the so-called earth resistances. The first is generally negligible where a sufficient number of wires in parallel is used. The second is derived from the expression for the radiated energy of an antenna, which is

$$E = 160\pi^2 h^2/\lambda^2 I^2,$$

where h represents the height to the center of capacity of the antenna, λ the wave-height, and I the current measured at the base of the antenna. The expression $160\pi^2 h^2/\lambda^2$ is called the radiation resistance, as it takes the same position in the energy equation as that occupied by R in the case of ohmic losses. The expression shows that the radiation resistance falls rapidly as the wave-length is increased.

Up to the present no satisfactory theory of ground resistance has been developed. The experimental curves of antenna resistance, on account of the decreasing radiation resistance, fall rapidly at first, as the wave-length is increased, and then, as the wave-length is further increased, remain nearly constant if the ground conditions are good, as in the case of a ship's antenna, or again rise nearly in a straight line if the ground conditions are poor. This rise may be very rapid in the case of peculiarly poor grounds. For instance, the resistance of the Bureau of Standards antenna rises from 13 ohms at 800 meters wave-length to 28 ohms at 2,000 meters. Great difficulty has been found in explaining this increase of resistance with increasing wave-length, but the following explanation is given by L. W. Austin in the *Journal of the Washington Academy of Sciences.*

The antenna system must be looked upon as a condenser, the antenna itself being the upper plate and the ground water the lower plate. Between the ground water and the surface there is usually a layer of semi-conducting material which would correspond to a poor dielectric in the case of an ordinary condenser. It is well known that the dielectric losses in imperfect condensers generally increase in proportion to the wave-length of the current employed in the measurement. It is found that by covering the surface of the ground under and around the antenna with a wire net, thus making the net the lower plate of the condenser, the ground losses nearly disappear.

Australian Navy Department to Supervise Wireless.

The Australian Government has decided to transfer the wireless telegraph work from the Post Office Department to the Navy Department.

Digitized by Google

New Electrical and Mechanical Appliances

Nonbreakable Fuse Plug.

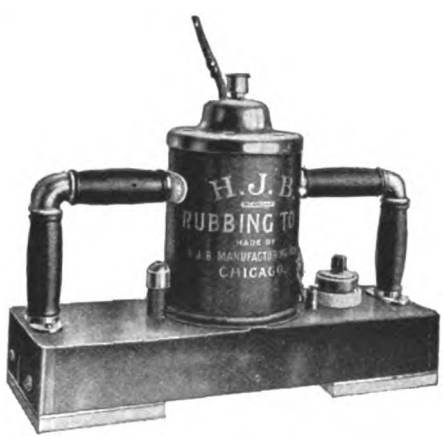
Where the ordinary porcelain-body Edison fuse plug is exposed to rough handling in shipment or while being taken from the stock room to the point of use, considerable breakage is found to occur. To overcome this difficulty, the Connecticut Electric Manufacturing Company, Bridgeport, Conn., has recently placed on the market a plug that is practically nonbreakable. It is made of white horn fiber, which makes a body of great strength and durability. The cylindrical body has a thinner wall than the porcelain plug which gives a much larger internal air space and therefore safer and more reliable plug. The light weight and more rugged and compact construction of the plugs permits as many as 500 of them to be packed readily into a paper carton weighing only 18 pounds and 13.5 by 11.5 by 7 inches in dimensions. This means that these plugs can be shipped in standard package lots by parcel post or express to any part of the United States quickly and at comparatively low expense. These plugs are nonfillable; they have been approved by the Underwriters' Laboratories.

Fiber-Body Fuse Plug.

Electrically Operated Rubbing and Polishing Machine.

One of the important elements in the cost of any piece of furniture is the finish and polish given to it. The finer the finish, the more rubbing is required. In the older methods where this was done by hand this involved very tedious and costly work. A number of pneumatically operated rubbing and polishing machines have been developed, but these are very noisy in operation and entail considerable investment, because of the necessary air-compressor equipment.

An electrically driven machine for this purpose has recently been developed, which is believed to be a marked advance in equipment for this purpose. As shown in the illustration, it is a completely inclosed, compact and portable outfit, connected by flexible cord to any lighting outlet. It contains a one-fourth-horsepower motor, controlled by a simple snap switch. This motor is connected by suitable mechanical means so as to oscillate the two pads on the bottom of the machine. These felt pads are each 5.5 by 4.5 inches in area and are given an oscillating motion 400 times per minute toward and away from each other. These pads can be readily removed in a few seconds by the pressure of a finger. To them can be affixed emery cloth, sand paper or other grinding, smoothing or rubbing surfaces.



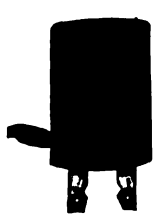
Electric Rubbing Tool.

This machine works very efficiently and ecomonically. It does about five or more times as much work as a man can do by hand, and at a cost of only a few cents per hour. Its work is uniform at all times, unlike that of the manual finisher, whose work becomes less and less efficient, due to fatigue, as the day advances. The machine is provided with black fiber handles, which make it convenient to move it about over the surface being treated. The machine weighs 25 pounds, which weight has been found most effective for this service. The motor is entirely closed and protected from dust or moisture. The motor itself and the mechanism it operates are very ruggedly built, and are free from parts liable to get loose. The machine is very substantial in every respect, and is covered by a two years' guarantee. The outfit is self-oiling and needs practically no attention, except the turning on and off of the current. In operation the pads move to the extreme ends of the outfit, which permits polishing into corners.

Although designed particularly for use in the finishing rooms of furniture and piano factories this "H. J. B." rubbing tool is also useful for polishing marble or wood floors, glass, tile and other surfaces. It is being sold through Bagge's Trading Agency, 1363 Monadnock Block, Chicago, Ill.

Composition Current Tap and Lamp Receptacle.

Ever since the development of heat-proof composition materials that possess the insulating qualities of porcelain, without its liability to breakage, there has been a steady increase in the use of composition sockets, receptacles, etc., in places where porcelain was formerly used exclusively.



Composition Current Tap.

To the array of such products there has now been added a new combination current tap and lamp receptacle which is made of very tough composition material capable of withstanding hard usage without damage.

This device was designed primarily for use in industrial plants, but is equally serviceable in mercantile establishments, residences and other places where a durable and highly insulated current tap is needed. The device is provided with standard contacts and is interchangeable with the exceptionally complete line of Hubbell T-slot wall and flush receptacles. It is manufactured by Harvey Hubbell, Incorporated, Bridgeport, Conn.

There are over 125 different farm operations in which electricity can be used.

Digitized by Google

New Types of Globe Electric Ranges and Stoves.

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of August 21, 1915, there was given an illustrated description of a line of very handsomely finished and sturidly built electric ranges made by the Globe Stove & Range Company, Kokomo, Ind. The three ranges then shown were of the highest type of construction and finish, and necessarily involved high first cost. To meet the demand for moderate and low-cost equipment in this line the company has placed on the market a number of new models, two of which are illustrated herewith.

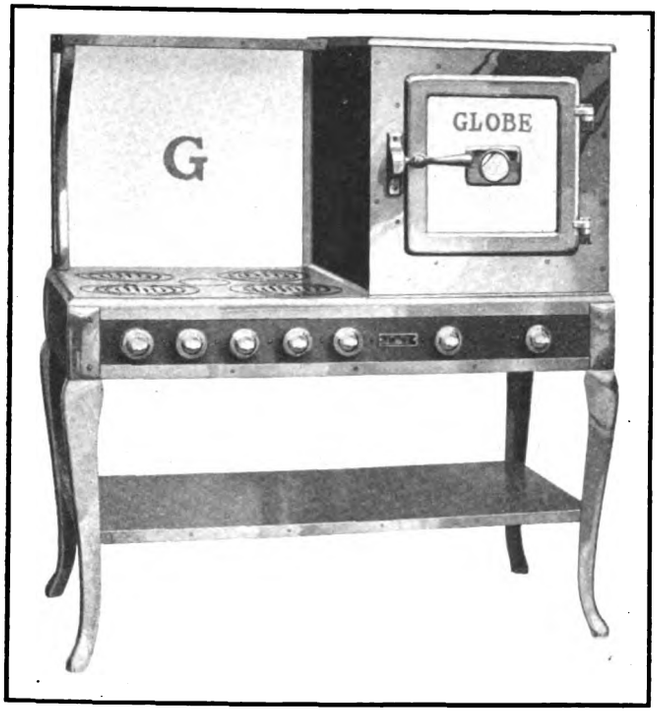


Fig. 1.—New Model Globe Electric Range.

Into the design of all these models, both of the high-priced and lower-priced types, the company has put nearly 40 years of experience in stove and range building, culminating in five years of careful investigation and experimentation of electric equipment particularly suited to the needs of the modern housewife. The result has been an assortment of electric stoves and ranges markedly different from the product of other makers.

Of the newer models, the one shown in Fig. 1 is similar in general design to one of those illustrated in the former article. A less expensive finish is employed; there is less white enamel and nickel, but even at that the range is very attractive in appearance. The main cooking surface is a hammered planished sheet. In this are five heating elements or "burners." Two of these are three-heat units and two single-heat units; a small simmering unit is placed in the middle. This range is not provided with a main switch nor pilot light, nor are castors supplied; it has been found that these features are not, as a rule, absolutely required. This range includes those features that have been found to be most popular by the average up-to-date housewife.

In Fig. 2 is show a new type of electric hot plate, with a three-heat element. This is mounted in a convenient raised stand made of Armco rust-resisting iron with nickel trimmings. This makes a very neat, durable and serviceable outfit. Like all the Globe heating elements this unit is of special construction, to combine the advantages of both the open and inclosed types, and is said to have the disadvantages of neither. It is possible to heat any ordinary cooking utensil directly on the hot plate. The coils are placed in grooves in an insulating base; a thin cast-iron top plate correspondingly grooved protects them.

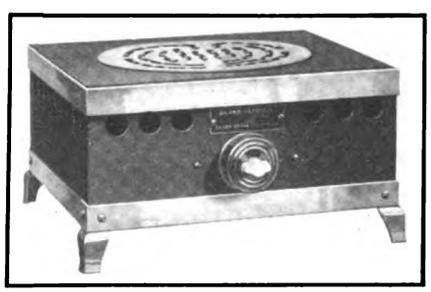
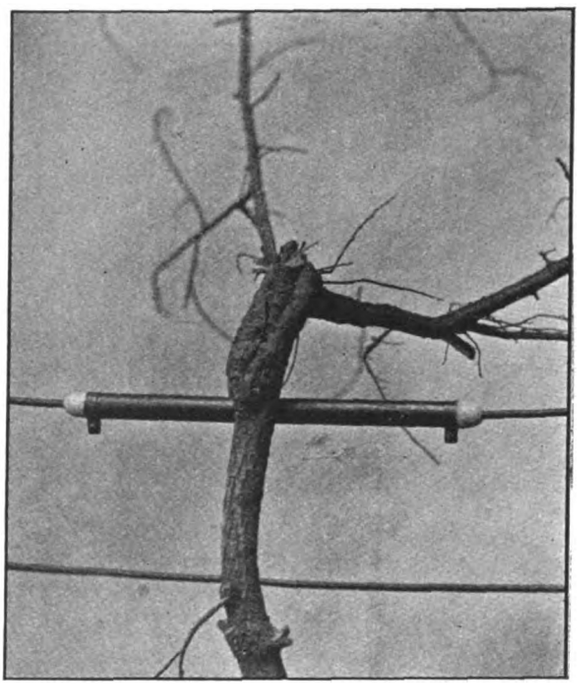


Fig. 2.—Single-Unit Globe Hot Plate.

The outfit shown in Fig. 2 is one unit in a new line of electric stove parts arranged to be assembled on the sectional-unit plan. This line includes a combination baking, roasting and broiling oven, a two-unit hot plate and various types of low and high supporting stands. It is possible to start with one of these hot plates or ovens and add to the equipment from time to time, until there is produced a complete electric range for all cooking.

In line with its progressive policy of increasing its array of electric cooking appliances, so as to have an assortment that will meet every requirement, and, in fact, anticipate future requirements, the Globe Stove & Range Company is developing five new models of electric stoves at its factory in Kokomo. Three of these will be announced to the trade in the near future. When the line of Globe electrics is thus extended, it will comprise electric stoves ranging in price from $25 to $500, which will make it, according to the claim of the company, the most complete line of the kind on the market.



Rogers Tree Insulator in Service.

Rogers Tree Insulator.

Where overhead telephone and electric light lines pass through residence districts in which shade trees abound, much care is necessary to avoid damage to the trees, else the ill will of the property owners be incurred. If the line rubs directly against the tree, the insulation is quickly worn off and a ground established through the moist branches of the tree. This not only damages the tree, but constitutes a hazard to children or other persons who may come in contact with the tree. besides being the cause of wasteful leakage currents.

These difficulties are overcome by

Digitized by Google

the use of an effective tree insulator, such as the one shown on page 907. The Rogers tree insulator is a simple device that can be quickly applied to the line where needed. It consists of a strong, split metal sleeve into the ends of which when assembled there are put split porcelain bushings. A clamp at each end holds the parts firmly together. The bushings serve both to insulate and center the wire in the sleeve. The latter is well galvanized to protect it from the elements. It takes all of the rubbing of the tree branches or trunk and thoroughly protects the line from contact with the tree.

Rogers tree insulators are made for five sizes of wire from No. 8 to No. 0 and they are furnished in various lengths from one to six feet. They are manufactured by the Frank Ridlon Company, 158 Summer Street, Boston, Mass.

Naval Men Witness Test of New Method of Refrigeration.

A number of prominent naval and shipbuilding officials were present at East Pittsburgh, Pa., on October 29 to witness a test on a new refrigerating machine manufactured by the Westinghouse Machine Company. The machine was invented by Maurice Le Blanc, the originator of the well known Le Blanc condenser, which is being manufactured and marketed in the United States and Canada by the Westinghouse Machine Company.

The question of refrigeration on shipboard, particularly on battleships, has always been one of importance, and it is predicted that this machine will greatly aid in solving the problem. A particular feature of the machine is the absence of all chemicals or compressed gases, such as carbon dioxide, ammonia or sulphur dioxide, which are generally used in connection with refrigeration. The presence of tanks of such gases under pressure is always an element of danger, particularly on battleships when likely to be struck by an enemy's projectile.

Among the other advantages claimed for the machine are small space and light weight, simplicity of operation, high efficiency, and the fact that the cooling of the water or liquid is accomplished in the machine itself without the use of a cooler. The test was entirely satisfactory, and those present expressed much interest in the results obtained.

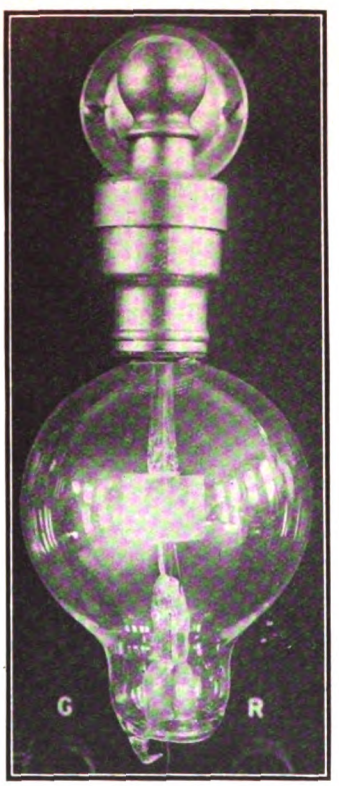
First Public Use of the de Forest Lamp as an Oscillating Audion.

For the following interesting and self-explanatory account we are indebted to Dr. Lee de Forest.

"In the recently announced long-distance radiotelephone demonstrations from Arlington to San Francisco, Honolulu and Paris, full use was made, for the first time in a public test, of the oscillating audion or incandescent-filament evacuated-vessel oscillator.

"At the Arlington transmitter a bank of 300 large bulbs seven inches in diameter, very similar in structure to and embodying the elements and circuits of the de Forest "oscillion," illustrated and described in *The Electrician* of June 12, 1914, was used. These were energized from a common direct-current dynamo of 250 volts, their output circuits acting in unison on the common radiating antenna.

"Other auxiliary audion paths which were in their turn voice-controlled from a 'master microphone' are at



From Photo by Paul Thompson.

DeForest Audion Lamp Used in Wireless Telephony from Washington to Hawaii.

times used to control this high-frequency energy as generated.

"This method is new in the larger amount of power here for the first time generated (approximately 75 kilowatts), but the cost of maintenance of the comparatively large number of really expensive bulbs and the difficulty of maintaining the requisite high vacuum make it, as yet, less practical than is the arc-in-hydrogen transmitter. The main point in its favor (the oscillion's) is the ease with which large power outputs can be controlled by a small master microphone.

"At the receiving station of the Navy Department the de Forest audion detector and amplifier were used, connected so as to first amplify the high-frequency currents to approximately 100 times their original intensity, and then to transform these into low-frequency telephone currents capable of actuating the telephone receivers.

"Thus the incandescent lamp, as audion detector, amplifier, and high-frequency generator, has very suddenly come into its own. It is gratifying to the one who for ten years has been working almost exclusively on this principle of the incandescent lamp as an accessory in radio transmission, and who until the last two years was practically alone in that field, to see this sudden and amazing justification of the faith he has always had in the possibilities of the principle which he first discovered."

Further Developments of the Audion Lamp—Music From Light.

In view of the great interest in the oscillating audion since its use in the remarkable radiotelephone demonstrations announced recently, it may be worth while to call attention to its development and to another use of it. Supplementing the article published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of February 20, 1915, Dr. Lee de Forest has written the following account of the use of the audion lamp for producing musical tones.

"While working on my experiments in developing the audion as a wireless telephone detector and incidentally as an amplifier to be used on long-distance telephone lines, I made the discovery years ago that when the circuits of the audion were connected in a certain way, a clear musical note was heard in the telephone receiver, which was connected in one of these circuits. The quality of the note was very beautiful, and I found after a little experimenting, I could change this quality or timbre into a great variety of sounds, imitating, for example, the flute, oboe, cornet, stringed instruments and other sounds, which while pleasing to the ear were quite unlike those emitted from any musical instrument with which we are familiar. The pitch of the notes is very easily regulated by changing the capacity or the inductance in the circuits, which can be very easily effected by a sliding contact or simply by turning the knob of the condenser. In fact, the pitch of the notes can be changed by merely putting the finger on certain parts of the circuit or even by holding the hand close to parts of the circuit. In this way very weird and beautiful effects can be easily obtained.

"At the earlier stage of these investigations I found that the pitch of the note could also be varied by a simple

Digitized by Google

arrangement, such as a graphite pencil mark on a piece of paper or slate, connected across between parts of the circuit, and that this afforded the most ready means of altering the pitch and quality of the notes.

"Acting on these discoveries and suggestions, I found it was a comparatively simple matter to arrange a crude scale similar in function to that of an organ, with switches in place of the ordinary keys, so that by pressing certain keys I could cut out, or in, more or less inductance or capacity or resistance, thus changing the notes emitted from the telephone receiver at will.

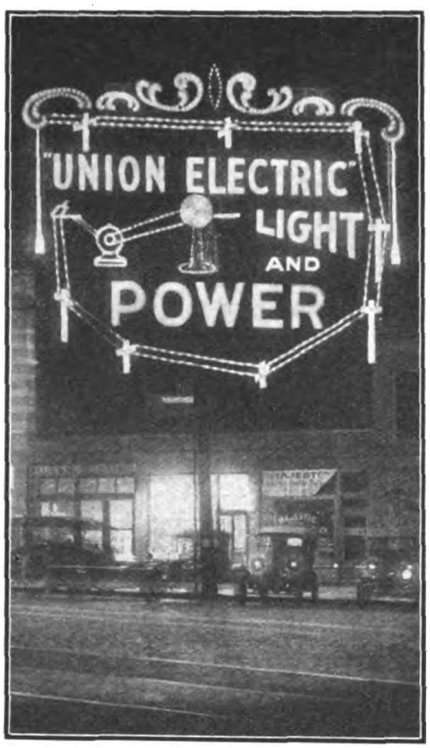
"In order to bring the volume of sound out large and full in the room, it was necessary to connect a number of loud-speaking horns connected with telephone receivers similar to those which one has sometimes heard in the central railroad stations as train announcers. With these horns distributed in different parts of my laboratory, or grouped together in one place, the sound can be made to emanate from all quarters of the room or from one corner, as I choose.

"In its simplest form, used as a detector for wireless signals, the audion is a small incandescent lamp about 1.5 inches in diameter, containing, besides the usual filament, a grid-shaped wire and behind that again a small rectangular plate of nickel, these elements being sealed inside the glass bulb, together with the filament. This bulb is perfectly insensitive until the filament is brightly lighted, whereupon it becomes, in connection with the aerial wire of any wireless receiving station, a detector of extraordinary sensitiveness.

"Now, this same little bulb which I have just described, in addition to being a receiver of wireless messages and an amplifier for long-distance wire telephones (in which use it is now employed on the transcontinental lines of the American Telephone & Telegraph Company) can be made to actually generate alternating current. It receives the energy which is expended in these currents from the battery or dynamo. The audion is, in other words, a transformer of energy. The alternating current, if of low frequency, can actuate the telephone diaphragm and make musical notes which the ear can hear, and this is the germ idea involved in the musical instrument which I have just described.

"At the present time I am using one bulb for an octave on the musical scale with the arrangement of keys and switches so that from this one bulb I can produce the notes of that octave by pressing the appropriate keys. For the next octave another bulb is used, and so on. The output of all these bulbs is made common to one set of telephone receivers or loud speakers so that the total energy in the form of sound is that of all the bulbs which are operating at any one time.

"In all my work with the audion—and I can imagine no device in the whole realm of practical physics of greater fascination than this little audion principle—I have never found any phase of its unlimited possibilities quite so interesting as this of producing musical notes. In the next twelve months I hope to be able to produce an instrument which will be far enough perfected so that I can turn it over to musicians to work out the thousand and one details of musical perfection which such men alone are capable of introducing."



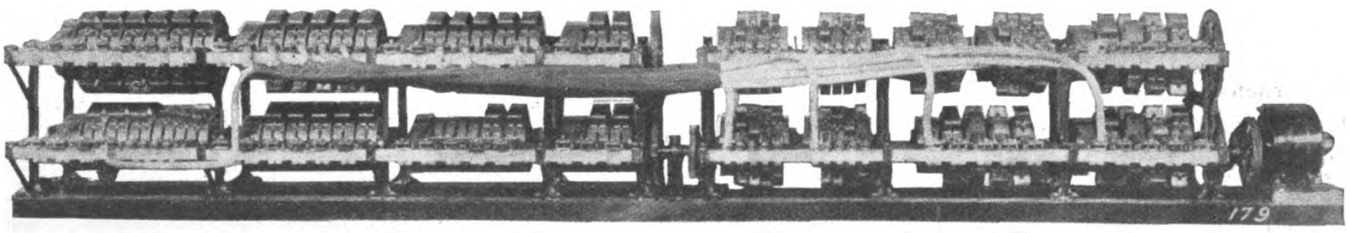
Spectacular Sign of St. Louis Central Station.

Spectacular Electrical Display Erected by St. Louis Central Station.

Probably the majority of central-station companies use some kind of electric signs for their own advertising with considerable success. In some of these signs ingenious spectacular features have been introduced, although like the shoemaker and the blacksmith of the proverb, the average electric light company contents itself with supplying energy for the clever moving displays of its customers in other fields, and does not realize the possibilities of flashed signs advertising its own wares.

A striking spectacular sign, advertising light and power service, has just been erected by the Union Electric Light & Power Company, of St. Louis, Mo., on the roof of a building at the turn of Broadway, near Morgan Street, where it commands a view of about 20 blocks of the former main thoroughfare. The spectacular features of the display depict, somewhat fantastically, of course, the electrical energy coursing over a transmission line and operating a motor-driven emery wheel against which a bar of iron is seen to be fed with an attendant display of bright sparks.

When the lights first come on, only the poles are seen outlined in red. Then as the flow of electricity is supposed to start, the line wires light up with a rapid progressive motion, in skyrocket fashion, encircling the sign, until the switch at the left is reached. This is then seen to throw in, and the motor, belt and emery wheel are shown in motion by means of flasher devices. Next the iron bar at the right is seen to move against the emery wheel, by an arrangement of lamps, and a series of sparks fly off from the point of contact, first white, then amber, and finally dying out to red at the extremities of their paths. Meanwhile, by means of a ripple effect, the "flow of energy" in the wires is seen, encircling the sign and entering the motor. The words "Union Electric Light and Power" next appear and remain a few seconds after the moving display has been extinguished. The other names appearing on the sign are those of merchants in the building below and that adjoining, whose good will it was necessary to obtain in order to erect the sign. The company, whose name appears at the



Large Reco Flasher Used in Producing the Spectacular Effects in St. Louis Sign.

Digitized by Google

top of the sign, was prevailed upon to remove its obstructing sign from the next building, in order to make this display visible, as this particular situation is probably the most conspicuous one in St. Louis for an electric sign.

This spectacular sign contains nearly 2,000 Mazda lamps of various colors. The sign itself measures 41 by 43 feet and the steelwork used in its construction weighs about 2,000 pounds. An idea of its size is gained from the accompanying illustration. All wiring is in conduit and the lamp sockets are inclosed in waterproof tin boxes forming the letters and signs.

The operation of the sign is controlled by a large Reco flasher having 53 switches. This flasher is driven by a one-eighth-horsepower Reco motor, and is inclosed in a weatherproof metal box, 11 by 2 by 3 feet, mounted on the roof. Four contacts are required for the sparks, 6 for the rotating devices, 12 for the ripple flow, 2 for the switch, 21 for the run of the pole line and 12 switches for the main circuits and signs. Color effects are obtained by the use of Reco color hoods on the lamps.

The difficulties of guying a large sign of this kind on the roof of an isolated narrow building were solved by erecting latticed bridge structures supported by struts, from which the sign is braced. The sign is a prominent spectacle from any point of the downtown business section of Broadway, and has occasioned the liveliest interest of passers-by.

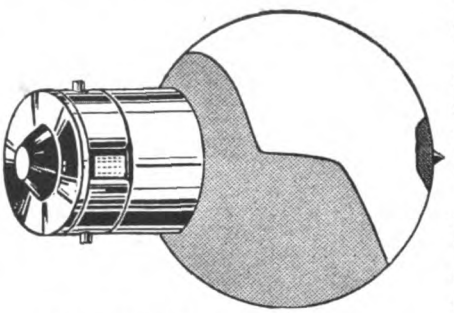
This sign was constructed and erected for the Union Electric Light & Power Company by the Brilliant Sign Company, of St. Louis, F. D. Beardslee for the former company and F. A. Kehl for the latter company and O. D. Ziegler, of the Reynolds Electric Company, having arranged the various details.

Glare-Free Electric Lamps for Automobiles.

Illustrated herewith is the Mac "Kno-Glare" swivel-bulb automobile lamp, which is creating considerable interest among motorists and dealers, and the manufacturers of incandescent lamps themselves, for it embodies not only a new principle of controlling electrical headlights and eliminating all dazzle and glare, but the base itself is said to be the only improvement made in Ediswan miniature lamp bases for many years.

As will be noted from the illustration, a portion of the lamp bulb is treated with a semi-translucent compound, this being placed upon the bulb in a peculiar form and in certain proportions. By means of this coating it is claimed by the manufacturer that the light rays emanating from the lamp filament are thoroughly diffused and the glare done away with.

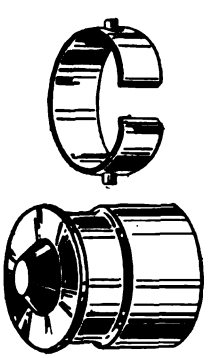
The base is, in size and dimensions, exactly the same as the standard Ediswan base, and will fit into any Ediswan socket of any make. The Mac lamp, however, has the pins which hold the lamp into the Ediswan socket mounted upon a separate ring, which fits into a recessed portion of the lamp



Mac "Kno-Glare" Automobile Lamp.

base. The lamp is installed identically the same as any other lamp, but when locked in the socket the lamp may then be rotated to bring the treated portion of the bulb to the bottom part of the reflector, this being done without necessitating changing of the positions of the socket, regardless of the year or make of car.

After the lamp has been properly placed in the socket and the current turned on, it will be noted that the clear portion of the lamp bulb, being at the top part of the reflector, permits the light rays from the filament to strike the upper portion of the reflector, from which they are reflected upon the roadway. The treated portion of the lamp bulb, however, being



Base and Ring of Mac Lamp.

at the bottom of the reflector, the light rays emanating from this part are subdued so that the light which would ordinarily be reflected upward, and which causes dazzle and glare, is softened, making it possible to look directly into a pair of headlights equipped with Mac "Kno-Glare" lamps without annoyance; the roadway, however, is said to be more brilliantly illuminated than would be the case if simply clear lamps were used.

These lamps are made in various candlepowers and voltages, in both single and double contact, for all makes of cars. The manufacturers claim to have the only device on the market which eliminates dazzle and glare, but does not decrease the driving light. The price of these lamps has been reduced on account of the heavy demand and increased production, until these goods are now sold to the consumer at only a slight advance over the ordinary cost of a clear lamp bulb. The manufacturers have been granted certificates from the state of New Jersey and various cities throughout the United States placing these lamps on the list of approved headlights.

When this product was originally marketed the lamps were supplied with the ordinary standard bases, but as some difficulty was experienced in installing the lamps, on account of the peculiar positions of the sockets in some cars, the new base was designed. In order that it may be thoroughly understood, it is illustrated separately, also the ring, thus making it easy to see the relation with the completed product.

The entire sales of this device are controlled by A. Hall Berry, 97 to 101 Warren Street, New York City.

New Novalux Units for Mazda Series Street Lighting.

At the present time more attention is being paid to street lighting and its problems than ever before. Municipalities are beginning to realize that good street lighting means a better, cleaner city, enhanced property values and civic progress. It is good business to have well lighted streets, good business for the merchants and property owners and good business for the city as a whole.

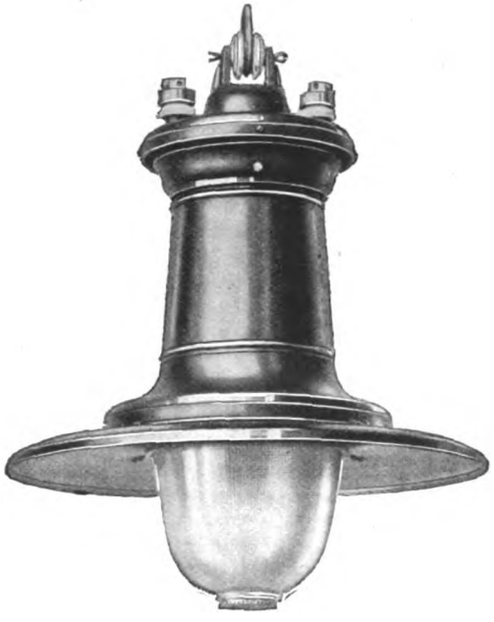
This growth of interest has been paralleled by activity on the part of the manufacturers, and wonderful advances have been made in both the development and application of street-lighting units. Among the most recent is the development of the new high-candlepower sizes of series gas-filled lamps. These lamps have efficiencies which were never before thought possible and make high-candlepower incandescent-lamp units practical.

Due to the high temperature of the bulb it is desirable to operate all lamps rated 400 candlepower or over in ventilated fixtures equipped with globes to protect the lamp bulb from the effects of moisture and atmospheric changes. Furthermore, the extreme concentration of the filament produces high intrinsic brilliancy and consequent glare unless globes of diffusing glass are used to conceal the light source and improve the distribution.

Digitized by Google

A new series of units has recently been added to the already comprehensive line of Novalux units made by the General Electric Company for the operation of the high-candlepower Mazda type C lamps, and they embody the latest ideas in design, both of an artistic and mechanical nature. These units have excellent light-distributing characteristics, giving the maximum light at the 10-degree angle below the horizontal, which is the best for effective street lighting.

These new units are made for use with the 5.5, 6.6 or 7.5-ampere straight series Mazda lamps, and for use with the 400-candlepower, 15-ampere and the 600 and 1,000-candlepower, 20-ampere Mazda series lamps. The units for operating the high-candlepower lamps are equipped with self-contained autotransformers or compensators, so that they can be operated on standard constant-current circuits of either 6.6 or 7.5 amperes.



New Pendent Novalux Fixture with Reflector and Prismatic Refractor.

A careful comparison shows that for the majority of installations the high-current series Mazda lamps with individual autotransformers are more efficient and economical to operate than low-current 6.6-ampere lamps of equal candlepower rating; furthermore, that the increased efficiency means increased capacity in constant-current transformers and other station equipment.

A Novalux unit with individual autotransformer for operating a 600-candlepower lamp at 20 amperes and equipped with a proper reflector gives about twice as much light as the 7.5-ampere carbon inclosed arc lamp, and consumes 30 per cent less energy. The station capacity is also increased by 30 per cent and a reserve capacity secured for possible extensions. No changes are necessary in the lines or cable and the same hangers and cutouts can be used, there being simply a substitution of lamp for lamp.

The new units are made in two different general types, one for mounting on brackets or permanent fastening to mastarms, while the other is for the regular method of suspension. These two types are termed the bracket and pendent types, respectively.

The bracket type is equipped with the same insulator that is used with the General Electric series incandescent brackets. This interposes an insulation between the unit and the pole which will withstand voltage strains up to 25,000 volts. This insulator has great mechanical, as well as electrical strength because it is composed of only one massive porcelain. In addition to this important feature, it is adapted for either open or concealed wiring of the unit.

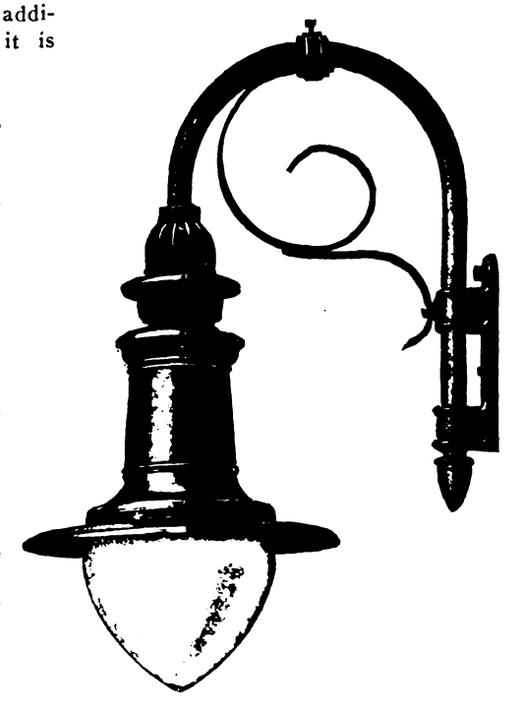
For open wiring the units are furnished with flexible leads equipped with substantially soldered connectors of liberal cross section. The circuit wires can, however, also be brought directly into the fixture by simply bringing the leads to the tieing ears on the insulator and then through the porcelain to the interior binding posts.

For concealed wiring the leads can be brought through the bracket pipe, through the hood into the top of the insulator and then into the binding posts. The binding posts in the insulator are heavy copper castings, each one being equipped with two phosphor-bronze screws to prevent the possibility of loose connections, open circuits, or grounds.

The following three combinations of light-distributing equipment can be used with the pendent or the bracket types: No. 87 light Carrara outer globe; No. 87 light Carrara outer globe and 20-inch reflector; prismatic refractor and 20-inch reflector. The prismatic glass refractor is the most valuable device ever applied to a light source to increase the light at effective angles. Instead of cutting down the light from the bare lamp by absorption, it more than doubles the candlepower values at angles of from 10 to 15 degrees below the horizontal. The refractor is made of two sections of prismatic glass with the prisms facing each other on the inside, thereby presenting exterior smooth surfaces which will not collect dust or dirt.

One of the important novel features of the new units is the method of ventilation. The globe seat is made air-tight. The air enters through the fine-mesh-protected openings under the lower flange of the casing near the globe, circulates around the socket, and leaves through fine-mesh-protected openings under the dome of the lamp. This method gives a liberal supply of cooling air but prevents the entrance of insects.

The globe holder is hinged to permit ready access to the lamp, and the globe-holding device holds the globe firmly and evenly against the globe seat, but is so constructed that it is independent of the retaining screw, thus preventing globe breakage from excessive tightening of the screw. The socket is of the skeleton type. The casing is made of spun copper with a black oxidized finish and is held to the dome by a bayonet joint and set screws. The reflector is made of steel with black enameled top and white fire-enameled reflecting surface.



Novalux Bracket Fixture with Reflector and Carrara Glass Globe.

Underground Electric Restaurant.

A large mining company has installed an electric restaurant 150 yards in from the foot of the shaft in one of its mines. Here food is cooked or heated electrically, and hot coffee is prepared by the same means. Since most of the important coal mines already use electric power underground for power purposes, there should be little difficulty in establishing subterranean electric restaurants in any of them.

A cent's worth of electric energy will lift 100 gallons of water 100 feet.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CINEMATOGRAPH PROJECTORS.—The Pathescope Company of America, 33 West Forty-second Street, New York, N. Y., submittor. Manufactured by Compagnie Generale d' Establishments Pathe Freres, Vincennes, France.

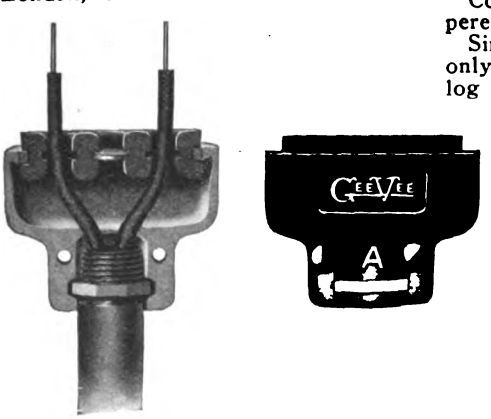
"Pathescope" portable miniature motion-picture machines, with incandescent lamps for illuminating elements. Rating 2 amperes, 120 volts.

Motor-driven model for alternating-current circuits; two types, in which lamp is in series with rheostat or connected to transformer respectively, and having single-phase induction motor, portable cord and attachment plug for use on ordinary lighting circuits.

Standard for use only with slow-burning films supplied by manufacturer.

Listed October 2, 1915.

CONDUIT OUTLET BUSHING AND FITTING.—The Gillette-Vibber Company, 32 Maple Avenue, New London, Conn.



Conduit Terminal Fitting—Gillette-Vibber Company.

Two-piece galvanized cast-iron terminal fittings with composition covers with wire openings for capping ends of rigid conduit. Catalog Nos. 10001, 10012, 10034. (See cut.)

Standard only for inside work, and only when secured to threaded ends of conduit with standard locknuts.

Listed October 12, 1915.

FIXTURE PARTS.—National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill.

National X-Ray Reflector Company fixture parts used in fixture construction.

Pendent fixtures for 100 and 200-watt Type C lamps, to be used with standard flexible cord having slow-burning insulation or asbestos covering, catalog Nos. 600, 610.

Listed October 6, 1915.

FUSELESS ATTACHMENT PLUGS.—General Electric Company, Schenectady, N. Y.

Separable and nonseparable attachment plugs, having porcelain or composition bases with porcelain, composition or brass-covered caps.

G. E. 660 watts, 250 volts, catalog No. GE624. With caps, catalog No. 49487.

Listed October 16, 1915.

FUSELESS ATTACHMENT PLUGS.—Simplex Electric Heating Company, Cambridge, Mass.

Cord connectors. Simplex, 20 amperes, 250 volts.

Single-heat: catalog No. 881; body only, catalog No. 891; plug only, catalog No. 871.

Bell-Ringing Transformer—Packard Electric Company.

Three-heat: catalog No. 883-S.

Listed August 14, 1915.

HEATERS, Electric.—General Electric Company, Schenectady, N. Y.

"G. E." heaters, 95-250 volts.

Tea kettles, types L-28, L-29, 220-575 watts.

Chafing dishes, type L-29, 600 watts.

Toasters, type D-56.

Disk stoves, types D-8, D-9, D-14, D-15, 225-900 watts.

Air heaters, type A-51.

Glue pots, type I-31.

Listed September 22, 1915.

HEATERS, Electric.—Wood, Nathan & Virkus Company, Incorporated, 30 East Twenty-third Street, New York, N. Y., submittor. Manufactured by The Prometheus Electric Company, 232 East Forty-third Street, New York, N. Y.

Virkotype machine, for supplying fresh printed matter to heat for a few seconds to glaze the ink. The printed paper, sprinkled with a special powdered compound, is fed on a motor-operated guide and carried between two stationary heating plates. 8.5 amperes, 220 volts; 17 amperes, 110 volts.

Listed September 23, 1915.

MUSICAL INSTRUMENTS.—J. P. Seeburg Piano Company, 209 South State Street, Chicago, Ill.

Automatic pianos and orchestras, operated pneumatically by motor-driven fan located at a remote point. Each instrument is provided with a switch to control self-starter of motor driving fan. A small motor of protected type is mounted within the case and is used to draw music roll over tracker board. These devices are intended primarily for use in motion-picture theaters.

Listed October 21, 1915.

PICTURE MACHINES AND APPLIANCES.—Atlas Education Film Company, 5 South Wabash Avenue, Chicago, Ill.

Arc lamp-house attachment, 40 amperes, 125 volts.

This device, for use with the Atlas Special Portable Hand-Operated Projector, consists of an arc lamp and lamp-house, 25-40-ampere, 110-volt rheostat, double-pole knife switch, and adjustable stand for the lamp-house and projector.

Standard for use with slow-burning film only.

Listed October 2, 1915.

PICTURE MACHINES AND APPLIANCES. — The Automatic Film Winder and Rewinder Company, 309 Market Street, Harrisburg, Pa.

The Horting rewinder. A cast-aluminum magazine mounted on a metal base and designed to inclose reels of films during rewinding process. An electric motor drives, by belt, one of reel spindles, and an automatic switch opens motor circuit when rewinding is completed.

Listed October 22, 1915.

SIGNS, Electric.—The Phelps Manufacturing Company, 265 Jefferson Avenue, Detroit, Mich.

"Baby" sign receptacle flashers, 60 watts and 100 watts, 110 volts, consisting of thermal element and lamp base mounted on porcelain base.

Listed October 12, 1915.

SOCKETS, Standard.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal shell.

Key, 250 watts, 250 volts, catalog No. BH-600.

Listed October 11, 1915.

TRANSFORMERS.— The Packard Electric Company, Warren, O.

Packard Belle bell-ringing transformers porcelain-clad. Type G. 1 to 25 cycles; Type D. 1 to 60 cycles. High voltage 110, low voltage 11. (See cut.)

Listed September 10, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

JERSEY CITY, N. J.—The Board of City Commissioners is planning for the installation of a new street-lighting system, forming a "white way" on Ocean Avenue. Nitrogen-filled lamps will be installed. A.

KEYPORT, N. J. — The Public Service Railway Company is planning for the erection of a new substation at the Highlands. A.

LAMBERTVILLE, N. J. — The Lambertville Heat, Light and Power Company has been acquired by new interests and will be known as the Lambertville Public Service Company. The new owners are planning for extensive improvements in the electric power plant and distributing system.

STRATFORD, N. J.—The Borough Trustees are negotiating with the Clementon Electric Light Company for the installation of an electric-lighting system throughout the town. A.

TRENTON, N. J.—The Board of City Commissioners has passed an ordinance providing for an expenditure of $27,500 for extensions and improvements in the fire and police alarm system, and telegraph underground system. A.

LANCASTER, PA. — The Berks-Lehigh Electric Company will shortly ask for a charter to supply light, heat and power by electricity in the township of Lower Macungie including the borough of Topton, Pa. Lawrence B. Myers, Edith H. Myers and John M. Groff, all of Lancaster, Pa., are the incorporators.

PHILADELPHIA, PA. — Complete electrical equipment will be installed in the Frankford High School and the Southern High School by the Board of Education. J. Horace Cook is the architect.

NORTH CENTRAL STATES.

BARBERTON, O.—The new park in West Barberton will be lighted by electricity, standards and lights at a cost of about $8.50 each being planned, after the extension of the lines to the park. Superintendent R. J. Long has charge of the installation. L.

EATON, O.—The Eaton Lighting Company has increased its capital stock from $50,000 to $80,000. A number of improvements and the extension of its service to Camden will be made. Address Judge Elam Fisher, president.

LIMA, O. — The proposed $60,000 bond issue for the construction of a municipal lighting plant to operate a comprehensive "white-way" lighting system was defeated at the election Tuesday, and some other plan may be adopted for the lighting system. L.

MASSILLON, O. — Improvements costing over $100,000 will be made by the Massillon Electric and Gas Company, on its plant in South Erie Street, within the next four months, according to T. O. Kennedy, general manager, who returned from New York Friday afternoon, where arrangements for the work were completed.

NEWARK, O.—Bonds have been voted for the reconstruction of the municipal plant, the amount being $30,000. L.

NASHVILLE, IND.—Bonds to the amount of $7,000 have been voted for a municipal light plant. Address village clerk.

DECATUR, ILL.—The Board of Local Improvements is considering a petition of property owners in North Main Street for the extension of an ornamental lighting system. The estimated cost is $6,377. Z.

PEORIA, ILL.—The board of supervisors has awarded the contract for electric-lighting fixtures for the new county jail to A. Kiefer, of Peoria. His bid for the work was $1,500. Z.

ORIENT, IOWA.—The council is considering the installation of a municipal electric-lighting system to cost about $7,000. Address city clerk.

BEVIER, MO.—Bonds in the sum of $12,000 have been voted for the purchase of an electric-light plant. Address the mayor.

KANSAS CITY, MO. — The city council recently passed over the mayor's veto, an ordinance providing for ornamental lights on Grand Avenue to Troost, a distance of nine blocks. M.

LITTLE RIVER, KAS.—Bonds for $16,000 have been voted and contract will be let November 15, for a municipal electric light plant including one 80-horsepower oil engine; a 50-kilowatt generator; a 300-ampere storage battery, etc. W. B. Rollins Company, of Kansas City, Mo., have made the plans.

CHANCELLOR, S. D.—Full twenty-four hour electric light service for Chancellor is to become a reality through the action of the town authorities in passing a resolution providing that plans for a municipally owned plant be secured and considered. The sum of $5,500 is to be expended by the town in carrying this project through.

MEDINA, N. D.—Plans are being considered for the installation of an electric-lighting system. Address city clerk.

SOUTH CENTRAL STATES.

PERRYVILLE, KY.—W. J. Debaun, of this city, has sold the local electric light and ice plant to Russell Brothers, of Washington County, who took possession on the first of November. The Debaun plant was recently established and has been very successful.

TYRONE, OKLA.—A state charter has been granted to the Tyrone Electric Light, Ice and Power Company, of Tyrone, Okla. The capital stock is $10,000.

WESTERN STATES.

HEDGEVILLE, MONT.—It is reported the proposition of installing a municipal electric light and water system is being given serious consideration by the town council, which recently asked the Billings Engineering & Contracting Company, of Billings, Mont., to furnish figures on the cost of constructing the improvement. O.

PROVO, UTAH. — Residents of Grand View ward, comprising the southern portion of Provo Bench, are making preparations to build a small power plant on Spring Creek to furnish light and power for domestic use for the residents of that village. Address city electrician.

BOISE, IDAHO.—It is announced that the Utah Power and Light Company is preparing to construct a second 10,000-kilowatt unit at its plant at Oneida, at a cost of about $250,000.

EMMETT, IDAHO.—The Electric Investment Company, of Boise, according to reports, will rebuild its electric light and power line in Emmett, work to begin in the immediate future. O.

KELLOGG, IDAHO.—Reported the Washington Water Power Company, of Spokane, Wash., will extend its electric power-transmission lines to two mining properties on Pine Creek, near this city, to serve the Constitution and Little Pittsburg mines. This company has extended its lines to several mining properties in this district. According to reports, other mining companies contemplate purchasing current to be used in operating their stamp mills, etc. O.

PETERSBURG, ALASKA. — The town council has commissioned Fred C. Purinton, here, to visit Seattle and other Puget Sound cities and investigate the proposition of converting the present coal oil lighting system into an electric lighting plant. O.

DAWSON, Y. T. — A recent fire totally destroyed the large steam generating plant of the Canadian-Klondike Mining Company, located here. Included in the loss was a battery of three large water-tube boilers, and a 400-kilowatt turbo-generator. According to reports, the plant will be rebuilt on an enlarged scale, at an early date. The plant was used for furnishing current to operate dredges, heating the company's shops, offices and general works. O.

CHEHALIS, WASH.—The holdings of the Washington-Oregon Corporation were sold October 30, in this city, to Harry N. Putnam, of Portland, who represented eastern bondholders of the organization. The price paid was $1,569,000. According to reports, the organization back of Putnam will take over the entire holdings of the Washington-Oregon Corporation under the name of the North Coast Power Company, which was recently organized at Vancouver, Wash. The following

Digitized by Google

properties located in all the principal towns and villages on the Northern Pacific main line in southwestern Washington, were included in the sale: Electric interurban line operating between Centralia and Chehalis; the power plant at Chehalis and on the Kalama River, near Kalama; other auxiliary plants which the company operates in this section. This company also controls nearly every electric light and power franchise in southwestern Washington. O.

FERNDALE, WASH.—The proposition of joining with the town of Custer, near this city, in inducing the B. C. Electric Company to extend its power transmission lines to Ferndale and Custer, thereby assuring a 24-hour service, is being considered by the city council. O.

PALOUSE, WASH. — Because a franchise granted 12 years ago to the Palouse Light and Power Company, now held by the Washington Water Power Company, of Spokane, expires this fall, this city has taken initial steps toward acquiring a municipally-owned and operated electric-lighting plant. Under the provisions of the franchise, the city has the privilege of taking over the property at any time during the next 12 months, at a valuation to be fixed by a board of appraisers. The city council has authorized city attorney McCroskey, and the members of the Public Utilities Committee to investigate the feasibility of the proposition. In case the committee recommends favorably, a special election will be called and bonds issued for the purchase and ultimate extension and improvement of the plant. O.

SEATTLE, WASH. — Bids have been called for by Seattle School District No. 1 for furnishing and installing electric light fixtures in the new Ballard High School building.

SEATTLE, WASH.—J. D. Ross, Superintendent of Lighting, states the municipal lighting department will petition the King County Commissioners for a franchise to extend its transmission lines and to furnish municipal current to the southern half of King County. The commissioners recently granted a similar franchise to the Puget Sound Traction, Light and Power Company, and the franchise granted to the corporation contains a common user clause, which will permit the city or any lighting company to use the poles of the corporation which holds the franchise. O.

SEATTLE, WASH. — After Mayor H. C. Gill vetoed the bill providing for the appropriation of $25,000 to be used in sealing the Cedar River impounding basin, he recommended that immediate steps be taken to construct a power plant at Landsburg, near Cedar Falls, where engineers claim between 40,000 and 60,000 kilowatts can developed under the most favorable circumstances. Willingness to consider Mayor Gill's recommendations has been evinced by the City Utilities Committee of the council. Mayor Gill proposes the Landsburg plant as an auxiliary to the municipal lighting plant, which has insufficient power to care for the growing needs of the city lighting plant, and he asserts that the plant can be built and in operation before the impounding basin can be sealed. O.

TACOMA, WASH. — The Home Electric Company, 924 Commerce Street, Tacoma, has been awarded the contract by Superintendent of Lighting Collins for $10,000 worth of electric lamps to be used by the municipal lighting plant. O.

TOPPENISH, WASH.—G. I. Drennan, local manager of the Pacific Power and Light Company, states his company will make an important extension of electric transmission lines to serve the district extending from Parker to Buena Station, including the territory around Sawyer. By this extension, the company will add 75 new lighting customers and will make power installations at several ranches in the vicinity of Parker and Buena.

ESCONDIDO, CAL. — An election has been called to vote on the proposition of issuing bonds to the amount of $40,000 for the installation of a municipal electric-lighting plant.

MANHATTAN BEACH, CAL. — The City Trustees have called for bids for furnishing and installing posts, wires, etc., for the electric lighting of Fifth Street.

REDDING, CAL.—Plans have been tentatively adopted for a new electric lighting system to cost about $3,000.

PROPOSALS.

ELECTRIC MOTORS AND APPURTENANCES. — Sealed proposals will be received by the city November 18, at Room 710 City Hall, Chicago, Ill., for fabricating and delivering at the Municipal Reduction Plant, of the city, located at Thirty-ninth and Iron Streets, electric motors, appurtenances and accessories, according to plans and specifications on file in the office of the Department of Health. Address John Dill Robertson, Commissioner of Health.

ELECTRIC LIGHT PLANT. — Sealed bids will be received by W. H. Copeland City Clerk, New Madrid, Mo., up to 7:30 P. M., on Monday, November 29, 1915, for additions to electric light plant for the City of New Madrid, New Madrid County, Missouri. H. H. Humphrey, 1312 Chemical Bldg., St. Louis, Mo., consulting engineer.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,029. POCKET ELECTRIC LAMPS.—A commercial organization in the United States transmits the name of a firm in France which desires quotations on pocket electric lamps, hardware, and sanitary articles for surgeons and hospitals.

NO. 19,039. WIRE MACHINERY. —A commercial organization in the United States transmits the name of a man in Spain who desires to establish connections with American manufacturers of machines to cover wire with silk. A sample has been forwarded, which may be seen at the Bureau or its branch offices.

NO. 19,055. X-RAY APPARATUS AND ACCESSORIES.—An American consular officer in Spain writes that a man in his district wishes to communicate with American manufacturers of X-ray apparatus and accessories. Correspondence should be in Spanish.

NO. 19058. ELECTRIC LAMPS, ETC.—A commercial organization in the United States transmits the name of a man in Spain who desires to establish connections with American manufacturers of electric lamps, and machinery. Correspondence should be in Spanish.

NO. 19,099. ELECTRICAL GOODS. —The commercial attaché of the Department of Commerce in China writes that a firm in that country desires to establish connections with American manufacturers of electrical wires, fixtures, batteries, and lamps of the cheaper class.

NO. 19,107. ELECTRIC FLASHLIGHTS.—An American consular officer in the United Kingdom reports that a firm in his district is desirous of importing electric flashlights or torches, particularly vulcanite torches, complete with lens, etc. Sizes desired are 1.25 by 5 inches, 1.5 by 6.5 inches, and 1.5 by 8.5 inches. Descriptive litterature should be sent with quotations.

FINANCIAL NOTES.

The Interstate Electric Corporation has authorized an increase of its capital stock by the issue of $1,000,000 seven-per-cent preferred stock, of which $500,000 will be sold at once and the proceeds applied towards the purchase of three additional electric properties in Texas.

E. H. Rollins & Sons and William P. Bonbright & Company, Incorporated, New York City, have purchased jointly $4,500,000 ten-year six-per-cent convertible debentures of the Great Western Power Company, of California.

It is stated that Commonwealth Edison, Chicago, early next year, will issue $4,500,000 new stock to stockholders at par for new turbines and other improvements in connection with construction work on the north side of the city.

Dividends.

	Term	Rate	Payable
Am. Ry., com	Q	1 %	Dec. 15
Cent. Ark. Ry. & Lt. Corp., pf.	Q	1.75%	Dec. 1
Detroit United Ry	Q	1.5 %	Dec. 1
Ill. Traction, com	Q	0.75%	Nov. 15
Kings Co. Elect. Lt. & Pr.	Q	2 %	Dec. 1
Wash.-Va. Ry.	S	2.5 %	Nov. 1

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK

	Nov. 8	Nov. 1
American Tel. & Tel. (New York)	128	124⅝
Commonwealth Edison (Chicago)	140	140
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery, common (Philadelphia)	71	72½
Electric Storage Battery, preferred (Philadelphia)	71	72½
General Electric (New York)	177	181⅞
Kings County Electric (New York)	120	120
Massachusetts Electric, common (Boston)	7	7
Massachusetts Electric, preferred stamped (Boston)	40	40
National Carbon, common (Chicago)	150	150
National Carbon, preferred (Chicago)	121	121
New England Telephone (Boston)	132¼	132½
Philadelphia Electric (Philadelphia)	29¼	27
Postal Telegraph and Cables, common (New York)	83	79½
Postal Telegraph and Cables, preferred (New York)	65¾	65
Western Union (New York)	87¾	80¾
Westinghouse, common (New York)	69	72⅝
Westinghouse, preferred (New York)	143	140

Digitized by Google

NEW PUBLICATIONS.

MAGNETISM. — An address by George F. Stradling delivered before the Franklin Institute and the Philadelphia Section of the American Institute of Electrical Engineers last April entitled "Modern Theories of Magnetism," has been reprinted in pamphlet form from the Journal of the Franklin Institute.

MAGNETIC PERMEABILITY. — Technical Paper No. 245 of the Bureau of Standards is entitled "Temperature Coefficient of Magnetic Permeability Within the Working Range," by R. L. Sanford. For precise work, variations with temperature must be considered, but no definite and permanent coefficients seem to exist.

TORONTO SYSTEM.—The fourth annual report of the Toronto Hydro-Electric System for the year 1914 has been issued by the commissioners of the city of Toronto. It gives a financial statement of the operation of the city system, with a report of the general manager, H. H. Couzens, and statistics of the output.

BUREAU OF STANDARDS.—The Bureau of Standards, Washington, D. C., has issued technical papers No. 256 entitled "Construction of Primary Mercurial Resistance Standards," by F. A. Wolff, M. P. Shoemaker and C. A. Briggs, and No. 257 entitled "Note on the Resistance of Radiotelegraphic Antennas," by L. W. Austin.

TELEPHONE TRANSMISSION LOSSES.—Reports Nos. 16 and 17 of the second section of the Electrotechnical Laboratories, Tokyo, Japan, are entitled "Transmission Losses in Common-Battery Subscriber's Loops," and "Transmission Losses in Telephone Lines," by M. Tonegawa and T. Arakawa.

NEW INCORPORATIONS.

CLEVELAND, O.—The Domestic Electric Company has been incorporated with a capital of $17,000 by Harry T. Gettins, B. S. Soden and others.

LEBANON, VA.—The Lebanon Light Company has been incorporated with a capital of $5,000, to operate a light plant in Lebanon. E. R. Combs is president of the company.

RIO GRANDE CITY, TEX.—The Rio Grande City Ice, Water and Light Company has been organized with a capital stock of $24,000. It will build a water and light plant and an ice factory. R. R. Margo is interested.

CHICAGO, ILL.—The Service Electric Company has been incorporated to manufacture and deal in electrical and mechanical appliances. The company's capital stock is $6,000, and the incorporators are William F. Gresham, Ethel W. Downes and Douglas C. Gregg. Z.

KALISPELL, MONT.—The Mission Range Power Company has filed articles of incorporation with the county. The company is organized for the purpose of furnishing electric power for the city of Polson. The company is incorporated for $100,000, with paid-in capital of $51,000. The officers of the company are: J. H. Cline, of Polson, president; J. A. Johnson, treasurer, and C. E. Wood, secretary.

BLACK HAWK, WIS.—The Valley Electric Light and Power Company; capital, $7,500; incorporators, A. George Barber, Oscar A. Jaeger and Lucile Barber.

PERSONAL MENTION.

MR. F. S. MONTGOMERY, advertising manager of the National Metal Molding Company, Pittsburgh, Pa., has been elected treasurer of the Pittsburgh Publicity Association.

MR. A. S. LANGSDORFF, dean of the School of Electrical Engineering, Washington University, St. Louis, Mo., who was operated on for appendicitis on October 20, has left the hospital and is reported to be doing very nicely. He will recuperate for a few weeks at a health resort in Arkansas.

MR. PAUL M. LINCOLN, whose term as president of the American Institute of Electrical Engineers, expired july 1, 1915, and who has for a number of years been prominently identified with the engineering department of the Westinghouse Electric and Manufacturing Company, has resigned his position with this company in order to be able to devote his time to the manufacture of a meter which he has recently invented. Mr. Lincoln graduated from the Ohio State University in 1892. Shortly afterwards he entered the employ of the Short Electric Company, in Cleveland, learning first hand the operation of street railways, and becoming familiar with the difficulties encountered in operating electric cars on steep grades with small generators in the power house. He then joined the Westinghouse Electric and Manufacturing Company and was engaged in the testing room and in general engineering work. At the opening of the Niagara Falls Power Company's plant he became its electrical superintendent, and was thus identified in the early and notable days with the first great power plant in this country. He had much to do with the first transmission line to Buffalo, which in the amount of power transmitted and distance traversed was the greatest line of its time. In 1902 he returned to the Westinghouse company where his operating men has proven of great advantage in his work in connection with the general engineering of power stations and transmission lines. For several years he was in charge of the power engineering department in which position he supervised the design of a large amount of generating and converting apparatus. On the organization of the great engineering department, he was transferred to this department where his large acquaintanceship with operating conditions and operating men has proven of great value. He has thus been identified with the formulation of many of the large projects of recent years and has come into contact with operating conditions, as well as those pertaining to the design and performance of apparatus. In the American Institute of Electrical Engineers he has presented numerous papers, and was one of the members of the Transmission Committee which began its work a dozen years ago. To the work of this committee, through meetings and discussions, and through reports and published data, is due, in o small measure, the rapid and successful advance in power transmission. At the time of the appointment of that committee not quite twelve years ago, there was no plant in the country operating above 40,000 volts. He has served on many committees, notably by holding the chairmanship of the Committee on Local Organization for five consecutive years. This has brought him into intimate touch with the conditions and Institute needs in all parts of the country, while his service on the board of directors has acquainted him with internal Institute affairs. As an educator he is professor of electrical engineering in the University of Pittsburgh. In the field of technical journalism he has been a member of the publication committee of the *Electric Journal* for a number of years. Mr. Lincoln is a positive, definite, original thinker. Among those who have been most intimately associated with him, as well as those whose acquaintance with him is slight, or only through his writings, there is a regard and respect for his opinions and for the straightforward and frank way in which he is ready to express them.

OBITUARY.

MR. A. W. FIELD, charter member and first president of the Ohio Electric Light Association, in 1895, died at Detroit, Mich., on October 21. He was born in Columbus, Ohio, in 1851.

MR. ALBERT C. HUEBNER, for the past three years sales representative of the insulated wire department of the B. F. Goodrich Company, Chicago, Ill., was killed in an automobile accident at Akron, O., on Saturday, October 30. The car in which he was riding, through the fault of the steering gear, swerved from the road and turned completely over, pinning Mr. Huebner under the car. He was 31 years old and has held several important positions, including the post of secretary to the president of the Philadelphia Rapid Transit Company. He was well known in the trade, and had many friends in Chicago, where he last served the Goodrich Company. His widow survives him, and also his father and mother, Mr. and Mrs. Paul Huebner, of Philadelphia.

MR. P. A. B. WIDENER, financier and former street railway magnate, died on November 6, at his home, Lynnewood Hall, Elkins Hall, Philadelphia, Pa. He was 80 years old. Mr. Widener was one of the most widely known financiers in America, one of the powerful groups which controlled traction interests all over the country. The last years of his life were shadowed by the loss of his son, George Widener, who perished aboard the *Titanic*. His estate is valued in the neighborhood of $100,000,000. Mr. Widener was born in Philadelphia on November 13, 1834, and after receiving a public school education started his business career as a butcher. He soon became interested in politics and for more than 20 years he bore an active part in all the important political movements in the city. In 1874 Mr. Widener entered on the life which made him conspicuous in the financial affairs not only of Philadelphia, but of the entire country. He began by buying a few shares of street railway stocks here and there, and finally became the controlling factor of all the Philadelphia street railways. In 1890 Mr. Widener, in association with the late William L. Elkins, William C. Whitney, Thomas F. Ryan, Charles T. Yerkes and others, began to seek railway control in other cities, and in a few years the lines of New York, Chicago, Pittsburgh, Baltimore and other

Digitized by Google

cities came under their domination. Mr. Widener was active in the formation of the United States Steel Corporation and the American Tobacco Company. Mr. Widener has given large sums to charity. Since his wife's sudden death in 1896 his great ambition seemed to have been to commemorate her name, more than $11,000,000, having been spent on memorials. Among them are the Josephine Widener memorial branch of the Philadelphia free library and the Widener Industrial Home for Crippled Children.

DATES AHEAD.

Mississippi Electric Association. Annual convention, Hattiesburg, Miss., November 12-13. Secretary, H. F. Wheeler, Hattiesburg, Miss.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Zanesville, O., November 18 and 19. Secretary, Frank E. Sanborn, Ohio State University, Columbus, O.

American Society of Mechanical Engineers. Annual meeting, New York City, December 7-10. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Association of Engineers. First annual convention, Hotel La Salle, Chicago, Ill., December 10-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

The General Insulate Company, Brooklyn, N. Y., has appointed as Pacific Coast agents the Dean Electric Company, 212 West Third Street, Los Angeles, Cal., and P. Seiler Electric Works, 324 Market Street, San Francisco, Cal.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has got out several leaflets on its handy electrical devices. One of these describes and illustrates Hubbell attachment plug No. 50,815, said to be the smallest two-part plug on the market. Another is devoted to Hubbell lamp guards, of which eight types are illustrated; the locking guard with its many advantages is particularly featured.

E. T. Chapin & Company, Spokane, Wash., manufacturer and distributer of western red cedar poles, posts and piling, has opened a branch sales office at 2008 Railway Exchange, St. Louis, and a storage yard at Minneapolis, Minn., where a large supply of western red cedar poles will be carried in stock. These new facilities enable the company to get into closer touch with customers and prospective customers in the south and middle west and to supply their wants with the greatest dispatch.

The M. W. Dunton Company, 150 Niagara Street, Providence, R. I., has issued a new edition of "Soldering Kinks." This is a 31-page book, containing nearly 70 valuable suggestions on soldering all kinds of things. Many of the kinks suggest the use of Nokorde, the company's well known soldering paste. Among the kinks are quite a few that should be of interest to electricians. Copies of the book can be obtained from the company by sending postage.

The Globe Stove & Range Company, Kokomo, Ind., has issued an attractive booklet on electric cooking. It is printed in two colors and handsomely illustrated; a neat three-color cover is designed to invite the attention of housewives. The booklet sets forth the practicability of electric cooking and points out its many important advantages. The various types of Globe electric stoves, ovens and ranges are briefly described and their merits modestly proclaimed.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just had prepared for distribution to the electrical trade a four-page folder printed in two colors, which deals with six-ampere pull switches. The switches described and illustrated are of the ceiling, pendent, and threaded-cap types, the shells being interchangeable with C-H 660-watt sockets. The principal point brought out in this circular is the fact that the capacity is just double that of any other pull switch on the market.

Spray Engineering Company, 93 Federal Street, Boston, Mass., has had reprinted as a 24-page illustrated book the paper on "Cooling Ponds for Condensing Engines," which was presented by Lee H. Parker before the recent convention of the National Association of Cotton Manufacturers. This paper gives a historical review of the development and use of cooling ponds. The spray system for increasing the efficiency of such ponds is described in detail. It is shown that the spray system dissipates about 36 times as much heat as a natural cooling pond with partitions and it increases the capacity of the plant it can take care of in the same ratio.

Safety-Armorite Conduit Company, Bailey-Farrell Building, Pittsburgh, Pa., announces that on November 3 a change was made in its selling organization affecting New York City and state, Philadelphia, Baltimore, Washington and adjacent districts. Heretofore its goods in that territory were marketed by a firm of selling representatives, while hereafter the company will look after such business direct. The company believes that direct selling will permit it to give better service. The eastern office will be located at 1670 Hudson Terminal Building, 50 Church Street, New York City, and will be in charge of William G. Campbell, a gentleman well known throughout the electrical industry.

Simplex Electric Heating Company, Cambridge, Mass., is sending out to dealers of its heating appliances two booklets of much interest. One of these is a 24-page book, entitled "Simplex Electric Household Devices." This contains large illustrations of the principal appliances of this line and should serve the dealer by aiding him in giving a better idea of the handsome appearance of these devices than can be obtained from the smaller cuts in the regular catalog; thus sales are facilited in cases, where the actual articles are not in stock. Another booklet intended for general distribution, deals very attractively with Simplex appliances that can be used in the dining or tea room and connected to any lamp socket. This 12-page booklet is printed by the rubber-offset color process and is illustrated with views showing the convenience and utility of these devices in the home. The merits of these products are cleverly and convincingly set forth, which should make the booklet of great value in any sales campaign, particularly that connected with Electrical Prosperity Week.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., announces a number of changes in the Supply Department, which have recently been put into effect. S. A. Chase, formerly special representative, T. J. Pace, formerly in charge of the illuminating and rectifier divisions, and Carl G. Schluederberg, formerly head of switchboard sales, have been appointed assistants to the manager of the department, J. J. Gibson. C. E. Stephens, engineer of lighting, has been appointed manager of the illuminating section to succeed Mr. Pace. C. Streamer, formerly head of the order division, succeeds Mr. Schluederberg as manager of the switchboard section, and A. P. Joseph is appointed head of the order section to succeed Mr. Streamer. M. C. Morrow, formerly of the Philadelphia office, is appointed manager of the appliance section, which is a combination of the former heating, fan motor and ozonizer divisions of the Supply Department. M. C. Rypinski, formerly manager of the Detail and Supply Division of the New York office, becomes manager of the meter section. The Power Department, of which E. H. Sniffin is manager, also announces the following section managers: W. H. Garrett, in charge of contracts; J. G. Worker, stokers, and H. D. Storer, auxiliaries.

Digitized by Google

Record of Electrical Patents

Issued by the United States Patent Office, November 2, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,158,421. Percolating Device. T. Abtmeyer, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Comprises an immersion electric heater combined with percolator pump, etc. (See cut.)

1,158,426 and 1,158,427. Electric Switch. F. Barr, New York, N. Y. First patent: Wall light switch has condition indicator operated by oscillating switch lever. Second patent: Spring-operated for lamp sockets.

1,158,428. Pull Switch. F. Barr, Woodhaven, N. Y. Details of spring-operated lamp-socket switch.

1,158,441. Rectifier System. D. E. Carpenter, assignor to Westinghouse Electric & Mfg. Co. Maintaining electrode has reactance in series in its circuit and incandescent lamp in shunt to reactance and maintaining arc.

1,158,451. Electrical Hot-Plate. R. W. Davenport, assignor to Detroit Stove Works, Detroit, Mich. For stove top.

1,158,463. Method of Assembling Core Structures for Dynamo-Electric Machines. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Sides of notches in laminae are caused to firmly grip securing key.

1,158,473. Electric Animal-Prod. W. B. Floyd, assignor of one-half to H. C. Hermsmeyer, Fort Worth, Tex. Has contacts at one end for pressing against animal and battery and induction coil mounted in handle.

1,158,474. System of Current Rectification. C. LeG. Fortesque, assignor to Westinghouse Electric & Mfg. Co. Arrangement of transformers and mercury rectifiers in connection with a two-phase circuit.

1,158,475. Self-Serving Table and Heater. W. J. Fox, San Diego, Cal. Revolvuble center has electrically heated disks.

1,158,486. Electrically Heated Boiler. W. S. Hadaway, Jr., and E. E. Rose, assignors to Westinghouse Electric & Mfg. Co. Protective mounting of resistance heating units extending through liquid tank.

1,158,487. Resistance Element. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Mfg. Co. Integral resistance unit for flatiron has zig-zag conductor arranged to intensify heating effect at iron point.

1,158,488. Electrical Apparatus. W. S. Hadaway, Jr., and E. E. Rose, assignors to Westinghouse Electric & Mfg. Co. Mica-covered resistor inclosed in flexible insulation, all within metal armor and the whole pressed together.

1,158,491. Secondary-Battery Element. E. Handler, Baltimore, Md., assignor to General Industries Co. Nonconducting, two-part grid for supporting active material has conductors running to each material-holding pocket.

1,158,492. Circuit-Interrupter. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Oil-switch contact mounting and operating devices for equalizing contact pressure.

1,158,495. Induction Motor. R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. Structure of stator with core having staggered groups of plates.

1,158,502. Automobile Clock. R. S. James, Seattle, Wash. Alarm clock having an alarm circuit also controlled by manual switch.

1,158,511. Polyphase Synchronous Motor. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Distributed field winding with resistance connections for starting, and short-circuiting and exciting connections for running.

1,158,512. Two-Speed Induction-Motor Winding. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Arrangement of end connections of windings of different pitch.

1,158,516. Electrode for Arc Lamps. G. M. Little, and B. J. Gudge, assignors to Westinghouse Electric & Mfg. Co. Manner of securing metallic end extension to rod of refractory material.

1,158,532. Commutator-Turning Tool. J. Moles, assignor to The Eureka Co., North East, Pa. For turning the interior surfaces of assembled commutation bars.

1,158,534. Switch Box. T. E. Murray, New York, N. Y. Has sliding block of insulation carrying movable contacts with spring tending to open and extension to outside of casing adapted to be sealed or locked in closed position.

1,158,535. Cutout Switch. T. E. Murray. Fuse forming switch element movable with hinged casing cover is removable.

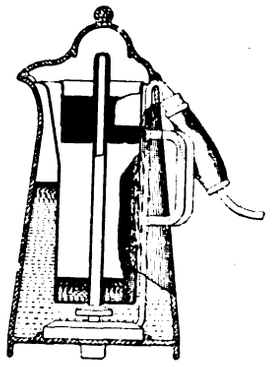
1,158,537. Cash-Register. W. H. Muzzy, assignor to National Cash Register Co., Dayton, O. Electric motor completing movement of coin-actuated levers and operating check-delivering levers, is controlled by coin-actuated movement of former levers.

1,158,539. Electric Immersion Heater. H. A. Newcomb, assignor to Westinghouse Electric & Mfg. Co. Buoyant arrangement closes circuit on immersion and opens on removal.

1,158,543. Electric Drill. R. A. Norling, assignor to Aurora Automatic Machinery Co., Aurora, Ill. Mounting of motor in casing of hand drill.

1,158,557. Electrically Heated Implement. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Flatiron has heat-storing, air-insulated body in which resistor is mounted, resistor being covered by the iron face of good heat-conducting material.

1,158,565. Induction Meter. G. A. Scheeffer, Indianapolis, Ind. Arrangement of



No. 1,158,421.—Electric Immersion-Type Percolator.

pressure and series magnets in disk instrument.

1,158,572. Electrical Resistance Device. A. Simon, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Dissipation of heat from grids facilitated by radiating to heat-absorbing bodies and cooling latter.

1,158,578. Dash and Trouble Lamp for Automobiles. J. C. Stearns, Worcester, Mass. Special structure of socket and plug.

1,158,586. Electric Heating Apparatus. F. Thornton, Jr., assignor to Westinghouse Electric & Mfg. Co. In liquid heating device, supply of liquid and circuit of heater is float-controlled.

1,158,587. Apparatus for Printing Cinematograph Films. J. E. Thornton, London, England. Utilizes mercury-vapor lamps.

1,158,593. Spark Plug for Internal-Combustion Engines. W. D. Vandecar, Grand Rapids, Mich. Casing extends within cylinder and comprises sparking chamber between main core and auxiliary core in inner end of casing, spark gaps being between central electrode and conductor carried by auxiliary core.

1,158,597. Combined Engine-Starter, Dynamo, and Ignition Timer for Automobiles. G. R. Wadsworth, assignor to Gray & Davis, Boston, Mass. Electric starting motor connected with dynamo, timer and engine shaft by over-running clutch so that motor may rest and engine drive dynamo and timer.

1,158,598. Commutating Device for Dynamo-Electric Machines. M. Walker, assignor to Westinghouse Electric & Mfg. Co. Manner of excitation of interpoles.

1,158,600. Handle for Illuminating Diagnostic and Surgical Instruments. R. H. Wappler, assignor to American Cystoscope Makers, New York, N. Y. Comprises battery, variable resistance and contacts for effecting connection with instrument carrying lamp.

1,158,617. Ship Propulsion. H. Zoelly, assignor to Escher, Wyss & Co., Zurich, Switzerland. Has two sets of propellers for different speeds, one driven by turbine and other by turbo-electric motors with provision preventing dragging of one set when other is driving.

1,158,620. Horn for Automobiles and Motorcycles. S. A. Beyland, assignor to Garford Mfg. Co., Elyria, O. Special structure of device having electromagnetically operated diaphragm.

1,158,636. Telephone System and Individual Transmitter Therefor. C. L. Chisholm, assignor to the Chisholm Transmitter & Telephone Instruments Co., Marysville, N. B., Canada. Portable telephone transmitter comprising microphone element and collapsible mouthpiece mounted in case like a watch.

1,158,665. Electric Telegraph Apparatus. J. A. Elms, Somerville, Mass. Multiplex system.

1,158,682. Electric Motor Time-Controller. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. For registering the maximum consumption of electricity.

1,158,708. Electric Circuit Connector. W. P. Mulligan, assignor of one-half to A. Ross, St. Paul, Minn. Connections with car-coupling heads having swinging and lateral movement.

1,158,709. Variable-Rate Metering Mechanism. G. H. Myrick, assignor to Chicago Electric Meter Co. Gear ratio is changed when consumption exceeds predetermined amount.

1,158,714. Coupling. G. O. Parker, Tampa, Fla. For connecting ends of trolley wires.

1,158,723. Electric Steam and Hot-Water Rediator. J. D. Ross, assignor of one-half to C. T. Swett, Portland, Me. Mounting of electric heater at bottom of radiator.

1,158,724. Electric Radiator. J. D. Ross, assignor to Electrical Steam Radiator Co., Portland, Me. Modification of above.

1,158,729. Automatic Circuit-Maker and Breaker. M. Scholl, Houston, Tex. Contact made through worm and contact piece moved along same against spring pull as worm turns.

1,158,731. Shade-Holder. E. J. Schroeder, Jersey City, N. J. Shade-holding petticoat surrounding lamp socket secured to cap by specially strengthened means, cap being rotatably mounted above socket.

1,158,734. Train-Stopping Apparatus. J. H. Skinner and D. E. Riley, Allegan, Mich. Special means to protect against rear-end collisions in sectional-conductor block system.

1,158,742. Fire-Alarm Box. N. H. Suren, assignor to Gamewell Fire-Alarm Telegraph Co., New York, N. Y. Details of particular mechanism.

1,158,749. Electrical Switch. A. A. Tirrill, Pittsburgh, Pa. Details of push-button wall switch.

1,158,762. Ignition Apparatus for Explosion Engines. F. B. Williams, assignor to Elkhart Mfg. Co., Monroe, Mich. Magneto-driving mechanism.

1,158,768. Meter Case. F. W. Andrews, assignor to Westinghouse Electric & Mfg. Co. Structural details.

1,158,781. Revolving Safety-Razor and Massage Mechanism. G. L. Bonham, West Hartford, Conn. Has driving motor in handle.

1,158,810. Induction Coil for Telephone Lines. S. B. Kent, assignor to Western Electric Co., New York, N. Y. Has core formed in separate sections spaced by insulating material and electrically connected by non-magnetic pins.

1,158,821. Railway-Signal-Recording Device. N. Lombard, Worcester, and W. E. Lombard, Arlington, Mass. Records operation of signal and also passage of trains.

1,158,824. Mechanism for Raising and Lowering Shutters or Curtains. E. H. McCloud, assignor to Kinnear Mfg. Co., Columbus, O. A number of curtains are selectively operated from electric motor-driven shaft and each curtain automatically controls reversing of motor.

1,158,834. Vibratory Electric Bath-Blanket. H. D. Parker, assignor of one-half to E. H. Phillips, Buffalo, N. Y. Layers of flexible material are stitched together and annealed steel resistor is between stitch rows; for connection to alternating-current circuit.

Digitized by Google

1,158,842. Protecting Device for Vapor Electric Apparatus. J. C. Pole, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. For preventing passage of current in reverse of desired direction in quartz lamp.

1,158,876. Controlling Means for Ignition Systems. L. C. Watson, and E. F. Boyer, Kansas City, Mo. Adjustable driving connection for advancing or retarding movable timer member.

1,158,894. Battery Well. C. A. Christofferson and W. M. McClintock, St. Paul, Minn. For signal cells; structure of metallic shell and fittings for burying in ground.

1,158,896. Protected Electro-Service Cut-out. R. C. Cole, assignor to Johns-Pratt Co., Hartford, Conn. Terminal clips on plate in bottom of box are engaged by clips on plate on hinged cover connected by fuse plugs, lifting of lid opening circuit and giving access to plugs.

1,158,898. Electrically Operated Device. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Special structure of magnet for operating vibratory contact.

1,158,899. Electric Furnace Intended Chiefly for the Manufacture of Nitrids. G. Coutagne, Lyon, France. Lower electrode is tubular carbonaceous block filled with coke and forming part of furnace base.

1,158,927. Automatic Telephone System. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Line and release relays for line switch initially energized by call, provision being made for continuing operation of line switch to select idle selector, line relay being thereupon de-energized, and release relay being de-energized on hanging up.

1,158,928. Terminal for Mercury-Vapor Apparatus. F. G. Keyes, assignor to Cooper Hewitt Electric Co. Platinum tube with core of iron is sealed in glass thimble and a cap fits about thimble and tube and is fused to thimble, the cap, tube and core being welded together.

1,158,930. Terminal Clip for Electrical Conductors. A. Klingner, assignor to A. R. Mosler & Co., Mount Vernon, N. Y. For securing to end of insulated conductor.

1,158,951. Impulse-Producing Mechanism. H. Pfannenstiehl and A. H. Adams, assignors to Western Electric Co.. For automatic telephone; contact device operated by finger disk is provided with governor controlling speed of operation.

1,158,954. Electrical Indicating and Regulating Apparatus. V. G. Apple, and G. B. Sayre, assignors to Apple Electric Co., Dayton, O. Special electromagnetic device governing connection of dynamo with battery circuit.

1,158,955. Switch. V. G. Apple and W. S. Miller, assignors to Apple Electric Co. Details of plunger-operated, snap switch.

1,158,967. Means for Detecting the Presence at a Distance of Icebergs, Steamships and Other Cold or Hot Objects. L. Bellingham, Turnbridge Wells, England. Comprises thermopile sensitive to infra-red wave lengths.

1,158,971 and 1,158,972. Electric Furnace. P. A. Boeck, assignor to Norton Co., Worcester, Mass. First patent: open-end receptacle has resistor in grooves in sides and bottom. Second patent: furnace chamber of refractory material has heat-distributing and equalizing envelop comprising previously molten alumina inclosing resistor and preventing overheating thereof.

1,158,988. Electrical Musical Instrument. J. C. Deagan, Chicago, Ill. Bells have electromagnetically operated hammers selectively controlled with provision for vibratory or single-stroke operation, as desired.

1,158,991. Spring Motor. A. F. Dixon and B. F. Merritt, assignor to Western Electric Co. Has electromagnet arranged to wind the spring.

1,158,997. Arc-Lamp Electrode. C. Field, Third, assignor to National Carbon Co., Cleveland, O. Carbon with double fluorides of potassium and zirconium.

1,159,021. Storage Battery. H. S. Hawkins, A. M. Green and I. W. Gibbins, Alturas, Cal. Unit having alternate disks of lead oxide and porous material clamped on a rod.

1,159,035. Storage-Battery Grid. W. S. Hutchinson, Montreal, Que., Canada. Columnar grid unit of conducting material carrying active material has peripheral covering of insulation held in position by transverse bars of insulation.

1,159,040. Electrical Distribution. N. Joleen, Chicago, Ill. Maximum-demand meter system.

1,159,046. Dynamo Suspension on Car Trucks. P. Kennedy, assignor to Consolidated Railway Electric Light & Equipment Co., New York, N. Y. Structural details.

1,159,047. Electric Lamp. H. Kimura, Gunn, Wyo. Pair of lamps mounted on handle are adjustable with relation thereto and each other.

1,159,061. Self-Starter for Internal-Combustion Engines. A. H. Midgley and C. A. Vandervell, Action Vale, England. Special structure comprising motor-driven friction wheel engaging periphery of flywheel.

1,159,074. Safety Device for Elevators. O. I. Nigh, Washington, D. C. Car-operating controller on one side, and cutout switch, which must be held to close operating circuit, on other side of door so that operator must obstruct doorway to operate car.

1,159,082. Electric Control for Delivery of Power. C. R. Pratt, assignor to Universal Speed Control Co., New York, N. Y. Differential gearing controlled by pilot motors.

1,159,093. Rheostat. T. Rhodus, Chicago, Ill. Helical resistance having its axis bent into a ring, has an interior rotatable contact arm successively engaging its convolutions.

1,159,111. Incandescent Lamp. F. Skaupy, assignor to General Electric Co., Schenectady, N. Y. Bulb contains halogen compound of thallium for lessening light obscuration by deposit of tungsten on bulb.

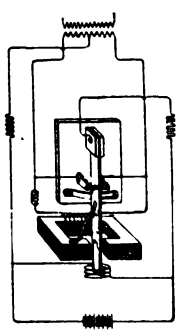
1,159,121. Dynamo-Electric Machine. C. W. Starker, assignor to Westinghouse Electric & Mfg. Co. Relates to structure and mounting of end members of stator.

1,159,124. Drop Light. J. I. Steen, Bakersfield, Cal. Special structure for ceiling attachment comprising spring take-up drum for cord and laterally extending telescopic arm having cord pulley at its end for adjusting lamp laterally.

1,159,126. Plate and Film Numbering Machine. J. R. Stephenson, Pullman, Wash. Details of mechanism employing electric light for printing the numbers.

1,159,128. Electric Security Device. C. Stille, Friedenau, near Berlin, Germany. Relay circuit is closed by particular conjoint operation of step-by-step mechanism and time switch.

1,159,154. Apparatus for the Electrolytic Manufacture of Alloys of Light Metals with Heavier Metals and the Continuous Treatment of Such Alloys for Obtaining Final Products. E. A. Ashcroft, London, England. Arrangement of electrolytic cells for the purpose indicated.



No. 1,159,189.—Vibrating Rectifier.

1,159,157. Electric Fly-Trap. W. A. Bass, Rio Vista, Tex. Bait-holding platform is surrounded by two coils of wire of different potential spaced apart.

1,159,174. Governing Mechanism for Mixed-Pressure Turbines. J. G. Callan, assignor to General Electric Co. Working range of governor for valves of turbogenerator set is controlled jointly by the high-pressure valve mechanism and falling off of generator load.

1,159,179. Flashlight Apparatus. J. L. Courson, assignor of one-half to T. D. Evans, Barberton, O. Igniting circuit of charge is closed by operation of camera-shutter-operating mechanism and new charge is electromagnetically brought into position when mechanism is released.

1,159,188. Intercommunicating Telephone System. G. Deakin, assignor to McMeen & Miller, Chicago, Ill. Pair of talking wires have a guard wire associated with them through which busy test and ringing circuits are alternately made.

1,159,189. Vibrating Rectifier. J. T. Dempster, assignor to General Electric Co. Electromagnetic vibrator operated by alternating current delivers the alternations as unidirectional impulses. (See cut.)

1,159,205. Protective Device. C. F. Frank, assignor to General Electric Co. Lightning-arrester horn gap has ground connection through mass of carborundum granules of critical breakdown voltage.

1,159,207. Attachment-Plug Receptacle. G. A. Gauthier, assignor to Arrow Electric Co., Hartford, Conn. Has rotary shutter with apertures normally out of register with receiving terminals but which may be moved into registry to admit plug contacts.

1,159,209. Method of and Apparatus for Producing Electrical Impulses or Oscillations. R. H. Goddard, Worcester, Mass. Circuit is connected to heated Wehnelt cathode in rarefied atmosphere and resulting beam of electrons is deflected alternately on number of anodes connected with the circuit, the currents inducing oscillations in another circuit.

1,159,224. Dynamo-Electric Machine. T. Hoock, assignor to Westinghouse Electric & Mfg. Co. Arrangement of air chambers and fan for ventilation.

1,159,226. Transformer. S. E. Johannesen, assignor to General Electric Co. Primary and secondary coils arranged one within the other have interposed magnetic shunt of iron ribbon wound transversely to leakage flux and having one end connected to core.

1,159,228. Electrical Winding. E. Keidel and F. Sieber, assignors to General Electric Co. Arrangement of windings on three-legged, three-phase transformer.

1,159,274. Vehicle Lamp. A. M. Roland, San Francisco, Cal. Arrangement of reflectors and lenses.

1,159,278. Artificial Electric Minnow. A. Sampey, Springfield, Mo. Head and tail portions joined by rigid strips separating transparent strips through which light shines from interior lamp bulb.

1,159,294. Electric Safety Device. T. J. Tobin, assignor to Bryant Electric Co., Bridgeport, Conn. Fuse receptacle and plug proportioned according to rating to prevent attachment of fuse of improper capacity.

1,159,296. Printing-Camera. J. Trimbach, Rye, N. Y. Unitary portable structure has electric light carried on collapsible support which is extended in printing.

1,159,306. Illuminating Apparatus. F. H. Weston, assignor to General Electric Co. Lamp receptacle adapted to be attached to line wires has provision for detachably securing a shade thereto.

1,159,307. Electrical-Discharge Device. W. C. White, assignor to General Electric Co. Device for detecting high-frequency oscillations.

1,159,312. Electric Automobile-Signal. F. A. Wright, Scranton, Pa., assignor of one-half to W. J. Brong. Illuminated direction-indicator has pointer electromagnetically controlled.

1,159,315. Induction System of Train Control. G. P. Finnigan, Wilton-on-James, Va. Signal and speed control controlled by flux change in magnetic circuit on car, on passing magnetic mass in track.

1,159,335. Seal for Vacuum Apparatus. F. G. Keyes, assignor to A. A. Noyes, Boston, Mass. In vapor electric apparatus barrier of yielding material is interposed between the fluid and a seal comprising a metal tube sealed in the vitreous envelope, to prevent injury of the metal tube.

Patents Expired.

The following United States electrical patents expired on November 8, 1915:

613,663. Connector. F. E. Case, Schenectady, N. Y.

613,669. Brush-Holder. A. E. Doman, Elbridge, N. Y.

613,688. Electric Switch. F. A. L. Roche, New York, N. Y.

613,705. Electric Timing Race Apparatus. J. I. McDonald, St. Joseph, Mo.

613,708. Electric Railway. J. F. McLaughlin, Philadelphia, Pa.

613,735. Electric-Circuit Controller. N. Tesla, New York, N. Y.

613,744. Mechanism for Holding Trolleys to Their Wires. W. R. Weaver, Covington, Ky.

613,778. Indicator Signal. P. Rabbidge, Syndey, N. S. W., Australia.

613,794. Electric Railway. W. M. Brown, Johnstown, Pa.

613,809. Method of and Apparatus for Controlling Mechanism of Moving Vessels or Vehicles. N. Tesla, New York, N. Y.

613,853. Electric Regulator. W. H. Chapman, Portland, Me.

613,864. Phosphorescent Electric Lighting. D. M. Moore, Newark, N. J.

613,869. Controlling Device for Electric Motors. F. J. Russell, New York, N. Y.

613,875. Marine Governor. J. T. Austin, Detroit, Mich.

613,880 to 613,882. Generating and Distributing Electric Energy. C. M. Green, Cleveland, O.

613,894. Dynamo and Electric Motor for Driving Vehicles. J. V. Sherrin, Ramsgate, England.

613,899. Instrument for Measuring Electric Currents. E. C. Eldredge, Springfield, Mass.

613,918. Electric Lighting System for Vehicles. R. N. Chamberlain and A. S. Hubbard, Belleville, N. J.

613,955. Flashlight Apparatus. S. D. Alter and L. T. Young, Philadelphia, Pa.

614,012. Primary Battery. C. Koenig, Berlin, Germany.

614,025. Brush-Holder for Dynamo-Electric Machines. G. L. Pratt, Atlanta, Ga.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 21. CHICAGO, SATURDAY, NOVEMBER 20, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich.....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
- Mica Insulation.....919
- The Conference on Valuation.....920
- Intangible Values.....920
- The Philadelphia Electrification.....921
- Nobel Prizes Awarded to America.....921

DEPARTMENTS:
- Commercial Practice.....929
- Electrical Construction.....932
- National Association of Electrical Inspectors.....935
- Public Service Commissions.....938
- New Electrical and Mechanical Appliances.....947
- Current Electrical News.....953
- Record of Electrical Patents.....957

LEADING ARTICLES:
- Features of Pennsylvania Electrification at Philadelphia.....923
- Business Hints for Dealer and Contractor.—By G. D. Crain, Jr. 932
- The Development and Operation of Outdoor Substations.—II.—By F. L. Hunt.....936
- Conference on Valuation of Public Utilities.....939

LETTER TO THE EDITOR:
- Some Law Regarding Contracts.—By W. M. Price.....946

BOOK REVIEWS.....946

MISCELLANEOUS:
- Boston Section Discusses Meters.....922
- Financier Says Utilities Are Big Money Savers.....922
- Illuminating Engineering Society.....922
- Philadelphia Section Activities.....922
- Telephone Display Adds to Attractiveness of Department-Store Show Window.....929
- The Function of a Utility Company in a Community.....929
- Louisville Electrical Interests Operate "House Electric".....930
- Electric Cooking Cheaper Than Gas in Salt Lake Apartment 930
- A Unique Electric Iron Float.....930
- W. A. Wolls.....931
- Massachusetts Contractors Investigate Licensees' Qualifications 933
- Among the Contractors.....934
- New System for Hospital Signal Lighting.....934
- Temperature of Mica Insulation.....942
- Tremendous Demand for Electrical Prosperity Week Sales Helps.....942
- Electrical Prosperity Week Meetings.....943
- Meeting of Electric Power Club.....943
- Large Electric Hoist for Montana Mine.....943
- Laboratory-Built Reactance of Large Capacity.....944
- Prize-Winning Electric Float.....945
- Million-Volt Transformer to be Demonstrated at the Panama-Pacific Exposition.—By Neill Willson.....945

Copyright, 1915, by Electrical Review Publishing Company, Inc.

MICA INSULATION.

At the time the Standardization Rules of the American Institute of Electrical Engineers underwent such a thorough revision a few years ago there was considerable discussion as to the proper allowable maximum temperature for those insulating materials which were designated as constituting Class B. This class consists of mica, asbestos and other materials capable of resisting high temperatures, in which a binder of such material as cotton, silk and paper is used for structural purposes only and may be destroyed without impairing the insulating or mechanical qualities of the insulation. Although manufacturers and many others were aware of the fact that mica was already being subjected to temperatures higher than 125 degrees centigrade without damage to the machinery, this temperature was nevertheless selected as the maximum temperature to which material of this kind may be subjected and the rules specify that the capacity of electrical machinery is to be determined upon this basis. The figure chosen was of course very conservative, but was finally selected to satisfy those who were not aware of what has already been accomplished in the use of mica at higher operating temperatures. Unfortunately sufficient data actually obtained under operating conditions were not at the time available to constitute a decisive argument on this point.

The paper presented by Mr. F. D. Newbury at the meeting of the American Institute of Electrical Engineers last week supplies experimental evidence of the kind desired, and, in the opinion of most of those familiar with the matter, gave sufficient justification for immediate change of the figure in the Standardization Rules to 150 degrees if not higher. The experiments described by Mr. Newbury resulted in the actual measurement of operating temperatures over 200 degrees in a machine which has been in steady service for 20 years, and in which the insulation is still in good operating condition. The fact that operation has frequently been carried out with loads greater than those utilized during the test shows that still higher temperatures than those measured may have been experienced at certain times, and, according to Mr. Newbury, these have probably exceeded 250 degrees. This machine is not of modern design and the operating voltage is only 2,300 volts. It does not follow that such operating temperatures would be safe in all types of machine and it is generally agreed that it would not be safe to raise the permissible temperatures above 200 degrees centigrade. As to what would be the best limiting temper-

Digitized by Google

ature to adopt in the range between 125 and 200 degrees is a matter of opinion and perhaps more evidence will be necessary to definitely determine this point. There seems little doubt, however, that no danger will be involved in permitting operating temperatures of from 150 to 180 degrees.

Those who have not been familiarly acquainted with the design and operation of electrical machinery under modern conditions may not be ready to adopt a step which at first may appear somewhat radical, but those to whom information has been available have long realized not only that mica may be safely exposed to higher temperatures than those specified in the past but that it has actually been so exposed in machinery long in successful operation. The actual temperatures attained have not been definitely known, and even those most intimate with this subject have been somewhat in the dark as to exactly what has been going on. Additional observational data along these lines will be very welcome to the industry.

THE CONFERENCE ON VALUATION.

The Utilities Bureau which was endorsed by the conference of mayors held in Philadelphia about a year ago has been definitely launched and a conference on the valuation of utilities which was called by it took place last week in Philadelphia and is reported elsewhere in this issue. The desire was expressed at this conference that such gatherings be made an annual event and it seems probable that this desire will be carried out.

This year's conference was valuable in bringing together a large number of those who have been devoting a great deal of attention to matters connected with the regulation of utilities. Among the number were members of public service commissions, representatives of a few utility companies, rate experts, etc. Most of the opinion expressed in the various sessions was from the standpoint of those who claim to represent the interests of the public as opposed to the interests of utility corporations. Nevertheless, in most cases both sides of the debatable points at issue were brought out and authorities of various kinds were cited for the different points of view. It was evident that the subject is still in a somewhat chaotic state.

One of the principal questions at issue was as to whether the return permitted to a utility company should be based upon reproductive cost or original cost. So far as equity between investor and consumer is concerned, original cost would seem to be the fairest basis. In many cases, however, original cost cannot be determined and recourse is necessarily had to the cost of reproducing the property. Many court decisions have approved of this method and it has even been specifically required by certain statutes. In most cases this method of appraisal will result in a higher valuation than one based upon original cost, since the present is a time of high prices for both material and labor. At the present time such a policy therefore redounds to the benefit of the utility companies, but it should be kept in mind that under conditions which may obtain in the future the method might be correspondingly prejudicial to their interests.

A determination of rate questions upon the basis of actual investment in the property might therefore seem to be the fairest and also the safest basis for safeguarding the interests of both investors and the public in the long run. In cases where the question of confiscation is to be decided by the federal courts, previous decisions would indicate that the actual present value of the property would have to be given main consideration, but in determining fair values for rate-making, suitable legislation might require commissions and local courts to give principal weight to the actual investment, as is already done in Massachusetts.

INTANGIBLE VALUES.

Probably more disputes arise in the valuation of public utility properties for rate-making purposes over intangible values than over any other debatable element. Of the elements of intangible value those representing a legitimate actual outlay, as for organization expenses, are generally accepted as proper and allowable. Other items, such as franchise value, going value and early losses, are frequently bones of contention for which no definite rules have as yet been developed for general application. Certain elements are said to have value in connection with appraisals for purchase or condemnation, while not having value which should be considered in connection with rate-making. Values which result from the capitalization of present earning power are usually placed in this class. It is claimed that such values would not exist if the regulatory power had been previously used to establish reasonable rates, and if such values are recognized no rate already in existence, however high, can be deemed unreasonable except possibly with respect to its relation to other rates. To destroy any part of the present income by reducing rates will destroy the intangible value represented by capitalized earning power.

With respect to the value of a going concern as distinct from that of the physical property alone, opponents of this allowance claim that an ordinary appraisal is made from the standpoint of a going concern and that otherwise the physical property would have only scrap value. The decision of the Supreme Court of the United States in the Des Moines gas case is pointed to as an endorsement of this idea by that tribunal. However, this and other cases coming before the highest court which have involved this question in any way, have not brought forth an opinion which has elucidated this point in such a manner as to place it beyond dispute, and it will probably be necessary to take other cases involving the point to the Supreme Court before a general rule is recognized. It should be remembered, however, in this connection, that the rulings of the federal courts are usually made from the standpoint of infringement of rights which are

Digitized by Google

guaranteed by the fourteenth amendment of the constitution of the United States. The courts merely decide how far regulating commissions may go without confiscation. The rules which they lay down in these cases are not to be considered decisive in determining what elements of value should be allowed in fixing reasonable rates.

The question of franchise value has never been clearly settled by the Supreme Court, but it is probable that this will be done in a case now pending which has been appealed to it by the Public Service Company, involving the rate for gas in Passaic, N. J. The points involved in this case have already been discussed in these columns upon several occasions.

THE PHILADELPHIA ELECTRIFICATION.

A description is given in this issue of the electrification of the main line of the Pennsylvania Railroad, between Philadelphia and Paoli. Electric power is used only for suburban passenger service, and its adoption was dictated principally by the congestion at the Broad Street terminal. This growing demand for trackage and switching in the station approaches has partly been met by dispatching trains through from New York to Pittsburgh and Washington, without entering the main station at Philadelphia, but continual growth of traffic demanded further relief. The adoption of electrification for suburban trains adds to the train capacity of the terminal, and equipment of the Chestnut Hill and other suburban lines will follow the initial installation.

Electric operation has been going on for some months and has given great satisfaction. The single-phase system was chosen, not primarily on account of its suitability to the work in hand, but with regard to the extension of electrification to through traffic, which will no doubt take place on this system at some time in the future.

Two features are especially to be noted in connection with this electrification. One is the purchase of electric energy from the local central station. The Philadelphia Electric Company, after a study of the proposition, found itself enabled to offer a rate for this supply which would be advantageous to both purchaser and central station. The railroad is thus relieved of both investment and care required for it to operate a separate power house of its own. Single-phase current is delivered to the railroad at 13,200 volts and stepped up to 44,000 volts for transmission to the substations. At the substations the voltage is stepped down to 11,000 volts and supplied to the cars at this pressure. The substations are operated without attendants, and this is another feature of interest, but one to be expected where there is no rotating apparatus in operation.

Separate supply of current is supplied for signal lamps, so that failure of the motive supply will not interfere with steam operation. This is especially desirable for a case of mixed operation.

NOBEL PRIZES AWARDED TO AMERICA.

The first press dispatches stating that the Nobel prize in physics for the year 1915 has been awarded to two American investigators has been confirmed by the official announcement. The award has been made to Thomas A. Edison and Nikola Tesla, both of whom are best known for their inventions in the practical electrical field. The work of both, however, has had an important bearing upon the more theoretical and physical aspects of electrical science, and it is gratifying to find two practical American men of genius carrying off the award in a scientific field.

The recognition of the researches of these inventors comes rather late but is none the less welcome. The work upon which the reputation of each is principally based was done many years ago, but in making the Nobel awards, consideration is given not merely to the attainments of those under consideration during the past year, but to the total accomplishments of their entire lives.

Dr. Edison's name is probably best known in connection with the incandescent lamp, the phonograph and the storage battery, but his investigations have covered a much wider field and even the inclusion of his telegraph inventions and other technical applications does not exhaust the field of his accomplishment. A number of principles which are of importance in physics were first demonstrated by him and the variety and extent of his work are evidenced by the fact that he has received patents upon more than nine hundred inventions.

These include in their subject matter the carbon telephone transmitter, the kinetoscope and kinetophone, the microtasimeter, the aerophone, the mimeograph, and poured concrete houses. His work has been recognized in various ways. He is a Commander of the Legion of Honor and has been awarded the Rathenau and Adelskiold medals, as well as an honorary degree of doctor of philosophy.

Dr. Tesla similarly is best known from his practical work with the alternating-current motor and the production of high-frequency currents. The latter work, however, involved physical principles which had not previously been applied and he was the first, through the use of what is known as the Tesla transformer, to produce high voltages at exceedingly high frequencies. At the time this was first done they were of merely physical interest but developments since that time have added to the practical importance of this work. His more recent work with the reversible turbine and pump is also of scientific as well as practical interest.

The award in chemistry to Prof. Theodore W. Richards brings another deserved prize to this country. The work of Professor Richards at Harvard University is generally recognized as the most thorough and exhaustive in the study of atomic weights that has been done anywhere, and it is appropriate that it should receive this recognition.

Digitized by Google

Boston Section Discusses Meters.

At the November meeting of the Boston Section, American Institute of Electrical Engineers, held November 9, at the Engineers' Club, W. H. Pratt, of the General Electric Company, Lynn, Mass., described the construction of meters.

William Bradshaw, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, showed a new prepayment device which is used in connection with a standard meter. Instead of a device which is set forward when the coin is inserted and which returns to "O" after the amount of energy has been used, this apparatus has two hands which coincide when the switch is open. When the coin is inserted and the device turned, one hand goes to the point representing the limit of the coin's value and the travel of this indicator shows the amount yet to be used.

In the discussion, the relative usefulness of diamonds and sapphires as meter bearings was touched upon. It was stated that the diamond is the superior where there is a heavy moving element, and is used mainly in meters of high capacity. The costs of these stones is about one dollar each, they being chips discarded in jewelry cutting. It was pointed out that a film of high quality oil adds to the life of meter bearings.

The next meeting of the Section will be held December 7. A plan is being perfected for a joint dinner of the electrical, mechanical and civil engineering societies of Boston in January.

Financier Says Utilities Are Big Money Savers.

Tribute was paid to public utility corporations as money savers to the people, government investigation of capital was decried and a bright future for the United States was predicted in an address by Thomas W. Andrew, cashier of the First National Bank, of Philadelphia, at the weekly luncheon of the Jovians at the Hotel Adelphia, Philadelphia. "The business outlook for the country is all right," he said, "and a man who is a bear on the United States will go broke." The speaker also intimated that the place of the Federal Reserve Bank in its relation to the general banking system of the country had not been fixed to the satisfaction of the national banks as a class. The speaker, after touching upon the money trust investigation, said that for a while the idea was abroad that anything that was big was iniquitous. "A year ago," Mr. Andrews said, "I remarked to a man who shared this idea that I wished all the public utilities, the street cars, telephone, gas, electric light and other companies would suddenly stop doing business. It would bring people to their senses and cause them to realize the great benefits received from the public utility concerns."

Illuminating Engineering Society.

At a meeting of the Council of the Illuminating Engineering Society, held November 11, it was announced that a special edition of the "Code on Lighting of Mills and Factories" would be published within a week. This edition is to be distributed to factory, mill, legislative, lighting and other authorities at a nominal price.

Hereafter the badge of associate members is to have a maroon field, while that of members will be blue.

C. A. Littlefield was appointed general secretary to succeed Alten S. Miller, resigned.

Further arrangements were made for the convention, which is to be held next February to mark the tenth anniversary of the organization of the Society. Plans for the proposed course of lectures, similar to that given at Johns Hopkins University in 1910 under the joint auspices of the University and the Society, were discussed but the place and definite dates were not set. It has been decided, however, that the course will be given early next fall, probably immediately following the annual convention which is usually held during the latter part of the month of September.

Lincoln Highway Association Holds Annual Meeting.

The annual meeting of the directors of the Lincoln Highway Association was held on November 10 at the offices of the national headquarters in Detroit, Mich., and important plans for the future development of the great national thoroughfare were formulated.

Officers for the coming year were elected as follows: Henry B. Joy, president; Carl G. Fisher, vice-president; Roy D. Chapin, vice-president; Emory W. Clark, treasurer, and Austin F. Bement, secretary.

Of highest interest among the plans for the coming year will be the building of as large a number as possible of seedling miles along the entire route.

Nobel Prize for Edison, Tesla and Richards.

To Prof. Theodore William Richards of Harvard University has been awarded the postponed 1914 Nobel chemistry prize for fixing the atomic weights of chemical elements, a Stockholm dispatch reports.

The 1914 prize for physics goes to Prof. Max von Laue of Frankfort-on-Main, for discovering the diffraction of X-rays in crystals.

The awards of the 1915 prizes have also been made as follows:

Physics—Thomas A. Edison, Nikola Tesla.

Chemistry—Prof. Theodor Svedberg.

Philadelphia Section Activities.

"Preparedness" on the part of the employee was the subject discussed at the opening meeting of the Philadelphia Electric Company Section, N. E. L. A., October 18, and a capacity attendance of over 500 members listened in close attention, as President Joseph B. McCall, in a forceful and interesting address, discussed the many important points incident to this timely subject.

Mr. McCall laid particular stress upon the educational work being done by the Philadelphia Electric Company and other large electrical companies throughout the country in assisting employees to qualify for advancement, and especially urged the younger men to take advantage of these opportunities if they hoped to qualify for the higher positions in the industry.

Vice-President Eglin followed with a brief address emphasizing the value of co-operation as manifested in the results at Station "A-2" and then awarded the prizes offered by Mr. McCall for the three best papers on "Economies in Operation or Management." The first prize of $50 in gold was awarded to N. E. Funk, of the Operating Department, for his paper on "Boiler-Room Efficiency;" the second and third prizes of $25 in gold each, to Frank T. Adams of the Underground Department and Harold Goodwin, Jr., of the Distribution Department. Mr. Adam's paper is entitled: "A Description of Underground Construction of Conduit and Cables for Electrical Purposes, with Suggestions on Economy"; and the title of Mr. Goodwin's paper is: "Single, Two, Three and Four-Phase Distribution."

The opening meeting of the Commercial Branch was held on Monday evening, October 25. Charles J. Russell, sales manager of the Philadelphia Electric Company, addressed the meeting on the subject of "Systematic Sales Effort." Mr. Russell's paper contained many valuable points.

The November meeting of the Engineering Department Branch was devoted to a discussion of the steam-flow meter. The speaker was John Bernard, of the Operating Department.

The November meeting of the Meter Department Branch was devoted to a discussion of subjects related to metering. Henry Duus spoke on "Sangamo Meters" and Paul F. Quinlan, Jr., on "Experiences with Westinghouse Meters."

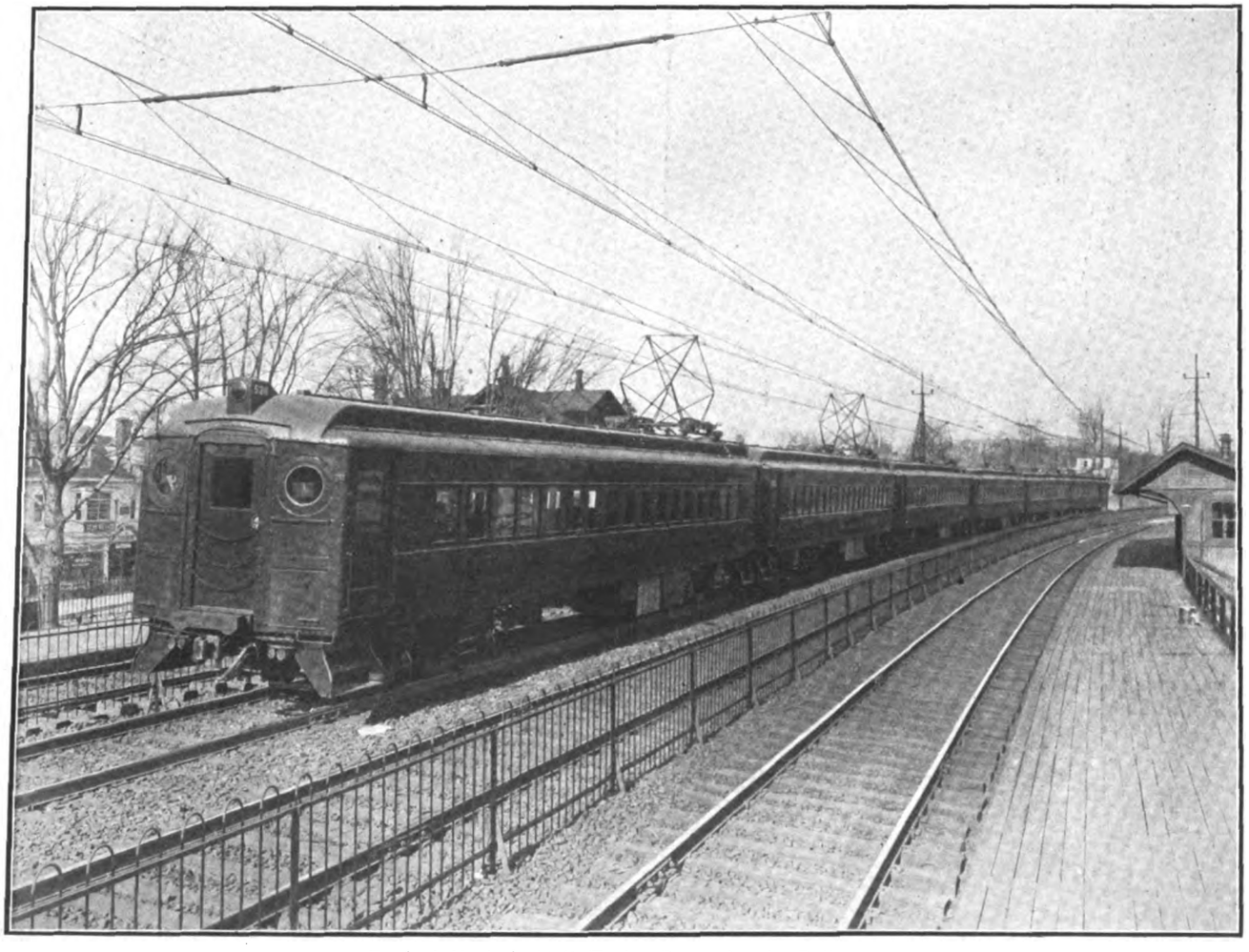
The November meeting of the Section will be addressed by Douglass Burnett, commercial manager of the Consolidated Gas, Electric Light and Power Company, of Baltimore, Md., on the subject of "Self-Advancement."

Digitized by Google

FEATURES OF PENNSYLVANIA ELECTRIFICATION AT PHILADELPHIA

This article deals with the important features of the electrification of the Pennsylvania Railroad, from Philadelphia to Paoli, comprising 93 miles of track. Single-phase energy at 11,000 volts, 25 cycles, is employed and all power is purchased from the Philadelphia Electric Company.

The electrification of the suburban service of the Pennsylvania Railroad between Broad Street Station, Philadelphia, and Paoli is the first electrification undertaken by that company in the vicinity of Philadelphia and its primary purpose is to increase the capacity of Broad Street station and thus to relieve congestion at the terminal. Broad Street station is of the stub-end type having 16 station tracks approached by six main line and three yard tracks on an elevated railroad which crosses the Schuylkill River from West Philadelphia, at which point the routes divide for New York toward the north, Washington toward the south and Pittsburgh toward the west. In addition to the through passenger train service accommodated at Broad Street station, there is an extensive suburban service extending over six different routes. The growth of all business in recent years has been such that the limit in capacity of the station has been reached and many plans have been formulated and discussed for relief by physical enlargement of the station and its approaches or by rerouting movements. All of these plans involve extensive reconstruction and would require much time for their accomplishment so that some more expeditious method of obtaining relief was desirable. The possibilities of electric traction as a means to this end were examined into by committees consisting of operating officials of the road and their analysis and estimates indicated that during the rush hours the relief which would be secured by the electrification of the suburban Paoli service alone would be equivalent to increasing the station capacity by an amount equivalent to 17 or 19 per cent of the Paoli service and for the station as a whole would be equivalent to the relief accomplished by reducing the total number of trains by about 8 per cent. A similar increase in capacity would result from the electrification of other suburban lines and work in connection with one of these, namely, the Chestnut Hill service, has already commenced. This increase in capacity is effected by electrification because mo-



Typical Multiple-Unit Train—Pennsylvania Railroad.

Digitized by Google

tor-car trains are substituted for those hauled by locomotives and thus the shifting back and forth from one track to another of cars and drafts and movement of empty power is eliminated, also there is some gain in capacity due to the quicker acceleration of trains and shorter length of track occupied by a given train when the steam locomotive is omitted. Relief thus afforded by electrification of the Paoli and Chestnut Hill lines is estimated to be sufficient to take care of the normal growth of business for the next seven or eight years and the period of relief can be further extended by the electrification of other suburban lines, should the trial of this initial electric service meet expectations.

It is estimated that under electric operation there will be sufficient saving in operating costs as compared with steam to pay interest on the investment, which, in this case, includes the most expensive portion of the work in that the entire Broad Street terminal with elaborate yard and restricted property lines and approaches thereto form a part of the construction required for a relatively small amount of train service. This is not an unfavorable result under the circumstances, meaning as it does that the increased capacity thus obtained will in part, at least, be self-sustaining, whereas increased capacity by physical enlargement would give no direct return upon the heavy investment. In addiiton there are the other contingent and important advantages of electrification such as higher speed of trains, more punctual service, especially in bad weather, and more cleanly and attractive conditions for the traveling public.

Electric System.

Analysis of service conditions and cost estimates covering all available electric systems led to the conclusion that one using a very high-voltage overhead contact wire and one which eliminates moving machinery in substations for the supply of power is most suitable and also the most economical from the standpoint of both first and operating costs. In arriving at a conclusion as to system, primary importance was attached to the feature of possible long-distance operation over the entire divisions affected rather than to the requirements for present short suburban electric service. In this case 11,000-volt, single-phase, 25-cycle power is supplied directly to the trains from the overhead catenary trolley system.

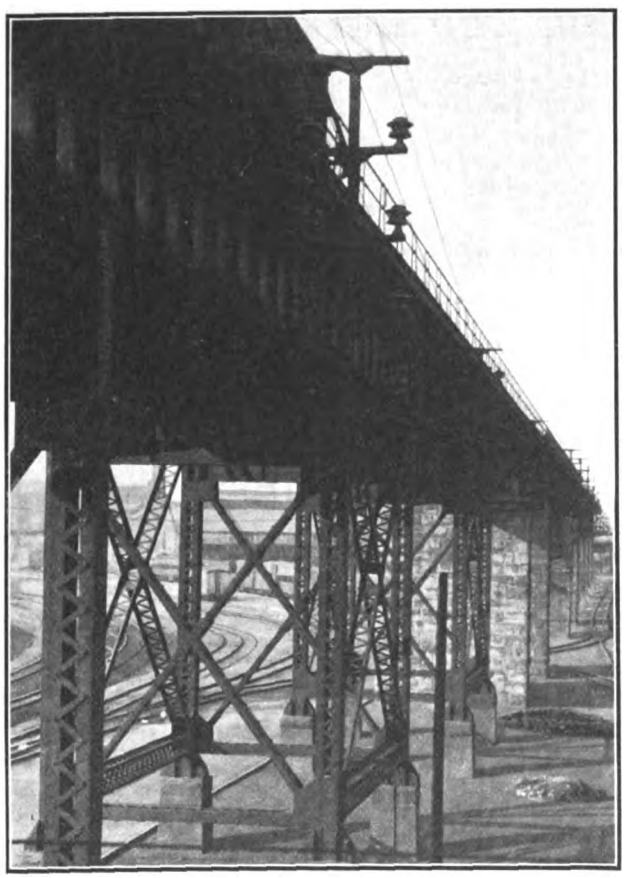
While the studies which preceded this work involved the possible future electrification of several different railway divisions and classes of service, the present installation covers the suburban passenger service only and involves about 43 trains each way per day from Philadelphia westerly to Paoli on the main line of the Philadelphia division. From Broad Street station the main tracks are electrified for 20 route miles, including also a coach yard at West Philadelphia and a coach and repair yard at the end of the electrified section at Paoli. The present electrification embraces about 93 miles of track.

Power Supply.

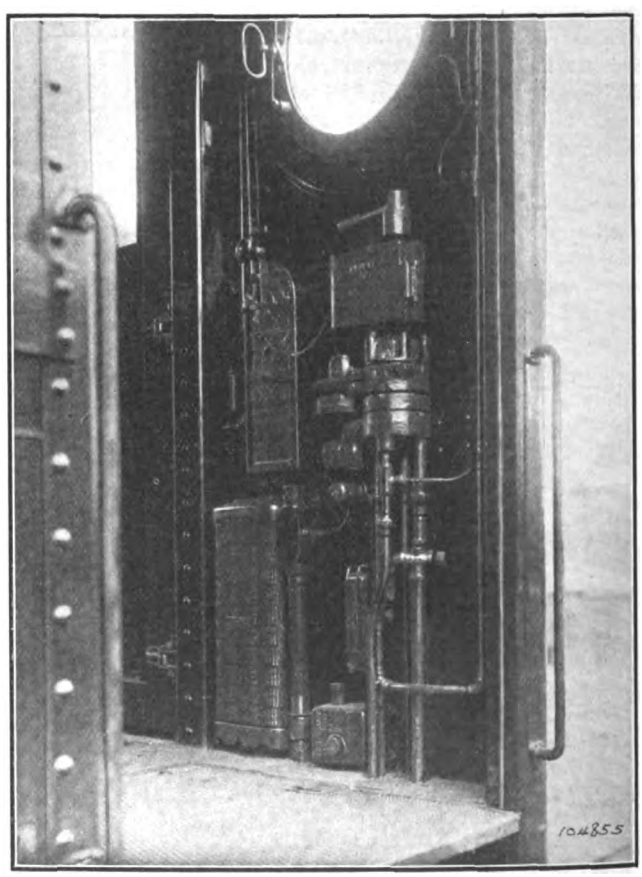
Power for traction purposes is purchased from the Philadelphia Electric Company and is generated in its main power station at Christian Street on the easterly bank of the Schuylkill River about a mile south of West Philadelphia passenger station. It is delivered to the railroad company at a substation on the westerly bank of the Schuylkill River opposite the main generating station, the connection between the power house and the substation consisting of armored submarine cables under the river.

While the present service is on one phase only of the power company's three-phase generating system, the plan is to supply the succeeding or future electrification power requirements from the remaining phases.

The power is delivered to the railroad company's substation at 13,200



Four Transmission Lines Between Arsenal Bridge and West Philadelphia Substations.



Interior of Motorman's Cab Showing Control Apparatus.

Digitized by Google

Arrangement of Apparatus in Typical Substation.

volts. Here it is stepped up to 44,000 volts and by means of duplicate single-phase overhead transmission circuits is transmitted to the step-down substations. Special provisions have been made by the Philadelphia Electric Company to balance this single-phase load as well as to correct for the relatively low power-factor in order that the full three-phase capacity of its generating units may be available.

Transmission.

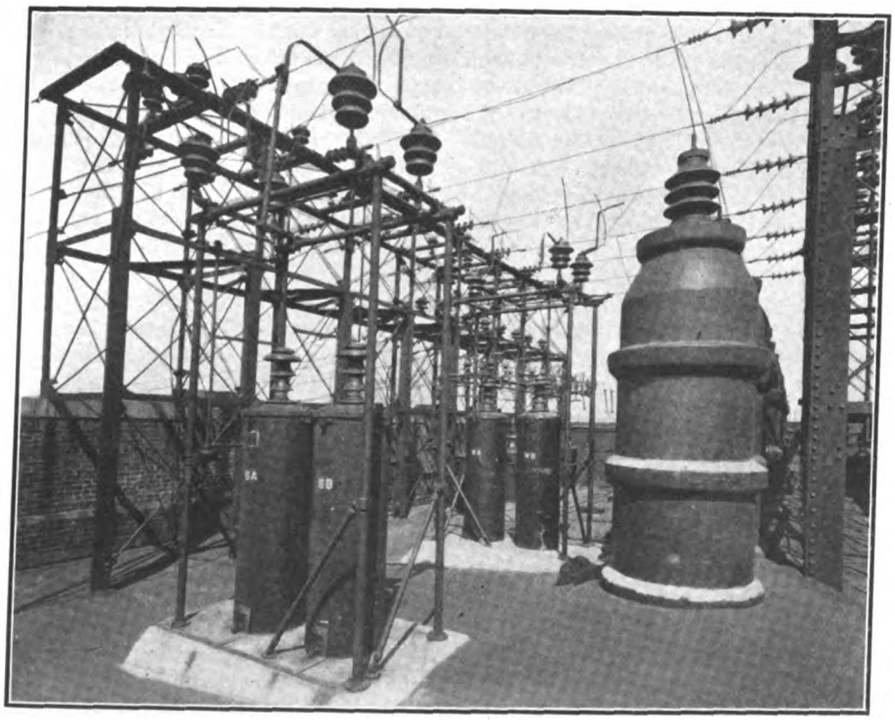
Power at 25-cycles and 13,200 volts is transmitted from the Philadelphia Electic Company's power house on the east bank of the Schuylkill River to the Arsenal Bridge substation over four 350,000-circular-mil, three-conductor submarine cables. On the west bank of the river, the submarine cables are connected to paper-insulated, lead-covered cables, installed in clay ducts. Switchboard meters are provided on each of the incoming 13,200-volt feeders.

From the Arsenal Bridge substation there are four 44,000-volt single-phase transmission lines to the West Philadelphia substation. These four single-phase lines will tee into the West Philadelphia substation and two of them continue on to the Bryn Mawr and Paoli substations and the other two will later go to the Chestnut Hill substation.

The four transmission lines are carried on brackets on the side of the elevated structure between the Arsenal Bridge substation and the West Philadelphia substation. Beyond the West Philadelphia substation the lines are carried on the catenary supporting structures. Along the right-of-way the lines are carried on both sides of the tracks. Horn-gap switches for sectionalizing are installed on the roofs of the West Philadelphia, Bryn Mawr and Paoli substations and lightning arresters on the roofs of all substations.

The transmission lines are 2/0, seven-strand, hard-drawn copper wires. Wires are spaced 5 feet apart where the two wires of a single-phase feeder are on the same cross arm and where there is more than one circuit on a pole the vertical spacing is 3 feet 6 inches. The lines are protected by a three-eighths inch steel ground wire on the top of the poles. Where the transmission lines pass under highway bridges, the ground wire is dead-ended on the bridge structure and the wires carried on post-type insulators.

Where the lines pass under the Belmont and Girard Avenue bridge, which on account of its width approaches tunnel conditions, they are covered with rubber and varnished-cambric insulation. The joints between the bare and insulated wire either side of the bridge are made outside of porcelain sleeves filled with compound. The wire is continuous throughout the sleeve, the insulation being tapered off inside the sleeve.



Electrolytic Lightning Arresters on Roof of Substation.

At the Arsenal Bridge substation, the lines are protected by relays which operate on overload and on an unbalanced load in either leg caused by a ground. In the other substations the relays operate only differentially, and in case of a ground between substations the circuit on which the trouble occurred would be cut out first in three of the substations and finally at the Arsenal Bridge substation. Overload relays are provided in the 13,200-volt lines at the Philadelphia Electric Company's power station and reverse current relays in these feeders in the Arsenal Bridge substation.

The pin-type porcelain insulators used on the transmission lines are 8.4 inches high and 12 inches in diameter, made up of four parts.

These insulators withstand the following tests:

Dry flashover	165,000 volts
Wet flashover	120,000 volts
Puncture	250,000 volts

After erection, the transmission lines were tested out at a potential of 66,000

Digitized by Google

volts, or three times the working pressure, to ground.

Substations.

Transformer substations are provided for stepping up the voltage for transmission and for reducing it at suitable points along the railroad to that required in the contact conductors.

The Arsenal Bridge step-up substation is located on the west bank of the Schuylkill River opposite the power house of the Philadelphia Electric Company, about one-half mile distant.

The West Philadelphia substation is located in the West Philadelphia yard, one mile from the Arsenal Bridge substation.

The Bryn Mawr substation is located at Bryn Mawr, 10.2 miles from the Arsenal Bridge substation.

The Paoli substation is located at Paoli, 20.1 miles from the Arsenal Bridge substation.

The substation equipment is housed in substantial fireproof brick buildings adjacent to the tracks. The lightning arrester equipment and high-tension feeder-sectionalizing switches are located on the roof; the bus bars and switching equipment on the second floor, and the transformers on the ground floor.

The installed capacities of the substations are as follows:

Arsenal Bridge, three 5,000-kilovolt-ampere step-up transformers.
West Philadelphia, two 2,000-kilovolt-ampere step-down transformers.
Bryn Mawr, two 2,000-kilovolt-ampere step-down transformers.
Paoli, two 2,000-kilovolt-ampere step-down transformers.

Space is provided in all substations for 100 per cent increase in capacity.

The transformers in all substations are of the 25-cycle, single-phase, oil-insulated, water-cooled type. The primaries of the step-up transformers in the Arsenal Bridge substation are wound for 13,000 volts and the secondaries for 44,000 volts. The primaries of the step-down transformers in the other substations are wound for 44,000 volts and the secondaries for 11,000 volts. Several voltage taps are provided on the primary and secondary coils of all transformers. The cases of all transformers are mounted on wheeled trucks and in each substation a transformer truck and chain hoist are provided for handling the transformers and cores. They are also equipped with thermostats which operate an alarm bell in case of high temperature in the transformers. Oil filtering and drying apparatus is located in each substation and a tank is provided into which the oil may be drawn off from the transformers.

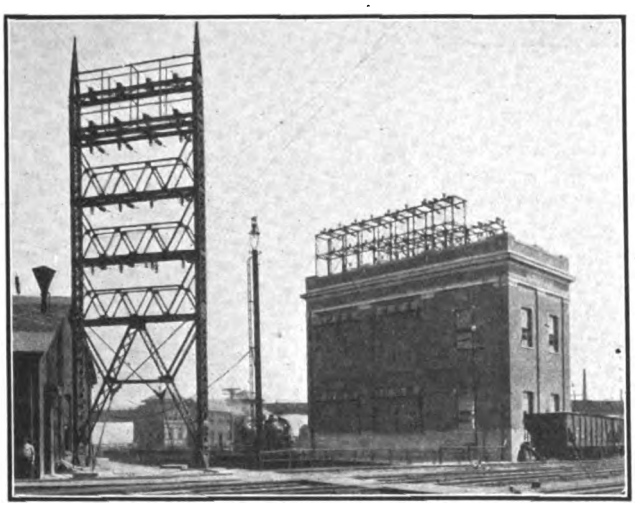
The neutral point of the high-tension winding of the step-up transformers is grounded, through a grid resistance, thus limiting the potential to ground from either side of the 44,000-volt transmission lines to 22,000 volts.

The lightning arresters on all 44,000-volt and 11,000-volt lines are of the electrolytic type and are located on the roofs of substations. All 44,000-volt circuits are connected to the buses in the various substations through oil circuit-breakers. The tanks of these circuit-breakers are made of heavy boiler plate and they are arranged along the floor without barriers. The circuit-breakers of the 11,000 and 13,000-volt circuits are of the oil type, those on the 11,000-volt trolley circuits being two pole with a reactance connected across one pole. The circuit-breakers are automatic and remote controlled. One of the accompanying illustrations shows the arrangement of apparatus in a typical substation.

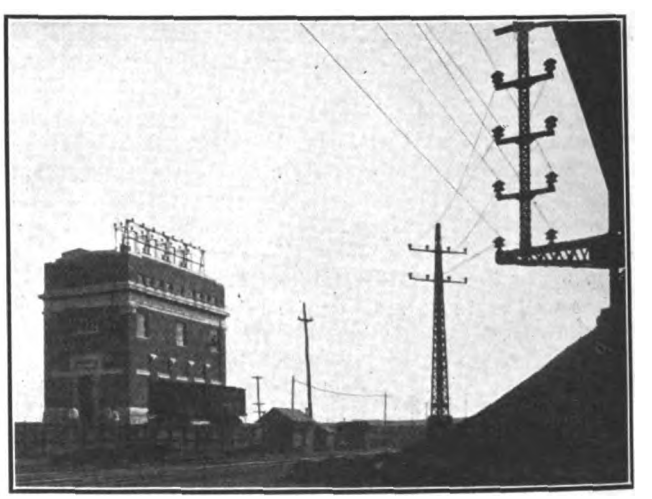
Open buses mounted on insulators carried by pipe framework are used throughout. In general all power wiring is bare and copper tubing or solid wire is used. Sufficient clearance has been provided so that no barriers are required between buses or wires except in the case of the incoming cables from the Philadelphia Electric Company in the Arsenal Bridge substation. Control, instrument and lighting wires are rubber insulated and run in conduits. The 44,000 and 11,000-volt buses are sectionalized in each station normal operation being with these bus disconnecting switches closed. In the step-down substations one transformer is connected to each side of the bus. One leg of the 11,000-volt side of all step-down transformers is connected to a bus through a disconnecting switch. This bus is connected to the track rails.

Power for the opening and closing of oil circuit-breakers is obtained from the 44,000 or 11,000, 25-cycle buses except in the case of the Arsenal Bridge substation where power is obtained from the 13,000-volt bus. Two transformers are provided in each substation, stepping down to 440 and 220 volts. The closing solenoids and hand trip coils on all circuit-breakers are operated on 440 volts. Series type relays are provided for the automatic tripping of all circuit-breakers. Power for lights and miscellaneous purposes is also obtained from these transformers. Sixty-cycle power is also provided in all substations to trip circuit-breakers in case of the loss of the 25-cycle traction power.

Except in the West Philadelphia substation where the power director or system operator is located there are no attendants. A switchboard, with the necessary instruments, controllers and indicating lamps, is provided in signal towers near the Arsenal Bridge, Bryn Mawr and Paoli substations. This board is connected with the board in the substation through a control cable and the opening and closing of circuit-breakers is done by the tower man. Telephones are provided in all substations and the signal towers controlling them so that the power director is in constant touch with all substations and tower men.



West Philadelphia Substation.



Arsenal Bridge Substation.

Digitized by Google

An alarm bell connected to the thermostat on the transformers is located in each signal tower.

Catenary System.

In order to try out the various types of structures and details considered for this work, an experimental four-track section about a mile long was completely equipped in the fall of 1913. An examination and study of this led to the adoption of what is called the "tubular cross-catenary bridge" for carrying the catenary trolley wires.

One of the illustrations shows one of these structures before any longitudinal wires were erected. On either side of the tracks a tubular steel pole is set and grouted into a concrete foundation. Each pole has a double guy anchoring the pole away from the tracks and spanning the tracks between the poles are two cross wires forming the cross catenary bridge which carries the longitudinal wires.

This type of structure has been used throughout wherever the property or arrangement of tracks will permit. Where there is no room for guying, self-supporting structural steel posts have been used.

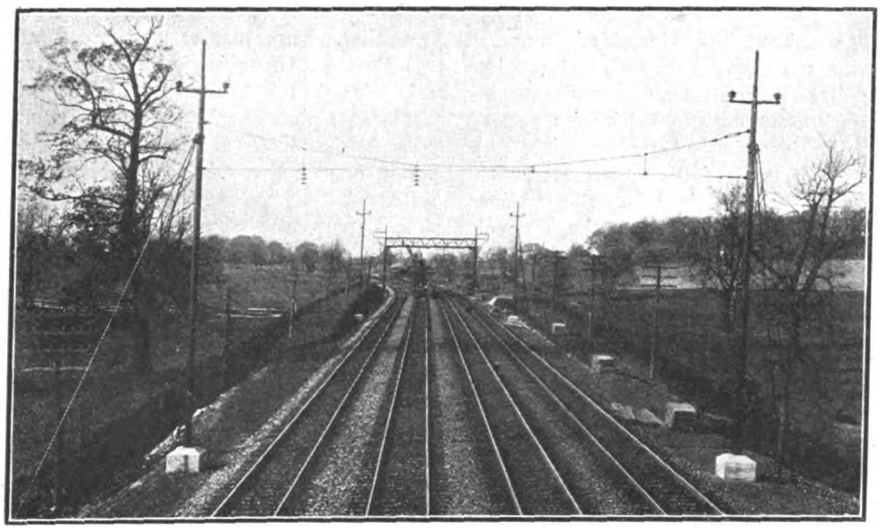
Each catenary structure or bridge is grounded by means of a copper plate buried in coke. The guy rods are attached to the pole by means of heavy steel castings.

The cross wires are of extra-high-tension galvanized steel strand, the upper strand usually being 0.75 inch and the lower one 0.5 inch in diameter. Both are socketed at each end and at one side a turnbuckle is installed to permit of adjustment. The top and bottom cross wires are joined together by means of a vertical 0.75-inch rod and suitable malleable-iron clamps, etc., at the points where insulators carrying the longitudinal wires are located.

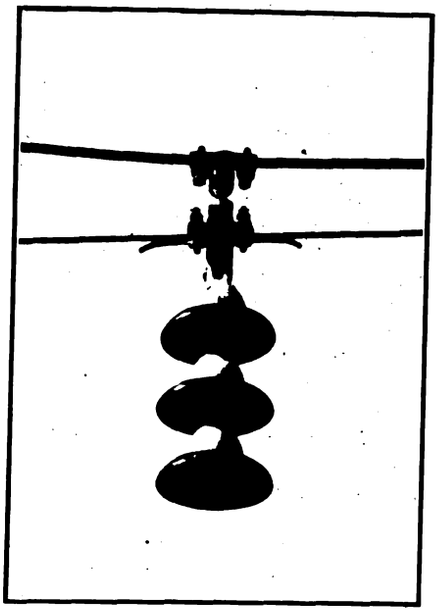
One of the accompanying illustrations shows a detail view of an insulator supported by these cross caternary wires. Each insulator consists of three suspension-type units, the porcelain being 8 inches in diameter and the flashover value of the three being many times that of the line voltage.

The cross wire bridges are located about 300 feet apart on tangents, but are closer on curves, the exact spacing depending upon the degree of track curvature. After the bridges are erected, insulators are suspended approximately over the center of each track; these being precisely over the center of the track on tangents but are offset towards the outside of the curve on curved track.

After the insulators are erected, the main messenger wire is strung out and suspended from them. This is a 0.5-inch extra-high-tension seven-strand double-galvanized steel cable, having a sag of 5 feet in a span of 300 feet. Every mile or two this messenger is socketed and dead-ended on one of the heavy structural signal bridges which are spaced about 0.5 mile apart. The messenger is insulated from the signal bridge by using two or more sets of three-unit suspension-type insulators, these insulators being similar to those used for suspending the messenger from the cross wire and other bridges.



Section of Line Showing Catenary Construction.



Detail of Insulator Used in Pennsylvania Electrification.

Booster Transformers.

In order to minimize the inductive effect of the traction currents on adjacent telephone and telegraph wires, a special system has been installed. This consists of series or booster transformers located about a mile apart. These transformers are mounted on the signal bridges and the current in each of the trolleys is constrained to pass through a primary coil of the transformer, thus inducing an equal current in the secondary coil, the ratio of the transformers being approximately unity. The secondary coils of these transformers are connected across insulated joints in the track and consequently as all trolley current must flow through the primary coil the secondary coil insures that all the returning traction current, at this particular point of the circuit at least, must flow through the rails. In this manner the traction current is prevented from taking earth returns in parallel with the track or if there is a tendency between these booster transformers for the traction current to seek an earth return this tendency is corrected at the next booster transformer which constrains or picks up all the traction current and again starts it through the rail.

Car Equipment.

One of the interesting features of the electrification is that the standard suburban steel coaches of the type used in the regular steam service have been used for the electric service without structural changes. This was made possible by the fact that the requirements for mounting electric apparatus on the cars had been thoroughly considered at the time when the steel car was introduced upon the railroad. All cars are motor cars, as no trailers will be operated in this service.

The equipment of each car consists of two 225-horsepower, single-phase, air blast-cooled, doubly-fed motors, mounted on one truck, with automatic acceleration, battery-control equipment, and automatic multiple-unit electric air-brake equipment. All o-

Digitized by Google

the main pieces of the electrical apparatus are mounted on one end of the car and the air-brake equipment is mounted at the other end. This gives an uneven weight distribution on the two trucks, approximately 60 per cent of the total car weight being on the driving wheels.

The cars are designed for double-end operation on a 11,000-volt, 25-cycle overhead trolley line. Each car is equipped complete with two motors, having a 24-tooth pinion and a 55-tooth flexible gear; one 11,000-volt pantagraph trolley; one oil circuit-breaker; one main transformer; one switch group complete with reverser and a limit switch mounted on one end plate; one grid resistor; two master controllers; one motor-generator set for supplying control energy; one control battery; three control junction boxes; four nine-point train line receptacles; one nine-point train line jumper; one valve magnet set for operating the trolley and "dead man's" feature; one line relay; one control cutout switch; one combined blower and compressor motor with a Sirocco fan, and one set of details including a control reservoir, control air details, battery switches, etc.

Current is collected from the overhead wire by the pantagraph trolley and is conducted to the main transformer through the line switch (oil circuit-breaker). Various voltage taps are made on the secondary of the transformer and connections are made to these various taps in the proper sequence by means of unit switches.

The motors, which are connected in series, are started and operated up to approximately 15 miles per hour, as repulsion motors, with the auxiliary or compensating field, the armature, and the main field in series. With these series connections, the armature is short-circuited through resistance. Resistance is also inserted in series with the motors on the first step and is cut out on the second step. The third step changes the connections to energize the auxiliary field from one portion of the transformer and the armature and main field, connected in series, from another portion of the transformer, thus affording doubly fed connections. The armature short-circuit is removed when operating as doubly fed motors. Subsequently steps are obtained by increasing the motor voltages.

Each motor has an hourly rating of 225 horsepower and a continuous rating of 200 horsepower when ventilated with 1,200 cubic feet of air per minute. The armature is of standard construction, the communtator and the laminations being mounted on the spider, the former being undercut one-sixteenth inch. The armature is wave-wound, cross-connected and no resistance leads are used between the windings and the commutator. The field windings consist of two entirely independent sets of coils; one, the main field circuit for producing the effective magnetic field; and the other an auxiliary or compensating winding which balances the armature reaction on the field and in addition has a neutralizing effect on the sparking voltage. The field consists of six poles, the coils being of copper bars suitably insulated, connected at the ends by straps.

Trains of from two to seven cars are operated in regular service, the average acceleration on a straight level track being approximately one mile per hour up to 30 miles per hour, with a balancing speed of 60 miles per hour.

Signals.

Throughout the electrified zone, it it was necessary to change the existing direct-current track circuits to alternating-current track circuits and to provide impedance bonds which permit the return of the 25-cycle traction current, but sectionalize the various track circuits so far as the 60-cycle current is concerned.

In the electrified portion of the Philadelphia Division, about 15 route miles all four-track, the old form of semaphore signals have been replaced by those of the electric-light type in which different rows of five lights each with suitable lenses indicate the various positions of clear, caution and danger.

In order to provide proper vertical clearance for the catenary wires as well as to provide points for anchoring same, practically all the old signal bridges in the electrified zone were replaced with ones of considerably heavier design.

In order to nullify the induction effect of the traction current in the signal circuits of adjacent tracks, resonant shunts have been installed which permit the local induced currents to be shunted around the track relays and thus avoid disturbing the signal circuits.

Power for the operation of signals is supplied from the West Philadelphia and Paoli substations. In the West Philadelphia substation there are located two 150-kilovolt-ampere motor generators with the necessary step-down transformers and switchboard apparatus. Power at 11,000 volts and 25-cycles is taken from the trolley bus and stepped down to 2,200 volts for the motor of the motor-generator sets. Power for the signals is generated at 3,400 volts, 60 cycles, and supplied to the signal system over three single-phase feeders.

The design and construction of the electric installation was carried out by Gibbs & Hill, consulting electrical engineers for the company, in co-operation with the engineering department and the officials of the road. All construction except that of substation buildings and inspection building, which were covered by outside contracts, was carried out by a specially organized force. The electrical equipment was supplied by the Westinghouse Electric & Manufacturing Company.

Electrical Phenomena in Gases.

Electrical phenomena in vapors and gases formed the subject of the joint meeting of the New York sections of the Illuminating Engineering Society and the American Electrochemical Society held on the evening of November 11, at the Engineering Societies Building, New York City. Three papers were presented as follows: "Unstable States in the Arc and Glow," by Walter G. Cady, of Wesleyan University, Middletown, Conn.; "Gaseous-Conductor Light," by D. McFarlan Moore, General Electric Company, Harrison, N. J.; "Electric Arc in Complex Vapors at Reduced Pressures," by W. A. Darrah, Ohio Brass Company, Mansfield, O.

The first speaker reported the results of a large number of tests with reference to voltage and current conditions and his charted findings should be of great aid to the research chemist.

A new portable type of carbon-dioxide color-matching tube was demonstrated by Mr. Moore, upon which a number of tests were reported by others, also connected with the General Electric Company. This lamp is described on page 949 of this issue.

The work of Mr. Darrah in evolving a set of materials which would produce a long arc in a gas-surrounded lamp was described by him in great detail and a working model was demonstrated. The features of this model were as follows: An exhausted glass bulb similar to a large incandescent lamp is provided with tungsten terminals placed four inches apart. The bulb is fed with a combination of titanium tetrachloride and bromine, the vapors from which play around the arc and produce a brilliant bluish-white flame.

Chairman C. S. Fink conducted the meeting with briskness and dispatch with the result that all speakers had time to be heard. There were written discussions on all three papers from Dr. Mott of the National Carbon Company; these were read by Mr. Moore who also discussed them. Dr. McKay, J. B. Taylor and F. A. Benford also spoke.

In Pennsylvania hired motors and fans are exempt from levy and sale on execution for rent due.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Telephone Display Adds to Attractiveness of Department Store Show Window.

A novel window display in the show window of a dry goods firm at Brockton, Mass., featured the value of the telephone in the conduct of a modern merchandising establishment. A miniature pole line was installed along the front of the window, with a private-branch exchange switchboard connected with batteries, showing how calls are handled in the store.

In the center of the window was installed a small electric motor which rotated four signs advertising the usefulness of the telephone and the low cost of toll calls. To the motor were attached 35 telephone instruments, some of them representing the different departments of the store reached by the private-branch exchange, and others showing the rate for toll calls to towns and cities surrounding Brockton.

By an ingenious arrangement, line lamps were attached to each instrument, and by a flasher operated from the motor were lighted intermittently, illuminating a card which bore the name of the store department or the toll rate to the distant exchange.

The window, which was designed by Grover C. Perkins, wire chief of the New England Telephone and Telegraph Company, attracted much attention, with resulting advertising value to the telephone company and to the store. A view of the window is shown herewith.

Department-Store Show-Window Display Based on Telephone Service.

The Function of a Utility Company in a Community.

In an address on the subject, "What it Means to be a Public Servant," delivered at a recent meeting of the Employees Club, Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company, passed on some exceedingly practical ideas to those who heard him. His theme was that the position of the company is that of a servant to the people of Louisville and he elaborated the argument as follows:

"A company such as ours is created for the purpose of supplying certain wants of the people. In other words, of being their servant along certain lines. The service which it performs takes the place of the work which was formerly done by the people who cut wood, split kindling and laid fires, and cleaned and lighted lamps, to say nothing of the enormous amount of work done in driving machinery. All such work in earlier ages was done by the members of each household; or in the case of the wealthy and powerful, it was done by slaves. In a city of this size, it would require more than three hundred thousand willing and efficient slaves to do the work which is done by our company, and the slaves would not do it as well. In other words, this public servant has brought into the homes of the humblest citizen a comfort and a luxury which was formerly possible only to kings and princes.

"It is well to fix in our minds that the relation of our company to the community is the relation of a servant. The company comes in contact with the public only through the men who represent it. If these men are polite and accommodating, the company gains the good will, which comes to every prompt, polite and accommodating servant.

"No man is so highly placed that he has a right to be arrogant, nor is any man so lowly situated that he need be servile, but all of us who have seen a merchant attempting to sell goods, or a man seeking to gain employment, know that where the matter is personal to himself, as it is in this case, the man will adopt such a tone of voice and such a manner as will gain for him the good will of the person to whom he is trying to sell goods, or from whom he is seeking employment.

"The same anxiety to please and to serve should characterize everyone who represents this company in any capacity. No man need be ashamed of being a servant. The president of the United States has more bosses than any other man in it.

"This matter of courtesy and accommodation is one of the largest factors in business. I have heard people speak of having their wall papering and their painting done by certain firms. When I asked why, it was not on account of

Digitized by Google

the price of material, or the quality of the work, it was because the concern employed such nice, accommodating men that their presence in a house was not objectionable. I am glad to say that I get many reports from the customers of this company to the effect that the men who have been sent on business relating to gas and electricity proved to be polite and accommodating. Occasionally I get a report of a different character. A man who thinks he is showing his independence by coming into a house with his hat on, and with dirty shoes, is vastly mistaken. He is inflicting a temporary inconvenience on some householder who is entitled to better treatment; he is doing what he can to make the company less popular in the community, and he is deliberately putting himself in that class who are never promoted, and who are dropped whenever the force is reduced, if not sooner.

"Go at the company's business as if it were your own. Let your attitude to the company's customers be that of thanking them for what they have already bought of its products, and hoping that they will buy more. If you have this in your mind, the chances are that both your words and your actions will be all right."

Louisville Electrical Interests Operate "House Electric."

A novel display of an advertising nature in operation at this time in Louisville is being participated in by several of the electrical concerns. The display is a residence, constructed and fully equipped by a Louisville house-building company in co-operation with the electrical supply houses of the city, etc. It is a two and a half story residence, located in a high class residence section of the city and kept open, furnished as if a family were actually occupying it, for inspection of the public. An electric sign contains the invitation to passers-by to step in. All modern electrical conveniences are displayed in their natural setting and the wiring and lighting equipment is in accordance with the most modern practice.

Boston Edison Company Makes Electric Cooking Demonstration.

The Boston Edison Company is featuring electric ranges in its show windows. Apparatus of several types are displayed and offered for sale. During the three weeks, November 22 to December 11, a model kitchen will be set forth in the show window. This will consist of an ornamental tile background and electrically-operated cooking, washing and other domestic apparatus, with four women demonstrators in charge.

Electric Cooking Cheaper Than Gas in Salt Lake Apartment Building.

Repeat orders are generally regarded as the highest testimonial for a product. Just one year ago the Utah Power & Light Company, of Salt Lake City, made a contract with Brigham Whitmore to install 26 electric ranges in a new apartment house he was building. This was the first apartment in the city to use electric ranges. Mr. Whitmore entered into the contract with some misgivings. His doubts centered about two points, first, he feared the cost of electricity would be more than the class of tenants to whom he was catering would care to pay, and, second, he thought that if the apartments were equipped with electric ranges some prospective tenants migh be deterred from renting, because they did not understand their operation. The electric company, however, had secured his confidence, and he was willing to try the experiment.

The installation was completed just before the close of last year. The average bill during the past nine months has not varied more than a few cents from two dollars, whereas, the average bill in another apartment owned by Mr. Whitmore, which is equipped with gas ranges, averages around two dollars and twenty-five cents per month, the class of tenants being substantially the same. Furthermore, the fact that the apartments were equipped with electric ranges has proven to be an advantage in renting them, some of his tenants even having gone so far as to tell representatives of the electric company that they would not move unless they could find another suitable apartment equipped with an electric range.

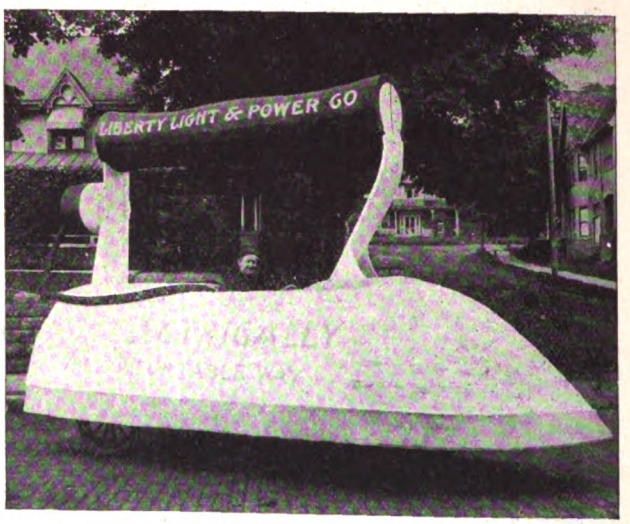
Mr. Whitmore has decided to remodel and modernize the building now equipped with gas ranges, and has recently entered into a contract to purchase 80 Hughes electric ranges from the Utah Power & Light Company for this purpose. This magnificent repeat order is in itself the strongest possible testimonial that electric ranges have made good. The unqualified success of this initial installation has made possible the installation of complete electric range equipment in six other apartment buildings in Salt Lake City during the past year.

A Unique Electric-Iron Float.

The accompanying illustration shows a float that was generally conceded to be among the best of the 117 that participated in the recent parade held by the business men of Liberty, N. Y. The float, which was built and entered by R. M. Sloan, superintendent of the Liberty Light & Power Company, was a representation of a Westinghouse type B electric iron, and was mounted on a Ford runabout.

Following the business men's parade, the firemen of Liberty held a parade and the "Iron" float was selected for participation therein as one of the best decorated in the previous event.

Realizing the advertising advantage to be gained by his company from a continued exhibition of the float, Mr. Sloan has mounted it on the roof of his power house where it can be seen easily from all parts of the city.



An Effective Electric-Iron Float.

The details and cost of construction of the float are given for the benefit of those who may have occasion to build a similar one.

The framework is made of half-inch strips of lumber, over which muslin is tightly stretched; sufficient padding is placed on the inside of the frame to prevent scratching the car. The muslin is then well coated with alabastine and when dry a coating of aluminum bronze is applied. The cord is made from four-inch fire hose and the plug receptacle was cut from a cheese box. The iron completely covers the car and the whole outfit measures over all 16.5 feet long by 7 feet wide by 9.5 feet high. The entire iron was constructed and then placed over the body of the machine.

The detailed expense was as follows:

5 pounds alabastine	$ 0.30
3 small cans black paint	.49
3 cans aluminum bronze	3.00
1½ gals. bronze liquid	3.75
8 yards of muslin	.64
Labor, lumber and carpenter work	20.50
Lettering	2.50
Total	$31.18

Digitized by Google

SUCCESSFUL COMMERCIAL MANAGERS.

W. A. Wolls.

A responsible position in the electrical field has more than one pathway of approach. That by which William A. Wolls, of Columbus, O., became head of the Columbus Railway, Power & Light Company's commercial department was unusually rough, at least in the early stage.

The plans of young Wolls and his parents for his education were frustrated by his delicate health, which compelled him to give up study at the high school period. Without any fixed plan for the future, he was still not content to be idle, and entered the employ of an electrical supply store. His duties here in looking after small contracts, gave him a desired outside line of work. This included the supervision of electric gas lighting, which at that time was used by a few buildings and some of the more pretentious residences. A natural bent toward mechanics was thus developed. His career was decided—he would become an electrical engineer.

On a visit to Columbus of the famous French actress, Sarah Bernhardt, certain unusual stage-lighting effects were demanded. An official of the Edison Electric Light Company, a concern then new in the field, found the problem put up to him a knotty one. Having some knowledge of young Wolls' experience in lighting, he called upon him for assistance. The latter satisfactorily installed the necessary lights and attended to their operation during the engagement.

This led to Wolls taking a position with the Edison company shortly thereafter. For eleven years he remained in its employ, most of the time as a switchboard operator. His hours were from noon until midnight, or vice versa. Such was the short-day system under which more than one now-successful electrician got his start.

With his original purpose in mind, Mr. Wolls gave every spare moment to study. Often he spent several hours over books and technical journals before going to bed upon reaching home at midnight. Good habits and an improved state of health permitted him to keep up the pace. Mr. Wolls later was made chief engineer by the Edison company, later becoming commercial power engineer.

When, in 1903, the company was taken over by the Columbus street railway interests, he went with the new corporation thus formed, as power engineer. In this position he greatly enlarged the scope of its operations by aggressive efforts in securing new business. His knowledge of the local field proved invaluable. Through careful surveys which he had previously made, he knew where every wheel throughout the city was moving, of whatever form of power. This knowledge caused his service to be claimed in an increasing degree by the contracting department, and in course of time he became its head.

His responsibilities took on added importance in 1913, when under the new corporate name of the Columbus Railway, Power & Light Company, the interests he served were readjusted more to present-day conditions. The company adopted the modern policy of exploiting the commercial power and lighting field to the limits which could be realized through enterprise and efficiency. A distinct commercial and new-business department was created, with Mr. Wolls in charge.

Mr. Wolls is modest in regard to any claims as to what he has been able to accomplish, but the general officers of the company do not hesitate to say that its commercial department has no superior and few equals in any city of like size in the country. It occupies modern, street-floor quarters at wholly separate location from the street-railway headquarters. One of the primary factors has been to merit public confidence. This spirit expresses itself, among other ways, in the arrangement of the offices, which is both original and unique. They are separated from the appliance displays and from each other by plate-glass partitions. No employee, not even Mr. Wolls, is hid from sight. All are in plain view of the visitor. It is not necessary to send in a card or a name to anyone. The visitor is at liberty to walk into Mr. Wolls' office unannounced, even though Mr. Wolls may be engaged with someone else. The errand may be the contracting for power for a factory or information regarding some small domestic electrical appliance.

W. A. Wolls,
New Business Manager, Columbus Railway, Power & Light Company.

"I never have anything to say to one customer that I am not willing any other customer should overhear," states Mr. Wolls. An extreme liberal policy governs the sale of appliances. No customer is allowed to be dissatisfied, even though this means exchange or refund of money after an article has been used beyond any reasonable trial period.

With regard to electrical appliances the company differs from most central stations in carrying a very large stock. On the grounds that it is the most important local electrical institution, it believes that its displays of all goods in that line should be the most comprehensive. Demonstrators are constantly in attendance. No outside canvass is made on appliances, but visitors are attracted to the store through newspaper advertising and the use of private printed matter.

The commercial department has grown so rapidly that additional space is a problem which it is now confronting. At the present time Mr. Wolls has a force of 24 employees. The efficient organization which he has developed gives him time for personal voluntary service in other branches of the company's activities.

Give the Public Electrical Literature.

This suggestion is advanced by W. S. Mendenhall, commercial manager, Grays Harbor Railway & Light Company, Aberdeen, Wash.:

"The electrical journals of the country have done and are doing a wonderful lot of good for the electrical industry. They in turn have to live and each wish to establish themselves before the public as leaders in their field.

"Now why wouldn't it be fair if the industry did just a little for them to put them before the public?

"I have in mind a little stunt for Electrical Prosperity Week which will cost us nothing and will help both them and us a little.

"Every electrical company has their shelves full of back numbers of the leading electrical journals, they are seldom referred to after the first reading.

"Let each company during Electrical Prosperity Week set out a table in their display room and pile it full of back numbers of these journals and place a large placard above it, reading something like this: 'These are back issues of the leading journals of the electrical industry, take some of them home and read what the industry is doing.'

"No doubt many of them would be carried away by visitors, it would help to establish their names with the public, and would keep those who took them thinking electricity at least during the time which they might spend in reading them."

Digitized by Google

Electrical Construction

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Possibilities of Lamp Business.

In Evansville, Ind., there is a lamp dealer who is making $1,800 a year by devoting himself exclusively to the sale of incandescents. This in itself is interesting, but the proposition becomes still more worthy of notice when one learns that this dealer is blind. All of his sales are made by direct solicitation, the dealer going from house to house and factory to factory, knowing the town well enough to be able to get about without assistance.

This is a wonderful record, considering the handicap under which the salesman is laboring; but it ought to make the retail dealer, possessed of all of his physical senses, a little bit ashamed of himself to get along with sales of a few hundred dollars' worth of lamps a year, when a blind man can go out and roll up profits of $150 a month on the same proposition.

As a matter of fact, the possibilities of the situation are simply unlimited. The field is so big, and the demand is so certain, that it is only a question of how much business the dealer wants to do. If he sets out to make a certain volume during the year, and figures his quota per month and per week accordingly, so that he can step on the "accelerator" when the situation demands, he will be much more likely to realize his ambitions and get the profits out of the lamp business that he is entitled to. If he lets the trade drift along, and waits for people to come in and take his lamps away from him, he will make a minimum amount of money, of course.

Peculiar Advantages in the Trade.

Owing to the fact that lamp manufacturers, in order to protect retail prices, have adopted the consignment feature, by means of which title to the lamps remains in their names, and the dealer does not pay for any stock that remains unsold, handling electric lamps has become the proverbial "cinch." They constitute the only line of staple goods that the writer knows anything about which can be stocked without making any investment, and, naturally, this feature should be considered in estimating the possible profits.

If a dealer is operating with $10,000 invested in stock, the interest on this is $600 a year, which must come off the gross before net profits can legitimately be figured. If total operating expenses are $6,000, then interest is 10 per cent of the overhead. If the latter is 20 per cent, then 2 per cent is chalked up to take care of the interest, and consequently the dealer can make at least 2 per cent more on his lamp sales than he could possibly do on anything else in which he has his money tied up.

This is not to say that the consignment system is an unmixed blessing, for it is not. In fact, some dealers are inclined to lie down on any proposition where they are not compelled to hustle to get their money out of the goods, and it might be a good thing for the business of certain members of the trade if they had to pay for their lamps when they are put in stock. But the method used in distributing them at least emphasizes the unusual opportunities for profits which exist in this department of the business.

The Sliding Scale of Discounts.

Inasmuch as lamps are distributed with a sliding scale of discounts, the dealer who sells the most getting the biggest margin, which applies to his entire sales, there is every incentive, all the time, to every dealer to keep pushing lamp sales. And as the electric lamp is the staple of staples in this field, inasmuch as almost universal consumption is the rule, it should be no trick for the live dealer, who has properly impressed this feature on his sales force, to increase his volume right along.

The dealer who starts in with a small stock, based on his previous sales, and disposes of it quickly, getting a bigger stock—and a longer margin—next time can continue to work this game, and earn rebates on all his previous sales, by the simple plan of increasing his volume sufficiently to graduate into the next higher class. This gives an element of interest—one might almost say a sporting phase—to the situation, and makes the work of selling additional lamps a lively game in which everybody connected with the store is a player.

Going After Contract Business.

The necessity of getting a maximum volume in order to get the top discount should impress the lamp dealer with the desirability of getting all the big business in his territory that he can. And he can go after the important trade secure in the knowledge that he can quote the only price that will be offered the consumer on a standard lamp. No matter how important the factory buyer may be, he will pay just as much to the manufacturer for lamps as though they were sold by the dealer; and when the element of service, including prompt delivery, is taken into account, there is simply no justification for the local consumer whose business is of importance getting his lamps anywhere except from the dealers in that community.

There is one exception to this statement; and that is that where the dealers themselves are so nearly asleep to their opportunities that they fail to solicit the contract buyers, the latter cannot be blamed for going over their heads and dealing directly with the manufacturer. As an instance of the fact that the dealers are neglecting their opportunities in connection with this most important phase of the business, the district salesman of one of the leading lamp concerns makes a practice of getting business in territory where he is not represented by going in and landing a big order from an important buyer.

If the local distributors were onto their jobs it would not be so easy for the outside man to make these sales; and the fact that he can step in, an unknown man, without personal connections of any kind, and possibly with a lamp which is not so well advertised in that community as some others already represented there, and get important, profitable business, makes it look as if the dealer who is not soliciting the contract buyers is overlooking a good chance for business.

He may excuse himself in this connection by pointing out that the extra discount which the consumer gets for quantity purchases makes the business less desirable; but it will be found on figuring the difference between sales in case and less than case lots that,

Digitized by Google

considering the increased time, trouble and expense involved in selling over the counter, the net profit on the case business is really greater than on the same volume of smaller individual sales. And, as suggested, those case-lot sales are needed to boost the volume and give the dealer the maximum margin on all of his sales, including the small business over the counter.

It would pay every lamp dealer in every town to list all of the consumers important enough to buy in case lots, and to go after them on a contract basis. This would include factories, office buildings, stores, motion-picture theaters and the like. Tying up this trade for a year at a time would be important, too, in that it would come pretty close to swinging all their other electrical business as well.

Putting Men Outside.

It was suggested at the beginning of this article that the record of the blind lamp salesman in Evansville is good enough to show what can be done by the determined dealer. The real secret of his success, and one that can be applied effectively by every member of the trade, is that he goes after the business directly. He works from his home, and goes out on the street and into the offices of his customers.

The electrical dealer-contractor who has a lot of good men on his pay roll often has to "make work" for them, because there is nothing for them to do in the way of contract or jobbing work. It is unprofitable to have them mark time, which is practically what happens; and yet the dealer feels that it is good policy for him to do so, in order to retain his force, and to be prepared for the rush when it comes.

A better plan of holding the force together and at the same time making a profit out of their efforts is to use the slack season in the contracting game by making lamp salesmen out of the extra men, and putting them out on the street selling directly to consumers for cash. Nearly every house that a solicitor enters will be found to be in need of a lamp here or there. Often the householder or his wife forgets to make the necessary purchase when down town, and lamps are switched about from one socket to another, to get the best results with a limited number of lamps. When the lamp man comes around offering the stock for sale he gets a warm welcome, of course, because the lamps are going to fill a long-felt want.

The fact that the lamps are converted into cash, without the necessity of making a mark in the books, emphasizes the clean and profitable character of the business, as well as the effective use which can be made of the spare time of employees in no matter what department. And it goes without saying, that a live man who is out selling lamps is going to find prospects for other electrical merchandise, not to mention wiring jobs.

"Buy Them by the Box."

One of the leading chewing-gum manufacturers, and apparently the most successful, featured for some time in all of his advertising the slogan, "Buy it by the box." He saw the advantage of supplying the consumer with large lots of his confection at a time; first, to anticipate possible competition; and, second; to enable the dealer to increase his sales.

In these two points the electric-lamp business is similar to the chewing-gum trade, and for that reason the dealer should tell his customers to buy lamps by the carton. There is no sense in buying a lamp or two at a time, and if the suggestion is made that it is a good plan to have a few extra lamps in the house all the time to make necessary replacements, it will undoubtedly be carried out, irrespective of the fact that the price per lamp is the same when a carton or only two are bought. Incidentally, the central-station man who is handling lamp sales should remember that keeping consumers well supplied with lamps is going to help the consumption of current, because there will be fewer idle sockets if the consumer always has enough lamps to go around.

Displaying cartons of lamps, quoting prices per carton, rather than per lamp, and making the suggestion to buy on that basis whenever the customer comes in and asks for "a" lamp, will have a good effect in this direction.

Establishing Dealer Individuality.

One reason why some dealers are not as enthusiastic as they should be on the subject of lamp sales is because they figure that lamps are so universally distributed that the consumer can get them anywhere, and consequently that it will not repay effort to attempt to build up a good-sized lamp trade, that any kind of competition will suffice to distract. But experience has proved that this is not the case. The dealer who ties up with a good brand, and pushes that brand, has something that will hold his trade. His customers, being satisfied with the lamps they have been getting from him, will not care to make a change, no matter how good the lamps carrying other labels may be. In this way, if the dealer will really endeavor to hook up his name with that of the manufacturer whose goods he is handling, and will use the window display materials, folders, circulars, etc., whenever he can, he will be able to create and establish a regular, permanent and profitable business on lamps. He has a better chance than distributors of Victrolas, say, and even here individual dealers have been able to develop distinctiveness through service and by other methods. The lamp distributor has plenty of opportunity along this line, if he will only take advantage of it.

Massachusetts Contractors Investigate Licensees' Qualifications.

The Electrical Contractors' Association of Massachusetts has employed a legal representative, in the person of James Wilson of Boston, whose duty it is to go from city to city and investigate the qualifications of holders of Class A or masters' certificates which enable them to engage in the business of wiring for electricity. As a large share of those who were given certificates were not subjected to examination, merely certifying under oath that they had been engaged in the business five years previous to the time the law went into effect, it was believed that a number of firms or individuals received certificates improperly. Already two licenses have been challenged.

The Board of Electrical Examiners is soon to issue a book giving the names of licensees in both the masters' and journeymen's classes, by cities or towns where they do business or reside. This will obviate a large amount of clerical work in the office of the Board, which is applied to continually for information as to local license-holders.

November 17 an examination was held at the State House, Boston, 150 applicants being examined. Of these 13 were candidates for Class A certificates. It is stated at the office of the Board that next year's examinations will include practical demonstrations, such as soldering, splicing, taping, etc., and possibly the connection of instruments and fittings on a model board. It is probable that the 5-years' experience exemption will be done away and all applicants subjected to a test as to their qualifications. The Gas and Electric Light Commissioners will probably adopt the National Code as the basis of examinations of candidates, the licenses of whom are subject to revocation, appeal being to that Commission.

To date about 750 candidates have been examined in both classes.

Carolina College Bequeathed Valuable Laboratory.

By the will of William Kearney Carr, the laboratory of the testator, located in Washington, D. C., and said to be valued at about $100,000, has been bequeathed to the North Carolina College of Agriculture and Mechanic Arts, West Raleigh, N. C. Mr. Carr was a son of a former governor of North Carolina and was particularly interested in radioactivity, discharges through gases, etc.

Digitized by Google

Among the Contractors.

During the month of October exceptionally important lighting contracts were executed by the McKenney & Waterbury Company, of Boston, Mass. Among the Boston buildings equipped with modern electric lighting fixtures in that time were the Massachusetts Charitable Association Building, rectory for Trinity Church, International Trust Company Building, the Crawford House, Niles Building, Franklin Building, Massachusetts Trust Company Building, Hunnewell Building, Youth's Companion Building and Lombardy Inn. In addition to the above similar contracts were filled for 13 other large buildings outside of Boston, located chiefly in the New England States.

A $25,000 contract has been closed by the Erner & Hopkins Company, Columbus, O., for electrical re-equipment of the Pioneer Pole & Shaft Company's plant, at Memphis, Tenn. Change is being made from the manufacture of specialties for horse-drawn vehicles to automobile parts. This requires almost an entire new outfit. The installation of 55 motors is among the features of the contract. The same company has the contract for electrical work in the new William Bott residence at Marble Cliff, and also for the wiring for the new Martin & Cooke power building at Columbus, O.

What is said to be the largest and most complete electrical equipment for a residence ever planned in Columbus, O., is in the hands of the Correl Electric Company of that city. The F. A. Miller home, costing $60,000, at the suburb of Bexley, is where the work will be installed. It includes wiring for lighting, vacuum cleaning, refrigeration and heating receptacles, with master switches and all up-to-date features.

The entire electrical equipment in the plant of the Western Cartridge Company, East Alton, Ill., is being installed by Charles J. Sutter, 1220 Pine Street, St. Louis, Mo. Twenty buildings in all are involved, devoted to shot shell loading, metallic packing (2), metallic loading (2), bullet mold, bullet swaging, primer, annealing, metallic inspection (3), main manufacturing, warehouses (3), shot shell inspection, shot shell manufacturing, machine shop, office building.

The Beaver Engineering Company, Newark, N. J., has been awarded contracts for electrical work for the new buildings to be erected in connection with the City Hospital.

New System for Hospital Signal Lighting.

The lighting system of a modern hospital is usually controlled from one or more distributing panelboards located on each floor. Branch circuits from these panels are run to the various rooms and the lighting of the individual rooms is controlled by a switch in the side wall. Separable flush receptacles are installed in each room as outlets for fans, heating pads, reading lamps and other electric portables.

Herewith is shown a diagram of a simple, inexpensive and efficient system which utilizes these standard circuits and is installed so that a positive indicating signal can be readily given by the patient. A green light is placed over the door inside the patient's room, and over the door outside the patient's room a red light is installed. Inside the nurses' room is located a red light for each patient's room and a pendent switch is placed at a convenient location and within easy reach of the patient. This switch is connected in series with the line through a flush receptacle of the separable type.

When desiring to call a nurse, the patient pushes the switch button which lights the lamps inside and outside of the patient's door and the lamp in the nurses' room. These lamps will burn until the nurse visits the patient and turns them off at the pendent switch. In addition to the pendent-switch control, the system may also be operated by a push-button switch installed in the side wall.

If desired, a single-button lock-type push-button switch can be used in place of the pendent switch. This switch when operated by the patient is locked in the on position and it is necessary for the nurse to use a key to turn off the lights.

This system has been designed by the General Electric Company, Schenectady, N. Y.

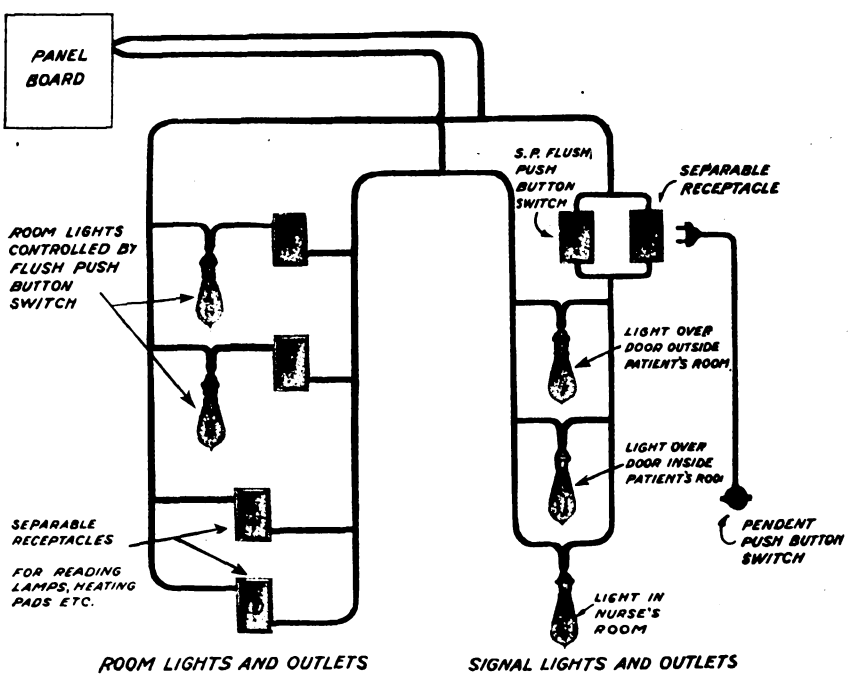

PANEL BOARD
S.P. FLUSH PUSH BUTTON SWITCH
SEPARABLE RECEPTACLE
ROOM LIGHTS CONTROLLED BY FLUSH PUSH BUTTON SWITCH
LIGHT OVER DOOR OUTSIDE PATIENT'S ROOM
LIGHT OVER DOOR INSIDE PATIENT'S ROOM
SEPARABLE RECEPTACLES FOR READING LAMPS, HEATING PADS ETC.
PENDENT PUSH BUTTON SWITCH
LIGHT IN NURSE'S ROOM
ROOM LIGHTS AND OUTLETS
SIGNAL LIGHTS AND OUTLETS

Diagram of Wiring System for Hospital Signal Lighting.

Meeting a Competitor's Bid.

A recent incident, involving financial difficulties for an electrical contracting firm, illustrates more forcibly than any arguments could, the advantages of co-operation among contractors, and the value of association work. The contractors' association, in the town of the incident, does not make any effort to control prices; but at its meetings the various details of work are talked over, and experiences are exchanged frankly. When one contractor "gets in bad" on a job, he is usually frank enough to tell his fellows why, that they may avoid a similar pitfall. The result is that most of the members figure rather carefully on all jobs; and jobs which they secure, even on low bids, usually net a real profit. The firm which got into trouble, however, had never affiliated with the association.

On one occasion the person letting the contract had received an especially low bid from an electrical contractor, who later discovered that he had made an error, and withdrew his bid. The builder went to the non-member firm and announced that such-and-such a bid had been received, asking if the firm would take the work at that price. The work was taken at a loss.

This practice of meeting a competitor's bid has frequently brought disaster.

Digitized by Google

National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, George Hubbard, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary recently received a very pleasant letter from one of our most distant members, Mr. Wheaton, of Saskatoon, Sask., in which he spoke of the interest our column always aroused when the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN appeared. The Secretary does wish other members would favor his office with correspondence upon matters of interest, and especially such as could be used in these columns.

The New York Section held its fourteenth regular meeting on Monday evening, November 8, in the Municipal Building, Manhattan, G. E. Bruen, superintendent of the Suburban Fire Insurance Exchange, presiding. The attendance was large, the members taking a lively interest in the matters brought forward. The feature of the evening, however, was a most interesting talk by F. M. Griswold, general inspector of the Home Insurance Company.

Mr. Griswold is a pioneer in his line, having been with his company 41 years, and in the course of his remarks carried his hearers back to the period when Mr. Edison completed his first incandescent station at Menlo Park, N. J., describing the applause when the lights were first turned on. He also emphasized the startling figures on fire losses in the United States, showing how the average rate of property loss is now $5.00 per minute!

As a result of P. J. McMannon, inspector in the city department, bringing forward at a previous meeting the subject of corrosion, occasionally met with in electric conduit where this is installed under adverse climatic conditions, it was announced that Alfred E. Braddell, superintendent of the Sprague Electric Works, was to read a paper on the "Evolution and Construction of Electric Conduit and Armored Cable" at the meeting to be held on December 13.

The Eastern Massachusetts Section held its regular meeting on Friday, November 12, and after a brief business meeting, at which the election of officers was laid over until December, repaired to the new factories of the Holtzer-Cabot Electric Company, in Roxbury, where they were most courteously received and escorted over the plant. This is not yet completed, but is in precisely that stage when it presents most of interest to the thoughtful inspector.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

13,000-Volt Conductors.

Question 314.—In a transformer substation would it be proper to install 13,000-volt primary leads of single lead-sheathed conductor in one conduit, conduit having condulet-type fittings? Inspector has advised multiple-conductor lead-sheath cables with potheads. The company claims the former construction is proper for 13,000 volts. Which is correct?

Answer 1(E). We are inclined to the opinion that single-conductor lead-sheathed for alternating-current systems of any potential in conduit would produce expensive inductive experiences. We would not encourage such installations regardless of location.

Answer 2(U). Should use multiple conductor.

Answer 3(D). There is nothing specific in the rules regarding the matter referred to, and it would be entirely a question of judgment as to how the work should be done.

Answer 4(B).* This question appears to be more of an engineering proposition than a question of what the Code requires. Personally I believe the method advised by the inspector would be the better construction.

Answer 5(F and G). We believe the inspector to be justified in advising the use of multiple-conductor cables. The inductive action which takes place under these conditions with single conductor in conduit has two separate results, one is to induce a counter electromotive force in the conductor, which in this case may be negligible on account of being only a small percentage of the total voltage. The other action is an electromotive force generated in the conduit parallel with the conductor, and may have a destructive action, depending on the length of conduit, frequency, and the amount of current flowing in the conductor. We have seen the results of a large number of tests made along this line, one of which resulted in the melting of 16.6 B. & S. gauge copper wires bonding and grounding the conduits, due to the current generated in the conduit itself.

Answer 6(M). For single-conductor lead-sheathed cable in conduit used on a 13,000-volt system it is not believed a condulet-type fitting should be approved. Either multiple-conductor cable and the usual pothead should be provided or the porcelain-type single-

Digitized by Google

conductor pothead, if the single-conductor cable is used.

Answer 7(P).* If the space is ample the only ground on which an inspector can base an objection to single lead-sheathed 13,000-volt cables in favor of a triple-conductor lead-sheathed cable is the fear of induction troubles, which in the case of lead should be entirely negligible.

Answer 8(O). All of the wires of a circuit should be contained in the same conduit, whether they are in one lead sheath or whether they are in several single-conductor cables. (See Rule 2 *d*.)

Answer 9(T). I am of the opinion that the intent of the Code rules is to require multiple-conductor metal-sheathed cable in approved conduits. Single lead-sheathed conductors would cause self-induction trouble, and for this reason I believe inspector justified in advising the use of multiple-conductor metal-sheathed cable.

Answer 10(R).* The construction as outlined by the inspector is, in my opinion, proper.

Answer 10(R),* The Code does not explain construction of this voltage as much as I could wish. I think that the lead-sheathed single conductors are all right, but condulet-type fittings should be replaced by potheads.

Answer 12(N).* The wires must, under the Code, all be as called for in class C (Rule 2 *d*). Class C, however (Rules 47, 48), says nothing about all wires of circuit being in one conduit as for low-potential alternating-current work.

There would be little effort of induction, because so far as it went the induced current in the lead sheath would neutralize the magnetic effect in the iron (following Lenz's law), so I believe single-conductor cables all in one pipe would be all right.

Neither can I find anything in Code calling for potheads in this case. The index, however, under "Potheads, installation," refers to Rule 8 *b* (just under five-point note on page 15, 1915 Code) and here they are only suggested as a satisfactory method.

By analogy I should insist on full protection against moisture and mechanical injury, but given these adequately controlled I do not see how potheads could be insisted on.

Electricity is used exclusively for cooking in Carlton Court, one of the largest apartment buildings in Buffalo, N. Y.

THE DEVELOPMENT AND OPERATION OF OUTDOOR SUBSTATIONS.—II.

By F. L. Hunt.

The development of outdoor substations is of course dependent on the development of various types of outdoor apparatus. Some of the special features of outdoor apparatus in use in outdoor stations may be of interest and are therefore briefly mentioned in the following paragraphs.

First consider lightning arresters. With the use of voltages from 6,600 volts up, aluminum-cell electrolytic lightning arresters are now becoming almost universal for the protection of such circuits and apparatus. These arresters have been adapted to use outdoors by the development of electrolytes which have low freezing points, and by fitting the covers with bushings similar to roof bushings which are used for carrying high-potential circuits into buildings. In warm climates, and even in this climate, manufacturers of these arresters feel that there is some danger of overheating the electrolyte when they stand in the sun, especially in dark-colored cans, and the practice has therefore become quite common to paint the cans white. This white paint tends to reflect a considerable amount of the sun's heat which would be absorbed by the dark cans, and as far as anything which has been experienced in New England is concerned, this white paint seems to be sufficient protection against the harmful effects of the sun.

The first installment of this article appeared in the issue of November 6. The article was read by Mr. Hunt at a meeting of the Western New England Section of the National Association of Electrical Inspectors, held at Greenfield, Mass., on October 13. The first portion of the article reviewed the development of outdoor substations, the reasons for their choice, their advantages and disadvantages. The arrangements of the Chicopee and Agawam substations of the Turners Falls Power & Electric Company are referred to.

Owing to one or two rater bad fires which have occurred when, for one reason or another, these lightning arresters have been overheated so that the aluminum cones have been damaged, the insurance companies have become considerably alarmed about the danger of fire from such arresters, and at the present time they recommend very strongly against the installation of aluminum arresters inside a station or substation. This feeling on the part of the insurance underwriters makes it almost necessary that electrolytic arresters be placed outdoors or in separate fireproof compartments in all important stations.

Oil switches have been developed for outdoor use up to 110,000 volts, and they have apparently proven very satisfactory in actual operation, as there are many installations now which have been in use for a number of years, in some cases where the oil switches are almost entirely covered by snow in the winter time. The switches are built with bushings similar to the bushings used in the lightning arresters, and are supplied with oil which does not freeze at a temperature much above zero Fahrenheit. Outdoor switches are made for either hand control or electrical control. When controlled electrically, they are generally operated from a storage battery and control board which would ordinarily be placed inside the building. Outdoor switches are generally built up of separate elements for each pole of the switch.

Air-break switches are built for outdoor uses generally in a manner similar to indoor air-break switches, except that instead of being mounted on a base they are mounted on separate fixtures arranged for suspending in an overhead line with disk insulators placed between the terminals. The operation of disconnecting switches of this kind is made comparatively safe by using operating rods which have ground chains between the operator's hand and the switch, and in the stations with which I have been acquainted we have never found any weather conditions under which the operators experienced any inconvenience in operating the outdoor disconnecting switches in the usual manner.

Another type of disconnecting switch which has come into considerable favor for outdoor use is the horn-gap switch. This switch is able to open a circuit which is carrying load, the circuit being interrupted by the arc rising on the horns until it breaks. Such switches are generally operated by a system of levers arranged so that all three poles can be operated at once. For 60,000 volts and higher, these switches are generally built with two horns on each leg of the switch, so that in the case of a three-pole switch the circuit is opened in six places at one time.

With regard to outdoor transformers, it was thought when they were first considered that there would be great difficulty in making them moisture-proof. Experiences which have been noted in connection with small distributing transformers have brought out the fact that this danger is not so great as was at first thought. One case is on record where 74 transformers, ranging in size from 1 to 25 kilowatts, were inspected after they had been in service from two to five years near the sea-shore, where the moisture

Digitized by Google

conditions were unusually severe, and samples of the oil were taken and tested. In every one of these transformers the oil showed an insulating quality which indicated that there was no trace of moisture in the oil, in spite of the fact that some of the transformers had been out of service during a considerable period each winter. We have on the circuits of the Turners Falls Power & Electric Company a number of installations of transformers ranging in size from 50 to 125 kilowatts which stand idle during several months in the winter. We test the oil in these transformers before putting them back into service each spring and have had no case in which the oil showed moisture, except in one instance when the transformer had a broken bushing. As a matter of fact, some instances have actually shown that there is as much, or more, danger of transformers indoors absorbing moisture as of those outdoors, since there is apt to be more moisture in the warm air inside a station, and if a transformer has been out of service for some time and is cooled down below the temperature of the room, it will, in the breathing process which is sure to take place with changes of temperature, draw in some of the warmer air from the room, and serious condensation of moisture will result on the inside of the transformer.

At the present time most large outdoor transformers are supplied with a small heating unit which takes about 110 watts and which is placed in the cover of the transformer above the oil. This keeps the temperature of the layer of air above the oil in the transformer a little above the temperature of the outdoor air, so that air which is taken into the transformer in the breathing process will at least hold in suspension whatever moisture it carried at the time of entrance. It is customary in the stations with which I am familiar to test the oil in all the power transformers once in six months. During the two and one-half years which these stations have been in operation, there has been no deterioration in the insulating characteristics of the oil and no signs of water having gotten into them. This statement is true even of the spare transformers which stand idle in each of these stations during nine months of the year.

Outdoor transformers are supplied with oil which freezes at about 15 degrees Centigrade or near zero Farenheit. In this climate the temperature goes lower than this at some periods of the year. Various methods are used to prevent the oil from freezing. In the case of oil-cooled transformers the temperature does not go down sufficiently to endanger transformers that are in use 24 hours of the day, but it is necessary to make some arrangements to prevent the freezing of oil in idle transformers which may be kept as spare units, in order that they may be on hand for instant service in case they are required. This is accomplished with oil-cooled transformers by one of three methods; either by connecting the transformer on the circuit during the cold periods and keeping it excited up to voltage, or by placing electric heating units inside the transformer which can be connected in service in cold weather, or by placing electric heating units underneath the transformer which may be connected in cold weather. In the case of water-cooled transformers, the above schemes may be used and in addition it is sometimes arranged so that the warm water from the transformers which are under load is circulated by pumps through the idle transformers. In the case of water-cooled transformers, it is necessary to insulate the water coils against freezing. In the case of the transformers in the Chicopee and Agawam substations, which have already been described, the spare transformers are placed on the circuit idle from about January 1 to March 10 each year. This covers a period during which the temperature seldom goes below zero for any length of time.

Outdoor metering has recently been faciliated by the development of outdoor metering equipment suitable for voltages of from 6,600 volts up to 66,000, in which the current and potential transformers and meters are arranged in a suitable iron box into which the current is brought through three bushings similar to ordinary roof bushings. This makes an equipment much less expensive than that which has heretofore been used for outdoor metering, and in which each separate current transformer required one high-voltage bushing and each potential transformer required two high-voltage bushings. With this development outdoor metering will be very little more expensive than indoor metering, and will complete the equipment necessary for small outdoor substations where loads of from 50 to 500 kilowatts are fed from passing transmission lines.

In conclusion, I might add that the experience of the Turners Falls Power & Electric Company, with which I am familiar, with outdoor equipment on high-tension transmission lines installed during the last three years has been very satisfactory. There have been only three brief interruptions to our service since the new line and substations have been put into operation which could be laid to this part of the system. One was caused by a 1,000-kilowatt outdoor transformer breaking down in the Agawam substation; one by four disk insulators in series breaking down in the overhead work of the Chicopee substation; and one was due to the burning of a set of outdoor aluminum lightning arresters at our Amherst substation. It seems proper to say, therefore, that the outdoor substation will unquestionably become more and more popular, since it is sure to offer a considerable saving in a great many cases, and this, along with its other advantages and the perfection which outdoor equipment has now reached, will in my opinion tend to increase the use of outdoor substations very rapidly.

In a recent discussion of this matter at a meeting of the American Institute of Electrical Engineers it was evident that all the engineers who had operated outdoor substations were very enthusiastic about them, while the only ones who seemed conservative about their usefulness were those who had no had much experience with them.

Report Shows Lightning Rod Protects Property.

The United States Bureau of Standards is about to issue a report of a survey of statistical data relating to life and property hazards from lightning and also of existing methods of protection against lightning. The field covered does not include electric power and signal systems, but does include buildings of various kinds, precautions to be observed by persons in thunderstorms, and interesting information in regard to lightning.

The paper is, in the main, designed for the layman, although some parts of it are of necessity rather technical. The literature of the subjects of lightning phenomena and protection against lightning was thoroughly searched for reliable information; reports of fire insurance companies and fire marshals were examined, and lightning-rod manufacturers were asked to submit the results of their experience and observations as to how a system of lightning rods should be installed.

The net result of the investigation is to show by means of reliable statistics that the lightning rod, when properly installed, is a trustworthy means of protecting property against lightning. This report, Technologic Paper No. 56, may be obtained by application to the Bureau of Standards, Washington, D. C.

Canadian Government Power Plant at Niagara Falls.

The Ontario Hydro-Electric Power Commission has completed a survey for a Government power house on the Smeaton farm, between Queenston Heights and Niagara Falls, Ont., Canada. Plans for the power station have been in preparation. The use of the surplus waters from the Welland Canal is projected, carrying the water to the generating station through a canal running from Chippawa Creek.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

INDIANA.

The Laporte Gas and Electric Company. The Commission has approved a contract for city lighting between the company and the city of Laporte. The contract provides the following rates, which are to stand "until further order of the Commission": for each 400-candlepower lamp, installed and maintained by the company, $57.50 a year; for each 100-candlepower lamp, $24 a year; for each boulevard post, lighted and maintained, $48 a year. The minimum number of 400-candlepower lamps is fixed at 225 and the minimum number of 100-candlepower lamps is to be twelve. The rates are to go into effect January 1, 1916.

MAINE.

The Turner Light and Power Company was granted permission to extend its system and furnish electric service in the town of Buckfield. The Buckfield Water, Power and Electric Light Company, while primarily operating as a water utility, has been furnishing some electric service in the town, and the Commission is very careful to state that, if it were possible for the company in the field to supply the service, the Turner company would not be allowed to enter. The decision says:

"Two courses are open to the Commission: to require the present company to furnish adequate service, or to permit some other company to do so. The former ought to be done, if practicable, because the interests of minority stockholders and bondholders should be protected, even if the management is negligent, and it should not be suffered through its negligence to jeopardize such interests.

"But this does not appear to be a case of failure to do what the company is able to do. It cannot furnish such service with its present plant and physical resources. The evidence indicates that a plant sufficient to supply the needs of Buckfield would cost more than the business would warrant. This view is substantiated by the fact that the company has not seen fit during these past few years to equip itself to take on the business which was knocking at its door. Under these circumstances we do not think that the position of investors in the local company would be improved by an attempt to require its officers to meet the demand for service. There is, then, but one other recourse, the admission of another company."

The order provides, however, that the Turner Company shall file with the president or treasurer of the Buckfield company a written proposal to purchase the property of the Buckfield company employed in furnishing electric service, at a reasonable estimate of its value, "before it begins to construct any part of its plant, pole lines, or other equipment in the town of Buckfield, or to furnish any service therein."

The Central Maine Power Company was authorized to purchase the property of the Waldo Water and Electric Light and Power Company, and has under consideration the application of the same company for authority to purchase the property of the Bath and Brunswick Light and Power Company. The petition states that by the proposed consolidation of these properties substantial economies will be effected, which will ultimately greatly reduce the price of electricity to its consumers.

The company was authorized to issue is six-per-cent cumulative preferred capital stock, in the total sum of $122,500, to be sold at not less than par, provided, however, that it may incur selling expenses not exceeding six per cent of the par value of the stock actually sold.

NEW HAMPSHIRE.

Nashua Street Railway. The Commission denied certain petitions for extensions of the Nashua street railway. In the decision, written by Chairman Niles, the Commission says: "An electric railway may often be justified in extending its lines with a view to probable further development of the territory to be served, though an immediate return upon its investment cannot be expected. But the judgment which determines what speculative risks of this nature shall be taken must be the managerial judgment—the judgment of those whose money is to be risked.

"If it were clear that the venture would ultimately prove profitable, or if the company were gaining an excessive return upon other parts of its system, it might be reasonable to compel it to make such an extension. But no such situation here exists. And we find no justification for such an order as is requested."

NEW YORK—Second District.

South Shore Natural Gas & Fuel Company. The petition of the residents of the town of Chautauqua, asking that the South Shore Natural Gas & Fuel Company be compelled to reduce the price for gas to the same amount charged in neighboring communities, has been dismissed by the Commission. The decision brings out the point that rates may be different without being unjustly discriminatory.

Commissioner Hodson points out in his opinion that the complainants have introduced no testimony in their case to show that the rates complained of are in themselves unreasonable, or that the lower rates in the adjoining territory are fair and reasonable.

Citing cases previously decided by the Commission and upheld by the courts, the opinion further says: "These cases uphold the principle that gas and electric companies are not prohibited by the law from giving a preference to particular persons or a certain locality, and thus discriminate against other persons and localities; and it is only when such preference is undue or unreasonable and the discrimination is unjust, that the Commission may intervene."

Fulton Light, Heat & Power Company. The Commission has dismissed its order to show cause why a penalty action should not be instituted against the Fulton Light, Heat & Power Company for selling certain securities at a price less than that authorized by the Commission and for attaching to the stock certificates a premium coupon entitling the purchaser to free electrical goods. The officers of the company have informed the Commission that the stockholders have paid into the company's treasury a sum equal to the difference between the price which should have been received for the securities under the Commission's authorization, and that for which they were sold to certain bankers and individuals and all the money represented by the coupons for free electrical equipment.

Digitized by Google

Conference on Valuation of Public Utilities.

Meeting Arranged by the Utilities Bureau in Philadelphia, November 10 to 12.

A discussion on the valuation of public utilities was held at the Hotel Adelphia, Philadelphia, Pa., November 10 to 12. This conference was arranged by the Utilities Bureau, which grew out of the conference of mayors held in the same city one year ago to discuss the relations of municipalities and public utilities. According to a resolution passed at the conference, similar conferences will be held annually in the future. This conference was attended by representatives of public service commissions, municipalities, and public utilities and by appraisal engineers, utility experts, college professors and others interested in the subject, the total registration approaching 200.

The principal difference of opinion brought out by the conference was in regard to the basis of valuation upon which utilities should be permitted to earn a return. It was made clear that in cases where the question of confiscation entered and the matter is taken to the courts for decision upon this point, a valuation based upon the reproduction cost of the utility property in its present condition is to be regarded as the "fair valuation" upon which the courts will require that the utilities be permitted to earn a return. In considering the question as to whether rates are reasonable, however, this is not the only basis for consideration and action, as has been exemplified especially in Massachusetts, where the original cost of the property has always been given the greatest weight by the commission in determining rates, and in no case has appeal been made to the courts under the plea that the rates were confiscatory.

With respect to intangible values, the weight of opinion was that such elements of value as are designated under the terms "franchise value" and "going value" should not be recognized for rate-making purposes. A number of the speakers also objected to permitting utilities to earn returns upon the unearned increments in land values, but it was considered that legally the present valuation of land actually used for utility purposes must be considered in making appraisals.

One of the most interesting discussions was that upon land values, which came up mainly at the session on Thursday evening. After a formal paper by Hammond V. Hayes, consulting engineer of Boston, entitled "Principles to be Applied in Valueing Land," the subject was discussed by A. E. Helm, counsel for the Kansas Public Utilities Commission; F. W. Stevens, of the New York Central Railroad; Milo R. Maltbie, former New York commissioner, and others. Mr. Helm took the view that railroad rights of way are public highways and that no allowance in rates should be permitted for increases in their value. In many cases such lands are donated by individuals or by communities and it is not fair to make the public pay interest upon the increasing value of its own donations.

Mr. Stevens, who was former public service commissioner in New York State, maintained that the decisions of the United States Supreme Court require the full present value of all existing property to be considered in rate-making, and that fair value meant actual present market value. Mr. Maltbie claimed that if an allowance for depreciation is to be made upon the expense side of the accounts, any appreciation as in the value of land should be entered upon the income side of the accounts. He pointed out, as did also Mr. Eshleman, Mr. Bemis and others, that if fair value is taken to mean present market value, no lowering of rates could ever be effected, since this lowering of rates will itself diminish the market value and hence might be regarded as destroying or confiscating part of the property. With respect to the land question, Mr. Knowles at a previous session had pointed out that the value of a utility property depended upon the rates which it was permitted to levy; that is to say, upon its income, and that any alteration of income affected this value. The value of all land is determined by the income which can be obtained from it actually or prospectively, and by restricting this income a commission or court would be preventing an increase in the value of the land. There is the same justification for restricting the income from this socially created value as in restricting the income from a franchise value which is similarly created by the public.

Seven sessions in all were held, each one dealing with some particular aspect of utility valuation. The first session was called to order on Wednesday evening, November 10, by Morris L. Cooke, acting director of the Utilities Bureau, who introduced Mayor Rudolph Blankenburg of Philadelphia, who made a short address of welcome and acted as presiding officer for the session. In an opening address, Mr. Cooke pointed out that the return to the investor was not a matter of discussion, as no one wished to deny him a fair return upon the actual investment. There is a diversity of opinion, however, between the marketers of securities and those who uphold the public interests as to the proper basis of valuations. He also stated that the financing of the Utilities Bureau had been assured and that it was already in operation, looking out for the public interests in any cities which cared to make use of its facilities.

Mr. Cooke was followed by John M. Eshleman, former president of the California Railroad Commission, and now lieutenant-governor of the state, who read a paper entitled "Criticism of Reproduction Theory of Valuation." He claimed that reproduction value is based upon what it would cost to build a similar plant entirely regardless of the need of such duplicate plant. There are two inconsistencies in the reproduction theory, since it attempts to apply competitive conditions to an actual monopoly, and also imagines the monopoly never to have existed while at the same time present. He quoted Justice Hughes in the opinion on the Minnesota rate case in support of his view. The point of view of those upholding the reproduction theory is as unjust as is that of a community which asks what a utility corporation would sell for rather than have a duplicate plant constructed to serve the community. Original cost should be considered in determining the returns to investors.

H. Findlay French, an attorney of Baltimore, then read a paper entitled "Reproduction Value Versus Fair Value." He pointed out that the fair value of an existing utility is not the reproduction cost but the cost of a modern plant which could render the same service. He claimed that the inclusion of intangibles in the valuation was intended to obtain a real return on an imaginary investment. Reproduction cost less depreciation gives the going concern value as distinguished from the scrap value.

Morris Knowles, consulting engineer of Pittsburgh, opened the discussion and pointed out that reproduction cost should be taken to include paving over mains and every other item necessary for actual reproduction. Whether this cost should be used as a basis for rate-making is another question. The historical cost should be considered

Digitized by Google

separately. He thought that the conference should consider equity rather than the law of the case, since court decisions change as public opinion changes.

A. B. DuPont, consulting engineer of Cleveland, argued against using either actual cost or reproduction cost, since the fair value of the utility is the price for which it can be bought, and two utilities which have cost the same may have entirely different valuations from the standpoints of service and earning capacity. The subject was also discussed by O. F. Gayton of Chicago, and James E. Allison of St. Louis.

At the session on Thursday morning George W. Anderson, former public service commissioner in Massachusetts, read a paper entitled "How to Get Rid of Reproduction-Cost Theory." He regards the reproduction-cost theory as a serious public menace. It assumes that rates must be based upon fair values, while actual values depend upon the rates. It was brought into the subject not through legislation but through court rulings. He pointed out that rate-making is a legislative function, while the function of the courts is to prevent confiscation. The rule of fair value has been adopted by the courts because the legislative power has failed to definitely fix the basis for rate-making. He favored legislation which would protect the investor and keep good the credit of utility companies through requiring a fair return to be permitted on capital actually furnished.

Edward W. Bemis, of Chicago, then read a paper entitled "Original Cost as the Chief Basis for Fair Value" in which he also advocated original cost as the most just basis to investors and public. Reproduction cost is entirely based upon estimates and is never consistently carried out; thus a five-year average price for materials is sometimes used; paving over mains has been disallowed by the Supreme Court; going value, as allowed in Wisconsin and New York with reference to early deficits, has nothing to do with reproduction cost.

The subject was also discussed by Robert H. Whitten of New York City and Edward P. Burch of Detroit. Dr. Whitten argued that reasonable rates should be based upon the normal cost of production, which is made up of operating costs and return upon the investment. The present cost of production involves the reproduction of the service rather than of the plant providing the service. To determine what it would cost to most economically reproduce the service would, however, be too complicated for application. The return must be enough to attract investment and investors will usually be satisfied with a rate providing a fair return upon actual cost.

Mr. Burch stated that reproduction cost is usually higher than actual cost. An appraisal could, however, be based upon the actual investment without great difficulty. Engineers are usually willing to carry out appraisals without bias, but the attorneys want only what will help their side of the case. He advocated the employment of engineers working directly for the court rather than for either party involved in a rate case.

John H. Gray, F. W. Stevens, F. P. Stearns, John M. Esleman, R. L. Hale and Edward W. Bemis also joined in the discussion. Mr. Stearns said that actual cost should be the basis for future investments and legislation should be passed to this end. It is not always possible or just to apply this idea to old utilities on account of the equities which have been developed. He favored considering the cost of reproducing a property as it was originally produced instead of considering only its present condition, which in fact is very seldom done consistently throughout anyhow.

Charles L. Pillsbury, engineer for the District of Columbia Utilities Commission, then read a paper entitled "The Making and Maintenance of Priced Inventories." This paper considered the basic features of inventory making and the purposes to which it might be applied. Whatever method be used for valuation, an inventory is valuable and one should be maintained by all utilities. The details of such an inventory were considered. Formal discussion of this paper was contributed by James W. Phillips of Philadelphia, F. W. Ballard of Cleveland, and R. J. Meigs of the Western Union Telegraph Company.

At the session on Thursday afternoon John G. Morse, appraisor for the Associated Factory Mutual Fire Insurance Companies, read a paper entitled "Valuation by Approximation" in which he showed the absurdity and uselessness of going into minute details in appraisals of large properties. By using average unit prices suited to the particular case, appraisals can be made in much less time with a final result as accurate as when details are considered. Examples were given.

This paper was discussed by Morris L. Cooke and Walter N. Polakov, who both agreed with the methods of the author.

Delos F. Wilcox, of New York City, then read a paper on "Franchise Values." Franchise values were considered for purposes of taxation, of rate-making, condemnation, involuntary sale, voluntary purchase, and capitalization. For rate-making purposes franchise values need be considered only in exceptional cases where they have been capitalized by the authority of the state. The fact that a franchise is taxed has no bearing upon the case.

In discussing this paper, Henry D. Baldwin, of the Queens County Water Company, took exception to some of the statements of the author. He thought that franchise value should be taken on the same basis for all purposes and if not considered for rate-making it should not be taxed. The method applied in New York to taxing franchises is particularly bad.

Chester A. McLain, of Harvard University, said that confusion results from the failure to segregate the legal and social aspects of franchises. Since a franchise represents a right to earn a return on the physical property, there should be no return allowed on the value of the franchise itself. In some jurisdictions franchise rights have been considered as easements in the land and a return allowed upon the value of these easements. He agreed with the previous speaker that franchise taxes should not be levied unless it be as a privilege tax.

Alfred Bettman, attorney of Cincinnati, discussed the matter from the point of view of different kinds of franchises, such as limited-term, perpetual and indeterminate franchises. With indeterminate or limited franchises under regulation, no value exists, but for condemnation purposes there may be such a value.

Harry Barker quoted from the opinion of Justice Miller in the Passaic gas case, in which a franchise was regarded as property which must be protected by the court, but property which is not used and useful in the public service and hence should not be included in a valuation for rate-making.

Going value was discussed at the session on Friday afternoon, which was presided over by Morris Schaff, Massachusetts commissioner. In an opening address General Schaff alluded to the pioneer work in regulation which has been done in Massachusetts. The obligation of the consumer was recognized to pay for the expenses of operation and depreciation to make a generous return on the investment and to provide a surplus for contingencies. The question of capitalization of earning power was never raised there. It was necessary to consider how much of the present value of any utility was contributed by the stockholders, how much by the customers and how much by the state or social factors. In confiscation proceedings he urged that a distinction be drawn between the conditions of competition and monopoly. He hoped that

Digitized by Google

we would not be confronted with another Dred Scott decision in which the property in slaves was put on a par with property of other kinds.

An address was then made by R. C. Wood, New York commissioner, in which he discussed the objects and the value of regulation.

A paper was then read by Clifford Thorne, chairman of the Iowa Railroad Commission, entitled "Going Value as an Element in Fair Value." He discussed the various meanings which have been given to the term "going value" and the proper treatment of early losses and profits. He dealt at some length with the Des Moines gas case, where the principal point involved was a proper allowance for an established business, and in which the Supreme Court decided that this element had been properly considered in making an allowance for the value of the plant in successful operation. A plant which is not in successful operation does not have a value equal to the reproduction cost less depreciation. Regarding early development costs, he considered whether these should be regarded as operating expenses, or be capitalized, or merely be considered in determining the proper rate of return. He favored the latter method. Unless there is actual proof of early losses no allowance should be made for them. He questioned whether losses arising through conditions of competition should be regarded as a part of preliminary expense. After a period of nonregulation he thought utility companies should be estopped from bringing up the question of early losses.

Addresses at this session were also made by J. L. Bristow, commissioner of Kansas and former United States Senator; A. M. Fox, of Detroit; and William J. Hagenah, of Chicago. Mr. Bristow claimed that the depreciation which securities had undergone in recent years is not due so much to an inadequate rate of return as to mismanagement by utility officials. He cited the case of one railroad which had gone into the hands of a receiver during the year in which its gross receipts were the greatest. He also pointed out the absurdity of the two claims for capitalization of both excess earnings and early losses.

Mr. Fox discussed the proper treatment of intangible values under the headings of overhead expenses, developing an organization, and going value. He considered the first two elements proper subjects for capitalization but going value should not be considered for rate-making purposes.

Mr. Hagenah advocated an allowance for going value in rate cases to be determined from actual records of operation. Early losses are evidences of cost, not of value.

Depreciation.

Depreciation received attention at the session on Friday morning. Papers were presented by J. H. Goetz, counsel for the New York Public Service Commission, First District, entitled "Court Decisions on Depreciation" and by Halford Erickson, of the Wisconsin Railroad Commission, entitled "Relation of Depreciation to Fair Value."

Mr. Goetz pointed out that the courts had been somewhat contradictory in their decisions on this subject, which at present is somewhat hazy. He classified these decisions with respect to their different bearings upon the subject and pointed out that tax cases have no bearing upon the application of the subject in rate cases.

Mr. Erickson dealt with appraisals and the meaning of "fair value." He considered the different elements in depreciation, pointing out that wear and general decay or aging were physical elements, whereas inadequacy and obsolescence are social elements. He favored allowance for depreciation in equal annual installments and pointed out that adequate service is bound up with a proper allowance for depreciation and proper care of the depreciation reserve. The unused portion of the depreciation reserve should earn interest to be added to this reserve and relieve the burden on the consumers. It is both legal and ethical to permit a return to be earned upon the cost plus the reserve fund minus depreciation. Whether the cost should be original cost or reproduction cost is another question. He discussed cases in which depreciation reserves had not been accumulated, and said that if rates had been sufficient to create such a reserve, cost less depreciation should be taken as fair value, but where income had been insufficient to create a reserve fund there should be no deduction from the cost for depreciation. A study of the balance in the reserve funds of actual utilities shows that this varies in amount from 10 to 50 per cent of the value of the plant.

This subject was discussed by James E. Allison, of St. Louis, and John Bauer, of Cornell University. Mr. Allison objected to the consideration of accrued rather than actual depreciation on account of its speculative nature and the inapplicability of average life data to any particular case. Life depends upon use and maintenance, and also upon obsolescence and inadequacy. Even if accurate figures for life were available for the individual parts of a plant, there is no such thing as a composite life since with proper renewals the life of the entire plant is indefinite. Depreciation of a plant is prevented when proper replacements are made and the funds for this purpose should be called replacement funds. Mr. Erickson regarded the fund as a part purchase of the plant by its customers. This is harmless if both parties are willing to regard it in this light, but it has nothing to do with the present value of the plant, and may work injury when applied to the past since it amounts to a regulation of past profits.

Professor Bauer said that if actual cost rather than reproduction cost were considered it would not be necessary to make deductions from the valuation for depreciation. He favored appraisals based on actual prices at the time of construction and pointed out the desirability of some definite method which would be to a certain extent automatic and represent a definite policy. In the future valuation should be based on actual cost. For utilities already operating a valuation should be determined for the present time and the curtain drawn upon the past. Whether depreciation shall be deducted from the valuation should be a matter of general policy and it cannot be expected to do justice in every indivdual case.

The Future in Public Utilities.

At the session on Friday evening which followed a dinner, President Charles R. Van Hise of the University of Wisconsin presided.

Charles A. Prouty, of the Interstate Commerce Commission, and William D. Kerr, of Chicago, made addresses on "Constitutional Protection in Valuation." Mr. Prouty said it was the function of commissions to regulate utilities but not to destroy them, and the courts stepped in whenever the question arose of whether utility corporations were being deprived of their property. The commissions, however, are supreme in their rulings as to rates, subject only to the condition that a fair return must be permitted on a fair valuation.

Mr. Kerr pointed out that nearly all of the various points of view in regard to valuation can find some authority in past court decisions. He interpreted Supreme Court rulings to mean that franchise values cannot be included for rate-making purposes. There are various restrictions to the property rights of a public utility corporation as compared with that of a private individual.

Newton D. Baker, mayor of Cleveland, regarded commission regulation as a barrier to public ownership of utilities.

John H. Gray, of the University of Minnesota, spoke on "Opinion Testimony." He discussed the rules of evidence and the evolution of the functions of juries, witnesses and judge. He showed that opinion is not evidence and that expert testimony is too often biased by business affiliations. Restrictions should be enforced to secure real experts, fewer in number, less biased, and at reduced cost, and they should preferably act merely as advisers of the court.

The last speaker was Milo R. Maltbie. Among other points, he emphasized that depreciation funds should be held in trust for that purpose and never distributed, or the public will in the future raise objection to liberal depreciation allowance.

Digitized by Google

TEMPERATURE OF MICA INSULATION.

Monthly Meeting of the American Institute of Electrical Engineers.

The 315th meeting of the American Institute of Electrical Engineers, held in New York City on the evening of November 12, with Vice-President N. W. Storer in the chair, was devoted to a consideration of the temperatures to which mica insulation may be subjected in electrical machines. F. D. Newbury read a paper entitled "Experimental Data Concerning the Safe Operating Temperature for Mica Armature-Coil Insulation." This paper gave the results of tests made upon a 3,750-kilowatt alternating-current generator installed at Niagara Falls, which has been in operation for 20 years. The insulation of the armature coils of this machine consisted of mica wound around the copper bars with cambric for a wrapper. This insulation is still in good condition although it has been subjected for long periods to temperatures up to and exceeding 200 degrees centigrade.

The Standardization Rules of the American Institute limit to 125 degrees the temperature to which insulation of this class should be subjected, except in cases of special guarantees by the manufacturer. As a result of this test Mr. Newbury showed that under the conditions of operation of this generator temperatures up to 200 degrees were not deleterious and he expressed the opinion that 150 degrees was a conservative limit under any conditions whatsoever.

In the discussion which followed this paper nearly all of those who spoke agreed with Mr. Newbury that this temperature limit should be raised in the Standardization Rules. Those who participated in the discussion were Philip Torchio, W. J. Foster, H. P. Wood, B. A. Behrend, C. F. Scott, H. F. T. Erben, C. E. Skinner, John B. Fisken, Paul M. Lincoln, F. W. Peek, Jr., L. T. Robinson, T. E. Fowler, W. L. Waters and E. W. Stevenson.

Mr. Wood was the only one to object to raising the temperature limit. Professor Scott, Mr. Lincoln and Mr. Skinner told of the early history of the Niagara installation. At the time the generator was built and during the early years of operation no one had any idea of the actual temperatures in the interior of the machine.

Several of the speakers pointed out that it would not be wise to exceed 200 degrees as a permissible operating temperature because the binding material used in connection with the mica would then undergo disintegration, even though the mica itself would not be affected until a much higher temperature was reached.

With respect to the general use of mica for insulating purposes, it was pointed out by Mr. Erben and others that for many uses mica had no advantage over other insulating materials and on account of its added expense would not be advisable. Mr. Foster told of keeping machines at 200 degrees operating temperature for several weeks without any deterioration. Mica will meet with a much wider scope of application if 150 degrees be regularly permitted.

Mr. Behrend pointed out that it was well known by designers and others that insulation had been subjected to higher temperatures than generally supposed for years and that it was much better for the entire profession to be acquainted with the actual facts.

Mr. Torchio pointed out the advantage of being able to run machines at higher temperatures for periods of overload and pointed out the peculiar characteristics of the Niagara machine which made it less susceptible to danger than might be the case in other models. He described two machines recently purchased by the United Electric Light & Power Company to supply single-phase current to the New York, New Haven & Hartford Railroad Company, in which an operating temperature of 150 degrees was accepted in the specifications. These machines have a capacity of 20,000 kilowatts at 25 cycles and 6,600 volts. On account of the load conditions the machines will not operate continuously at the maximum temperature. These machines are the largest of their kind in existence.

In closing the discussion Mr. Newbury said that the same type of insulation had been applied to small copper conductors with satisfactory results. Linear expansion due to high temperatures does not produce any difficulty, especially as the hot spots are local and the average temperature much lower. Temperature, however, is not the only limitation to rating.

Chile Telephone Company to Place Lines Underground.

The Chile Telephone Company is to begin work within a few months on changing its system of wires in Valparaiso, Chile, from overhead to the underground system. At present all of the telephone wires in Valparaiso are overhead wires. In laying the wires underground care will be taken to follow the lines of streets not paved with asphalt. The general manager for Chile of the Chile Telephone Company is William Johnston, Calle San Martin 50, Santiago. The local manager is Señor Ernesto Varas, Avenida del Brazil 54, Valparaiso.

Tremendous Demand for Electrical Prosperity Week Sales Helps.

One of the leading manufacturers has announced that through the medium of Electrical Prosperity Week campaign, he has sold nearly $100,000 worth of goods. Neil C. Hurley, of the Hurley Machine Company, makes this statement. Other prominent manufacturers and jobbers have stated that central stations, dealers and contractors everywhere are taking adavantage of the great campaign to sell electrical goods; even the department stores are stocking up preparatory to the Week and to the Christmas sales campaign.

That the campaign is the greatest movement in trade history is evidenced by the tremendous demand for the Electrical Prosperity Week sales helps. The Society has been deluged with orders for material from all parts of the country. Not only are the large cities celebrating the big affair but even the smaller hamlets have taken it up. It is nation-wide.

Leading sales and advertising experts in co-operation with the Society for Electrical Development at a spring meeting decided upon the quantities of material to be ordered. For example, originally it was thought that 2,500 car cards would meet the demands. There are 58,000 available cars in the country and up to November 12, over 23,000 car cards had been ordered. The first order was for 10,000 window cards. The Society has shipped 50,000 to date. Even the 5,000,000 poster stamps have not been enough. Probably 10,000 automobiles and wagons will carry the muslin signs.

The telephone companies everywhere are co-operating with the electrical interests in mailing the interesting little folder: "How Much Better the World is Since Electricity Became your Servant." Two million copies of this folder were printed by the Society. The telephone companies will mail nearly 600,000 to their subscribers. The Western Electric Company greatly aided the electrical interests in arranging for this co-operation. Many of the Western Union offices will display the window lithograph in their windows during the Big Week.

By an arrangement with the Society, *Collier's Weekly* had 25,000 copies of an advance advertising edition of *Collier's* printed. This issue has special edition cover showing a grandmotherly lady cooking a Thanksgiving turkey in an electric oven. It contains all of the ads to be run in the November 27 issue and gives the story of the Week and what is being done everywhere. Perhaps this was one of the biggest publicity strokes of the Society's campaign.

Collier's Electrical Number will be on the streets November 23. This big

Digitized by Google

magazine will advertise its special issue in electrical pages of newspapers, in street cars, on billboards and at the many electrical shows. The circulation of this issue will probably be considerably over a million.

Saturday Evening Post will carry a large number of electrical advertisements. The *National Food Magazine* and the *Scientific American* have special electrical numbers. In the aggregate, fully ten million people will see these ads.

The "How To" booklets issued by the Society have been largely instrumental in tying the sales end of the campaign into the celebration. These booklets will be valuable long after the campaign is over. They are free to everyone.

The big Week is nearly here and it is quite apparent now that it will be a tremendous success. It is without question the greatest sales campaign in the world's history.

Electrical Prosperity Week Meetings.

Members of the staff of the Society for Electrical Development have recently addressed several large meetings in the interest of the big campaign.

Harry W. Alexander, director of publicity, spoke at a meeting of electrical men in Washington, November 9. He told of the work of the electrical interests everywhere and what was being accomplished. Considerable enthusiasm was aroused and the Washington interests voted to get back of the campaign with might and main.

John McLaughlin, commercial manager of the Potomac Electric Power Company, presided and pledged the support of his company. Clarence P. King, president of the company, made some illuminating remarks on the great worth of such a campaign. An Executive Committee was appointed to take charge of the Big Week. It consists of E. C. Graham, O. R. Evans, John R. Galloway, John J. Bartram, C. Phillips Hill, H. R. Carroll, and A. Stephan. These men will appoint other Washington men to assist them.

Later the same evening Mr. Graham and Mr. Alexander spoke at a meeting of the Washington Chamber of Commerce. This body endorsed the movement. On November 10 Mr. Alexander addressed a meeting of the Retail Merchants of Washington. Most of those present offered to make special window displays during the Week.

Baltimore was a little late in getting started but all are working now for the success of the Week in that city. Robert Lee, publicity manager of the United Railways and Electric Company, was appointed director of the campaign.

The Executive Committee consists of Douglas Burnett, Walter Moulton, H. L. Lemmert, William L. Modell, S. B. Prather, and Eugent I. Rosenfeld. Special attention will be paid to window displays by electrical and non-electrical interests.

Mr. Alexander addressed the Jovians and associated electrical interests at a meeting held November 11, at Hotel Emerson in Baltimore.

George W. Hill, of the field co-operative staff of the Society for Electrical Development, is making an extensive southern trip in the interests of the campaign and in planning sales campaigns.

Meeting of Electric Power Club.

The Electric Power Club held a meeting at Hot Springs, Va., Nov. 8, 9 and 10.

It was one of the best meetings yet held and was attended by 47 men representing 20 companies.

The constitution was amended so as to include as members manufacturers of transformers and industrial control apparatus. This opens up a very large field for standardization which will prove as valuable to both the manufacturers and users as the standardization work already done on electric motors and generators. Five companies manufacturing this class of apparatus were elected to membership, making the membership 34 companies in the electrical industry.

In the work of standardization of motors and generators, a number of changes in the existing commercial ratings were made to bring them within the limits established by the new rules of the American Institute of Electrical Engineers. The allowable variation in voltage at which motors will operate successfully was fixed at 10 per cent above or below the rated voltage. It was recognized, however, that such a variation did not necessarily mean that the motor would operate within the guarantees given for operation at normal voltage. The starting torque for continuous-duty polyphase induction motors with full voltage applied was standardized at not less than 150 per cent of full-load torque for two, four and six-pole motors, 125 per cent for eight, ten and twelve-pole motors, and 100 per cent for fourteen-pole motors. The maximum torque for such machines shall not be less than 200 per cent of full-load torque.

For direct-current motors, the variation in speed from full load cold to full load hot was fixed as not to exceed 10 per cent, based on the full-load speed hot.

There was considerable discussion as to the proper basis of rating for continuous-duty motors and generators used for general purposes, as distinguished from special-application machines used where the conditions of service and magnitude of load are definitely fixed and known beyond question. An illustration is a motor direct-connected to a blower where the maximum load is definitely known and cannot be exceeded. The sentiment expressed at the meeting indicated that for general purposes the Electric Power Club was decidedly in favor of making no change in the present basis of rating, namely of 40 degrees centigrade at full rated load with a 25-per-cent overload temperature guarantee for two hours, but that in the case of special-application machines a higher temperature rise, but still within the limits established by American Institute of Electrical Engineers, and with no overload temperature guarantee, might be justified.

Large Electric Hoist for Montana Mine.

The hoist now in course of installation on the Granite mountain shaft of the North Butte Mining Company is the first large electrically driven hoisting engine to be installed in Montana. It is, in fact, the largest on the two American continents, and ranks with the very largest installations that have ever been made. On this installation particular attention has been given to economy of operation, reliability and "safety first."

The electrical equipment on the hoist is designed to handle seven tons of ore per trip. The ordinary operating rope speed is 2,700 feet per minute, but arrangements are made so that the speed can be increased up to 3,000 feet per minute. The equipment is designed to handle hoisting from various vertical depths down to 4,000 feet, and the cycles of operation have been chosen to give, approximately, capacities from various levels as follows:

Three hundred tons per hour from the 2,000-foot level; 250 tons per hour from the 3,000-foot level; 200 tons per hour from the 4,000-foot level.

The hoist itself has cylindrical drums 12 feet in diameter and the rope to be used is one and five-eighths inch plow steel cable.

To drive this hoist with an electric motor and still not draw excessive peaks of power from the electric power line, a combination of apparatus known as the Ilgner system was decided upon. In this system a direct-current motor is used on the hoist and supplied with power from a direct-current generator forming part of a motor-generator set. The motor of this motor-generator set is supplied with power from the electric supply line. Mounted on the shaft of the motor-generator set is a flywheel whose duty it is to equalize the amount

Digitized by Google

of power drawn by the alternating-current motor from the power line.

The power required to accelerate the hoist and its load from standstill to the running speed of 2,700 feet per minute depends of course on the rate of acceleration. In order to obtain the capacity desired from this hoist it was necessary to use a very high rate of acceleration, in fact, from standstill to full speed in about 15 seconds. This means that the power required to accelerate is very greatly in excess of the power required to do the hoisting once full speed is attained. The power required for hoisting averages about 1,500 horsepower, but to accelerate the equipment and the load requires peaks varying from 3,500 to 4,300 horsepower.

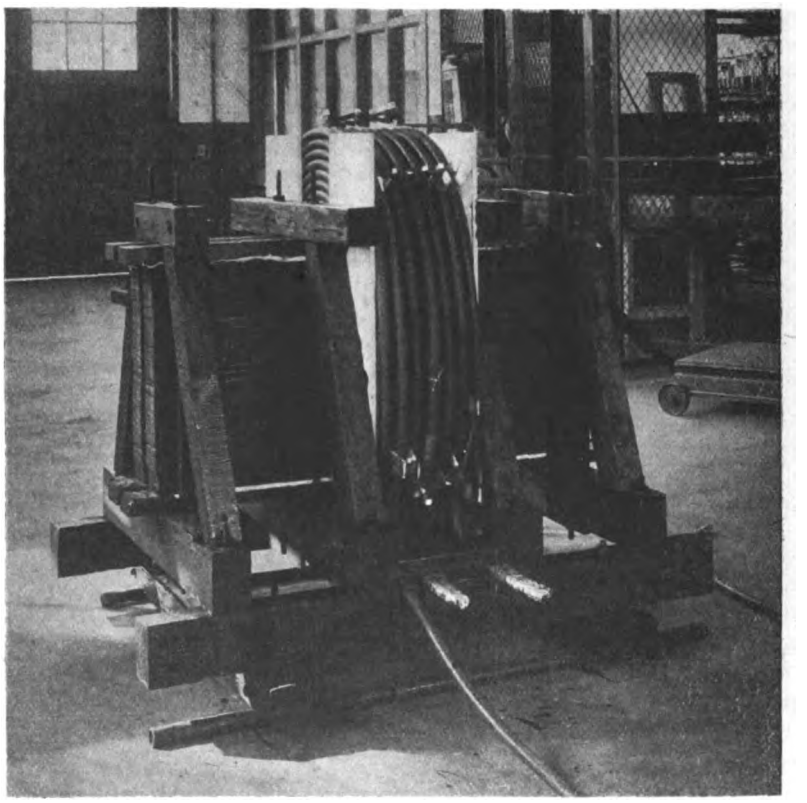
The flywheel on the motor-generator set supplies the extra energy (that is, the amount of energy above the average) required for acceleration.

The sizes of the electrical equipment involved in this installation are as follows: The direct-current hoist motor has a nominal continuous rating of 1,850 horsepower. Hoist motors not being operated continuously are usually given what is termed an intermittent rating, and this particular hoist motor has an intermittent rating of 2,750 horsepower. It is really big enough to pull 4,500 horsepower for a short period of time and is guaranteed to do so.

The generator of the motor-generator set has a rating of 1,500 kilowatts, and can deliver 3,750 kilowatts without trouble. The driving motor is 1,400 horsepower. The flywheel is 12 feet in diameter, weighs 50 tons, and the whole set runs at speeds varying from 400 to 500 revolutions per minute, according to the action of the slip regulator.

The peripheral speed of the flywheel will be as high as 19,000 feet per minute. Naturally this causes some stress in the material of which the wheel is constructed. In order to prevent any possibility of a flaw in the wheel, it is assembled out of sheets of rolled steel plate, each sheet being one-half inch in thickness and cut to fit the wheel. These various plates are being assembled together to a total thickness of 21.5 inches and then riveted.

Naturally a flywheel of this size, presenting such a great area for air friction and running at such a high speed, will cause considerable windage. Windage is energy wasted in uselessly stirring up air, and, in order to reduce it and thus increase the economy of the set, the entire surface of the flywheel is very carefully finished. All rivets are countersunk flush with the surface. The entire wheel is carefully cut and finally polished and lacquered, so that it will present as smooth a surface to the air as possible, and thus reduce friction. Further, the amount of air that could possibly be moved by contact with the wheel is reduced by totally inclosing the wheel in a short steel case carefully finished on the inside and fitting as closely as possible about the flywheel. Tests indicated that the friction and windage losses running the flywheel in the open air would be between 80 and 100 horsepower. By inclosing the wheel in a properly designed cover, these losses could be reduced to something like 50 horsepower. Excluding the air from the cover did not seem to reduce the losses by more than 12 or 15 horsepower, which saving in power would hardly pay for the application of the necessary water-sealed glands, air pump and changes in case construction to resist the external atmospheric pressure.



Large Reactance Coil Built In Laboratory.

Laboratory-Built Reactance of Large Capacity.

A 1,000-kilovolt-ampere reactance, for use in cable testing at the Boston Edison Company's Walpole substation, was recently constructed in the laboratory of the company. It was calculated by Prof. C. A. Adams of Harvard that a reactance of about 1.4 ohms should be used in the low-tension circuit to insure a good wave form in the high-tension circuit.

A transformer having the necessary core was found in stock, the calculation calling for a core of 140 square inches cross section and about 56 turns of wire in the winding around the core.

The transformer, which was a 200-kilowatt unit of the air-blast type, was dismantled and about 15,000 iron laminations taken out and reassembled on a strong hard-pine base.

The laminations were built up into two slabs, each 3.5 inches thick, 2 feet high and 4 feet long, with a 1.25-inch space between them for ventilation. The weight of the core thus formed was about a ton, and of the assembled apparatus about 2.75 tons.

The core was wound with 500 feet of 500,000 circular-mil flexible cable in pancake coils of eight turns each, with air ducts between the coils. The whole reactance was rigidly braced to withstand structural, shipping and electro-magnetic strains.

The instrument was insulated for 2,300 volts and designed to carry about 700 amperes. The characteristic curve was found to be a straight line throughout its current range.

In the laboratory try-out tests direct current, of 700 amperes, was sent through the winding, causing the iron coil to become a very powerful electro-magnet. A 20-inch screwdriver, with its point sticking to the end of the coil, would become tangent to the leakage lines of magnetic flux, though the axis of the screwdriver was stationary in the air at an angle with the floor. At the Walpole substation, when alternating-current energy was flowing in the winding, bolts and nails 1 to 6 inches distant from the core would become so hot as slightly to char the wooden frame. The heating was caused by eddy currents induced by leakage lines of magnetic flux passing through the metal objects.

Digitized by Google

A Prize-Winning Electric Float.

The advantages of the use of electricity in the modern household were very attractively and convincingly displayed in the float shown in the accompanying illustration, which was entered by the Westinghouse Electric & Manufacturing Company, in the parade held during the recent celebration by Wilmerding, Pa., of its twenty-fifth anniversary. The parade, which was composed of fraternal and commercial organizations and floats from industrial organizations in the vicinity, was the most elaborate ever attempted in the Turtle Creek Valley neighborhood.

Owing to the fact that the parade was held at night, the Westinghouse Electric float was the center of attraction, the profuse illumination afforded by the 14 60-watt lamps placed around the sides and two 100-watt lamps hung from the center adding greatly to its attractiveness.

The float represented two scenes, the front one being that of a dining room in which an electrically prepared dinner was being served to a number of young ladies. By means of table stoves, coffee percolators and other devices, dinner was prepared right at the table. Two of the ladies stood up and popped corn over an electric stove and threw it out among the spectators, all the way along the route of the parade.

In the rear portion was shown a laundry scene, emphasizing the difference between the "old" and the "new" way of washing. On one side was an electric washing machine, busily washing the clothes, while the young lady in her good clothes was sitting comfortably by reading a book, giving the machine only an occasional glance. On the opposite side was an old negro "mammy" bending over an old-fashioned back-breaking washtub. Appropriately worded placards explained the different scenes. In this part of the float there was also a table on which were placed several different electrical labor-saving devices. A "Cozy Glow" radiator, the soft light from which added much to the attractiveness of the scene, was also included. An electric vacuum cleaner set opposite an old-fashioned long-handled broom served further to emphasize the advance in household efficiency.

The float was built on the chassis of a five-ton automobile truck. Beams were bolted across the frame and other pieces, running lengthwise, were bolted to these. This framework served as the base for the floor and the superstructure. At the corners and midpoints of the structure, columns were fastened to the base. Bracings for the tops of the columns were secured by means of a skeleton gable framework. These gables were shallow and formed the support for the roof, which was covered with bunting as was the main body of the truck. The color scheme was a combination of orange and black, colors of the city of Pittsburgh.

Oscillating fans with streamers attached were placed on top of the four columns, but this did not prove a success, because of wind pressure of the moving float and also on account of the overhead obstructions met with en route. Current for the operation of lights and other devices was obtained from a 300-ampere-hour storage battery placed under the flooring.

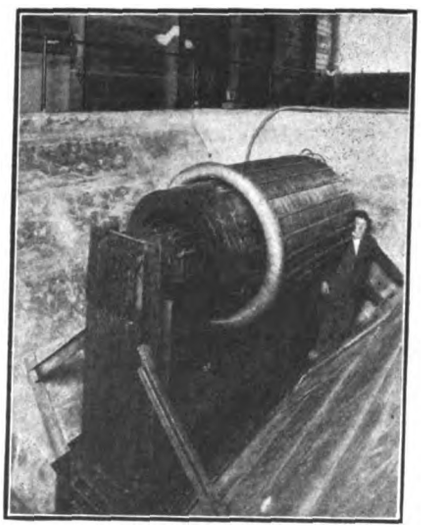
Prize-Winning Float.

MILLION-VOLT TRANSFORMER TO BE DEMONSTRATED AT THE PANAMA-PACIFIC EXPOSITION.

By Neill Willson.

A big frame building 30 by 90 feet in size and three stories high, has been constructed by the Panama-Pacific International Exposition at San Francisco to house a 60-cycle, million-volt transformer—the biggest ever built.

The structure stands in the vacant lot behind Machinery Palace. It draws its current from the adjacent power plant maintained by the Exposition in the Pacific Gas and Electric Building. In addition to the structure which was built to house the transformer, an immense metal pole and connecting wires were arranged outside, so that the public can have an opportunity to view demonstrations.



Million-Volt Transformer.

For a long time the transformer has been in process of manufacture. Part of the funds were donated by the Smithsonian Institution and part by the Exposition.

The installation of the transformer was completed November 1. It was designed and built in the laboratory of C. H. Thordarson, of Chicago, at a cost of $30,000. This cost includes the specially made machinery for winding the low and high-tension coils and the insulating tube.

The transformer is installed in a specially designed building erected by the Exposition at a cost of $6,000. There are no nails used in the construction, the structure being held together by iron bolts which run parallel to the high-potential wires to avoid the danger of fire from the electric static stress. It has the appearance of a large Zeppelin hangar, as both ends are left open for ample clearance of

Digitized by Google

the high-voltage wires that lead to the structures outside of the building.

The transformer is submerged in 225 barrels of oil in a specially designed cement pit with metal lining. The air surface at the oil line measures 16 by 18 feet. This high-grade insulating oil was loaned by the Union Oil Company of California to the Exposition.

The weight of the transformer is approximately 30,000 pounds, and it is made up of 26,000 pieces of paper, fiber, aluminum, copper, steel and iron, and designed to develop 1,000 kilowatts at 60 cycles.

The low-tension coils of this transformer are wound to receive 2,200 volts and are made up of 122 coils arranged in multiple-series, the coils being bridged in pairs across the 2,200-volt terminals. This allows for a neutral tap which is grounded to the transformer frame.

The paper tube which insulates the primary and secondary coils weighs over 2,000 pounds.

The million-volt winding is made up of 190 coils, each coil being wound for 5,000 volts, equally spaced, and wound with flat aluminum, 8-mil 0.1-ampere conductor insulated by three layers of paper. All coils are connected in series, with one end grounded.

There are 400 miles of paper, aluminum and copper used in the construction of the coils and paper tube, 90 miles of aluminum and 270 miles of paper being used in winding the million-volt coil.

Municipality Takes Over Berlin Plant.

The City of Berlin, Germany, has purchased the power stations in that city formerly owned by the Berlin Electricity Works, which is closely related to the Allgemeine Elektricitäts Gesellschaft. The price is about $31,000,000.

New York Electrical Society.

There was a large attendance at the visiting meeting of the New York Electrical Society, at the Equitable Building, 120 Broadway, New York City, on November 13. Twenty-three members were elected. After luncheon, C. T. Coley, operating manager of the building, gave a most interesting address on its leading features. The members were then conducted over the building.

Mica mining in the United States commenced in 1803 with the opening of the Ruggles mine, Grafton County, New Hampshire, and until mica mining began in North Carolina, about 1867, New Hampshire furnished the mica output of the United States.

LETTER TO THE EDITOR.

Some Law Regarding Contracts.

To the Editor:

Relative to a recent discussion regarding the law of acceptances and in particular to the issue in which one made an objection that the sender of a letter has the right to withdraw same before its delivery.

I am not a lawyer, but it seems to me that your answer is in error in principle. It is stated that B, by withdrawing his reply before delivery, has acted as if he ran after the messenger of A and snatched his message from him. Is the United States Post Office department the messenger of A exclusively? Is it not the common messenger of either and that until delivery is made of any message, to the party addressed, is it not the messenger of the party sending same? If this is correct, B did not snatch the message from A's messenger, but from his own. If this is true he is taking the message from himself and which he has the right to do before he has offered it to A.

It is stated in the same reply that if A had discovered that B had accepted A's letter at some later time, even though he had not received the written acceptance, he could claim same. As I gather it anyone has the right to change his mind before another has taken action on one mind phase as *stated* by the maker. If this is correct B can change his mind as many times as he pleases before any action is taken by A. This action, however, is assumed to be taken immediately upon receipt of any word by A from B. What is the law in this?

W. M. Price.

Seattle, Wash., October 14, 1915.

[Answer—Where A sends to B by mail, an offer, and B *by mail*, has sent an acceptance, the contract, as I stated before, is complete, and nothing which can be done by either party subsequently, can get away from it or away from the legal obligations that arise under it. Where the offer is sent by A by mail, the law holds the mail to be A's messenger, rather than B's—though, of course, in a sense the mail is the common messenger—and when the answer is delivered to the mail by B, it is as if it had been delivered to A himself. At this minute the contract is complete. Getting B's message of acceptance out of the mails would not change the situation because under the law it is technically already in A's hands.

Elton J. Buckley.]

Philadelphia, November 15.

Tampa, Fla., has passed an ordinance requiring the examination of electricians.

BOOK REVIEWS.

"Electrical Measurements and Meter Testing." By David P. Moreton. Chicago: Frederick J. Drake and Company. Cloth or leather, 328 pages (4x6½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.00 in cloth; $1.50 in full leather.

This volume has been prepared especially with the requirements of the practical man in mind. The first five chapters are devoted to the general principles of electricity and the following eight treat of methods of measurement. Numerous examples are given with solutions to elucidate the principles. The construction and operation, as well as the testing, of watt-hour meters is fully treated. The volume seems admirably suited to the class of readers for whom it is written.

"Universal Methods for Computing the Speed of a Telegraphic Message Sent by Automatic Transmitter or Hand Key." By J. Rymer-Jones. Published by the author. Paper, 22 pages (8½x13 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.25.

The personal work of the author which is presented here will interest only the technical worker in the telegraphic field. The author has developed a method for determining the speed of working submarine cables and has applied it to both manual and automatic transmission. He has endeavored to show that whatever may be the number of elements per word in the various codes, these can be converted into an equivalent standard word from which a speed constant may be determined.

"Rubber Machinery." By Henry C. Pearson. New York: The India Rubber World. Cloth, 419 pages (6x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $6.00.

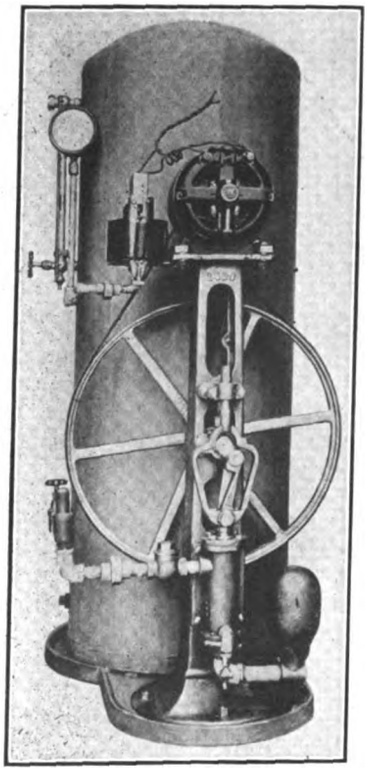
The author of this volume is the editor of *The India Rubber World*, and has no doubt had unusual facilities for collecting information upon this subject. The various processes through which rubber is carried from the collection of the crude product until manufactured into commercial merchandise are described, as well as the methods of reclaiming old rubber. Many illustrations of the machinery involved are given, including all important machines. The book should prove valuable to anyone who wishes to familiarize himself with this industrial process. The application of motor drive to rubber machinery is mentioned, as well as the use of electric energy for devulcanizers, ovens, and other electrically heated apparatus, as well as in controlling devices. The book is the best we have seen on this subject.

Digitized by Google

New Electrical and Mechanical Appliances

Columbiana Electrically Operated Pump.

A new electrically operated water pump for residence service has recently been marketed by the Columbiana Pump Company, Columbiana, O. It is of the double-acting cylinder type and has a capacity of 125 gallons per hour when operating at a speed of 120 to 135 revolutions per minute. The plunger is all of brass and the cylinder is brass lined, minimizing corrosion and insuring long life. The air intake



Electrically Driven Pump.

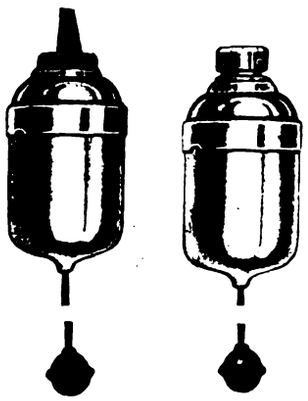
can be regulated to take any desired proportion of air and water at each stroke, or the air can be shut off entirely. To insure quiet operation the vacuum chamber is placed on the intake side. The tank can be furnished in sizes of either 50 or 100 gallons. It is electrically welded, heavily galvanized and absolutely air-tight and rust-proof.

Standard Westinghouse one-sixth-horsepower small motors, type CA alternating current and type CD direct current, are used to operate the pump. A spring idler maintains the flat belt at the proper tension at all times and insures quiet operation. Automatic switches can be set to start and stop the motor at predetermined pressures.

New Six-Ampere Pull Switches.

Pull switches to have the widest application must be of sufficient capacity to control entire lighting circuits as well as groups of high-candlepower gas-filled lamps. In other words, for some time a switch of six amperes, instead of three amperes, capacity was needed.

The accompanying illustrations show two styles of the new C-H six-ampere pull switches put on the market by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. These are claimed to be the only six-ampere pull



Pendent and Threaded-Cap Pull Switches.

switches on the market and the price is the same as for the others.

A new adaptation of the ingenious C-H quick-action, high-capacity switch mechanism is used, which makes it possible to handle easily the larger currents. These switches are made in ceiling, pendent, and threaded-cap types, the shells being interchangeable with C-H brass-shell sockets. The pendent type has the approved cord-strain relief used in C-H pendent sockets, which makes it unnecessary to knot the cord. Ten feet of black pull cord is furnished with each switch.

United States Consul E. A. Wakefield reports that American transformers have been installed in the new addition to the municipal electric-light plant at Port Elizabeth, South Africa.

Reflector for Industrial Lighting with Gas-Filled Tungsten Lamps.

Since the advent of the gas-filled tungsten lamp it has usually been considered necessary to mount these very brilliant lamps in special fixtures completely inclosing the lamp, this being true whether the lamps are used outdoors or indoors. However, where the lighting units are mounted on a very high ceiling, and where maximum efficiency is necessary, such as in industrial plants, it is considered by some lighting interests to be good practice to use a very efficient form of reflector for the lamp, this being mounted in the same way as for vacuum-type tungsten lamps. Such an arrangement gives very good lighting for an energy consumption of only 0.5 watt per square foot, which is a very material reduction from what is ordinarily re-

Mirrored-Glass Reflector for Industrial Lighting.

quired in a well lighted industrial plant.

To meet the requirements of such an installation there has been placed on the market a new silver-plated mirror-type reflector designed particularly for use with the 200-watt gas-filled lamp. This reflector is of the beehive type and is provided with corrugations in two directions to break up the filament images or strictions which would otherwise be obtained due to the marked concentration of the light source. This reflector is quite deep and conceals the lamp entirely from the direct view along the ordinary horizontal lines of vision, although being open at the bottom it permits, of course, a full view of the very bright lamp if one looks upward at it directly. This reflector may also be used

Digitized by Google

with the 150-watt vacuum-type tungsten lamp, with which it also gives uniform light distribution, although of lower illumination intensity and at a lower efficiency.

This reflector is the first one of a complete line of industrial lighting reflectors for all sizes of gas-filled lamps which is being developed by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill.

Bell-Ringing, Toy and Sign-Lighting Transformers.

The great convenience and economy resulting from connecting all current-consuming devices to standard-voltage lighting circuits is producing greatly increased use of all kinds of electrical appliances. Since alternating current is becoming more and more universal for distributing circuits, it is coming to be a rapidly growing practice to connect even the very small low-voltage appliances, for which batteries were formerly used exclusively, to 110-volt circuits by means of appropriate transformers.

To meet the requirements of such service, the Packard Electric Company, Warren, O., has developed and placed on the

Fig. 1.—Porcelain-Inclosed Bell-Ringing Transformer.

marked a complete line of small transformers, of which the type shown in Fig. 1 is made for operating door bells, door openers, buzzers, annunciators and all classes of light signaling devices. The active elements are entirely inclosed in a porcelain case, which is filled with insulating compound. These transformers are furnished in three colors of porcelain: blue, brown and white. They are very small in size, light in weight and have an attractive appearance. They are practically indestructible. The primary is 110 volts and the secondary 11 volts.

The outfit shown in Fig. 2 is a heavy-

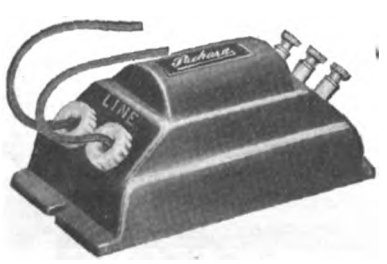


Fig. 2.—Heavy-Duty Bell-Ringing Transformer.

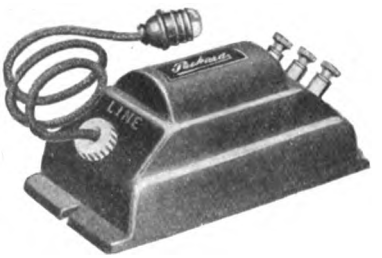


Fig. 3.—Fixed-Voltage Type Toy Transformer.

duty bell-ringing transformer and is adapted to the ringing of large gongs in school houses, factories, etc. This transformer is made along the same line as the one described above with the exception that the case is made of cast iron and is equipped with three voltages (6, 12 and 18) which makes it extremely flexible for operating bells installed on long or short circuits. It has a capacity of 50 watts and is designed to operate on any commercial frequency and is furnished for connecting 110 or 220-volt circuits.

For the operation of electrical toys, the transformers shown in Figs. 3 and 4 are furnished. Fig. 3 illustrates what is termed as the fixed-voltage or terminal

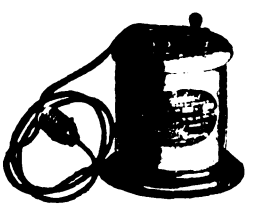


Fig. 4.—Master-Lever Type Toy Transformer.

type and is designed for operating the smaller class of toys. This device has a capacity of 50 watts, is housed in a cast-iron case and equipped with nine feet of flexible cord and attachment plug. Fig. 4 illustrates the master-lever type, which gives a voltage range of 0 to 30 volts by shifting the lever from contact to contact and also a permanent voltage of 6 volts for operating miniature lamps simultaneously with electrical toys. The cover is made of handsome blue-glazed porcelain equipped with nickeled hardware. The body is constructed of an aluminum spinning with satin finish and the base is

Fig. 5.—Sign-Lighting Transformer.

made of a malleable spider casting. These transformers have a capacity of 125 watts and are furnished for all commercial frequencies and voltages.

The transformer illustrated in Fig. 5 is adapted to tungsten-lamp sign lighting. The active element is housed in a cast-iron case, treated with two coats of baked enamel. Both primary and secondary terminal wires are porcelain-bushed and weatherproof. These transformers are furnished for all standard voltages and frequencies and in capacities ranging from 100 watts to 2,500 watts. The prime function of the transformer is to reduce the pressure from 110 or 220 volts to 11 volts, which allows the use of the 11-volt tungsten filament high-efficiency lamp in the electric sign.

Small Ammeters and Voltmeters for Battery Charging.

The development of the automobile has produced a great increase in the use of small storage batteries for igni-

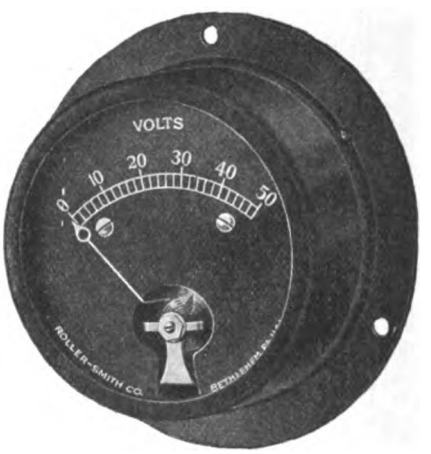


Fig. 1.—Small Voltmeter.

tion, lighting and starting the cars. For a great variety of other purposes also small batteries are coming into extensive use. Such batteries are liable to be neglected unless given as careful attention as the larger batteries usually receive. In order to safeguard such small batteries good instruments are required, by means of

Fig. 2.—Small Ammeter.

Digitized by Google

which the condition and output of the battery can be readily determined.

To meet these requirements the Roller-Smith Company, 203 Broadway, New York City, has recently added to its line of electrical instruments two new instruments, namely, an ammeter and voltmeter; these are known as "Junior Imps" and correspond in construction to the company's well known "Auto Imps" which have been very extensively used on electrically equipped gas cars. The new instruments are of the D'Arsonval type with permanent magnet and moving coil, which gives uniformity of scale division and dead beat indication. The permanent magnets are forged of tungsten steel; the entire moving element is very light but rigidly built. The dials are of etched metal with light indications on a black surface. The instrument case is made of heavy brass with black rubberoid finish; the case is sealed and is completely dustproof and moistureproof.

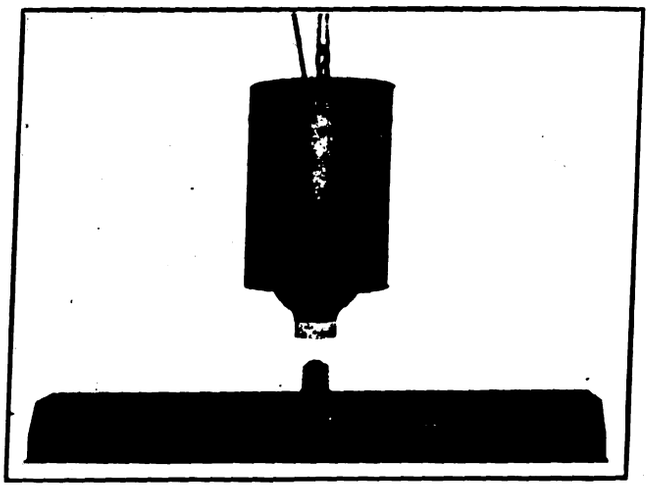


Fig. 1.—New Form of Moore Color-Matching Lamp with Transformer.

The instruments are very compact, having an outside diameter of the flange of only 3.5 inches. As a rule these instruments are furnished in the flange type as shown in the voltmeter, Fig. 1. The flush type, which is shown in Fig. 2, is also obtainable, however.

In range, the voltmeters are obtainable from 0-10 to 0-150. Ammeters are made either with single scale or with double scale having the zero point in the middle: their range is from 0-15 to 0-100. Although inexpensive, these instruments in every way are of high-class construction and are very serviceable for the purposes designed.

Automatic Telephony to be Used in Norway.

The Norwegian Government is planning for an automatic telephone exchange in Christiania. This will be the first of the kind in Norway.

New Form of Moore Color-Matching Lamps.

At a joint meeting of the Illuminating Engineering Society and the American Electrochemical Society, held in New York City on November 11, the new form of the Moore tube embodying a new principle was described in detail and illustrated by showing the difference in the color values of objects, such as dress goods, silks, meat and flowers, when viewed first solely by the light of a standard tungsten lamp and then by the new type of Moore light.

Elaborate spectrophotometric investigations have been made to prove that all articles when viewed solely by the light of the tube lamp have exactly the same shades of color as they possess when viewed by the light of a clear sky. It is stated that all dyers and other color experts agree that the standard light which they wish for color judging is that entering a window from a clear north sky at an angle of about 45 degrees and preferably about mid-afternoon with a clear sun shining in the southwest.

The spectrophotometric curve of carbon-dioxide gas consists of a broken line with many jagged peaks, but an average of these peaks results in a smooth curve which gives a correct idea of the effective color characteristics so that it should be used to compare with the spectra of other sources. The effect of the banded character of the CO_2 spectrum, the tabulation of which consists of a broken line, was thoroughly investigated to determine its relation to the color-matching properties of the lamp.

The following samples of colored silk taken from the National Color Card of America, were selected to represent all parts of the spectrum, and were spectrophotometrically tested to determine what the actual color composition was: Violet, National blue, Yale blue, emerald, lemon, orange and scarlet.

The results of each of these tests was carefully plotted in the form of a curve, and a review of the data obtained in connection with these reflection curves shows that the irregularities in the CO_2 spectrum are absolutely without visible effect, and that they deviate only very slightly from north-sky values to which they are compared. It has been pointed out that if these north-sky values had all been taken at an angle of about 45 degrees, there would have been no detectable variation, and that therefore the color-matching values of the CO_2 spectrum were all that could be desired.

Fig. 1 shows an exterior view of this new color-matching unit. The straight tube lamp is contained in an elongated sheet-metal case, which is provided with a screw base similar to that used on the larger sizes of incandescent lamps. Instead of the lamp being fed CO_2 gas by means of an electromagnetic feed valve, it is generated automatically within the tube itself. Near each electrode is placed a small bulb about an inch long, containing calcium carbonate, from which emanates CO_2 gas when the resistance wires imbedded in it became heated to exactly the proper degree by reason of their being connected in shunt to the gas column. See Fig. 2. The gas column is 0.875 inch in diameter and one foot long, and appears as a solid bar of light of intense whiteness. The foot-candles available near the tube are over 200, thereby making this apparatus suitable for the very closest color discriminations. The degree of vacuum is automatically held within 0.001 of a millimeter, and the apparatus will stand wide line-voltage fluctuations without becoming disarranged in any way. The lamp takes about 240 watts.

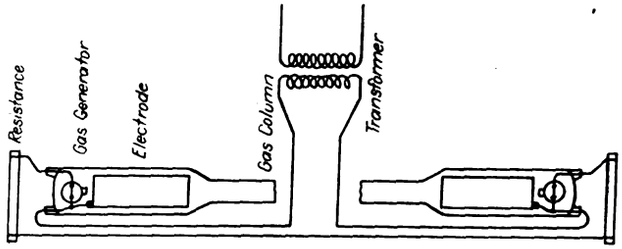


Fig. 2.—Diagram of Connections of New Moore Color-Matching Lamp.

Since light is the source of all color, it has been proposed that this new lamp receive official recognition from the International Conference on Electrical Units and Standards.

This new lamp is suitable for making absolutely correct color determinations, and is applicable to a very wide field, but is particularly useful in enabling the dye shops of the great textile industry to run night shifts. It is made by the Edison Lamp Works of General Electric Company, Harrison, N. J.

American Vacuum Cleaners in Canada.

A noticeable feature of the furniture-store window displays in Kingston, Ont., is the prominence given to vacuum cleaners of American make. With the interruption of supplies from elsewhere American manufacturers

Digitized by Google

have succeded in establishing their cleaners on a firm footing there. There are today a dozen or more business houses selling them, besides several persons acting as individual agents.

The outlook for this class of goods is encouraging. The demand is mostly for a moderate-priced, hand-operated machine, retailing for $12 to $15, but there is a sale of more expensive electrical machines also. This latter fact was illustrated by the recent experience of the manager of a large hardware store, who by working with a selected list of the firm's customers, sold 20 cleaners, after his corps of 13 clerks had declared the price ($135) too high for the local trade.

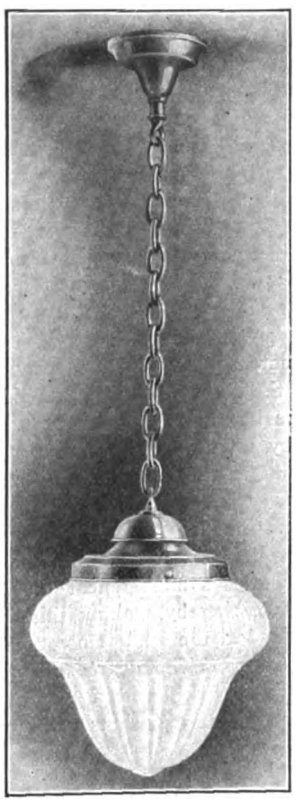


Fig. 1.—Pendent Fixture.

Diffusing-Glass Fixtures for Interior Lighting With Gas-Filled Lamps.

The very high efficiency attainable by the use of gas-filled tungsten lamps is bringing about their very extensive use in place of the less efficient vacuum-type incandescent lamps. A danger incurred when the new lamps are substituted for the old is that proper consideration is not always given to the particular properties of the new lamps and the requirements these impose, among which are the need for liberal ventilation of the fixture and for thoroughly screening the lamp so as to cut down the intense brilliancy of the highly concentrated filament which in the bare lamp produces very pronounced glare.

In a new line of fixtures these two considerations have been given special attention. Ventilation is provided by free circulation of air through the glassware and holder. By the use of the new Monax glass a high degree of diffusion of the light is obtained with very little absorption, the latter being only slightly greater than that of clear glass. This Monax glass, which is of light weight, transmits the light unchanged in tint and so well diffused that the location of the lamp filament cannot be discerned. A variety of shapes of this glassware are available, together with simple designs of holders and suspensions, making this line of fixtures suitable for all purposes where high efficiency and good illumination are desired without elaborate ornamentation.

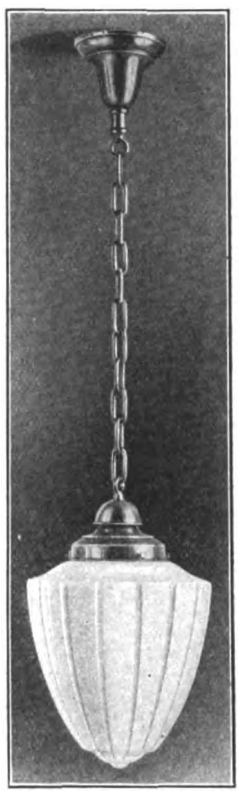


Fig. 2.—Pendent Fixture.

Fig. 3.—Ceiling Fixture.

Fig. 1 shows a typical pendent fixture with attractive acorn-shaped globe. In this particular design the diameter of the globe is 14 inches and its depth 12 inches. This fixture accommodates lamps from 300 to 500 watts. Four other sizes are available for different sizes of lamps, ranging from 25 to 1,000 watts. These fixtures are obtainable with or without chain.

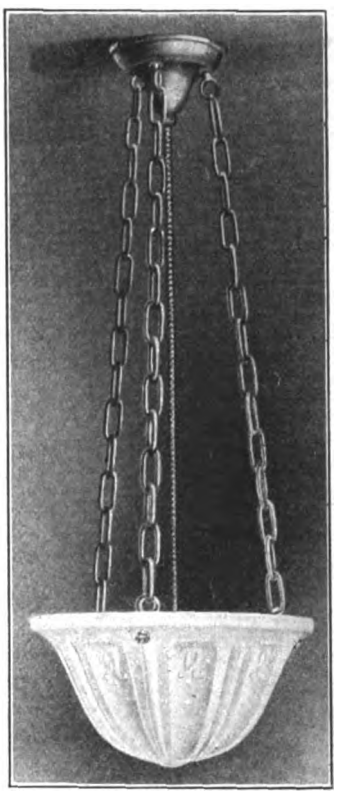


Fig. 4.—Semi-Indirect Fixture.

Another pendent type is shown in Fig. 2. This is intended for 100 to 300-watt lamps; five other sizes of the same general design accommodate lamps from 25 to 1,000 watts. There are about 25 designs of pendent fixtures in this line.

In Fig. 3 is shown how one of these types looks when hung close to the ceiling without chain. The diameter of the globe in this case is 15 inches and its depth 13. This fixture can be used for lamps from 300 to 500 watts. Another class of ceiling fixtures in which the holder is made of a simple spinning placed directly against the ceiling in place of the canopy is also made; this is made for several forms of glass globes and for lamps ranging from 25 to 1,000 watts.

In the way of semi-indirect fixtures there are several patterns included in this line, of which the one shown in Fig. 4 has a bowl 12 inches in diameter and 6 inches deep for use with 25 to

Digitized by Google

100-watt lamps. This bowl gives a very rich lighting effect. The cord for the lamp matches the finish of the brass chains and canopy.

This array of fixtures is known as the Ajax line and is manufactured by the Macbeth-Evans Glass Company, Pittsburgh, Pa.

New Presto Electrical Automobile Specialties.

The use of electricity has not only made automobiling with gasoline cars possible and safe through electric igni-

Fig. 1.—Six-Volt Cigar-Lighter.

tion, but it has also added many conveniences and comforts otherwise unattainable, such as electric starting and lighting. In this line are also a number of electric cigar-lighters which have been found very convenient by the motorist.

A new device of this kind is shown in Fig. 1. This particular one is intended for connection to a six-volt battery and has the lighter tip made of

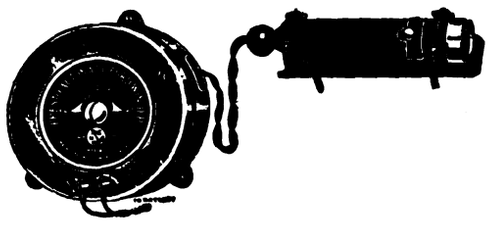


Fig. 2.—Cord-Winder and Cigar-Lighter.

pure platinum specially designed for this voltage. The case of this cigar lighter is made of polished wood with ebony finish. All metal parts are heavily nickel-plated. It is provided with 10 feet of connecting cord with terminals for ready connection to the battery. To energize this outfit it is necessary merely to press the stem, which closes the circuit to the platinum heating wire and furnishes instantaneous light for lighting any cigar, cigarette or pipe regardless of the wind or weather and without stopping the car. A holder is furnished by means of which the outfit can be hung up in any convenient place. This form of cigar-lighter is very compact on account of its watch-case form and has been found entirely reliable. A similar form of it designed particularly for the voltage of the magneto furnished on Ford cars is also made.

In Fig. 2 is shown a new automatic cord-winder together with another form of cigar-lighter and holder. This device winds up the cord automatically and thus eliminates the liability for tangling of the connecting cord for cigar-lighters or inspection lamps. It can be fastened wherever convenient; it is made with a silver-plated name plate and black rubber finish, although also obtainable in heavy brass nickel-plated.

Fig. 3 shows a new electric lamp for mounting on the dash of the car. On account of its rugged and compact construction it is called the "Bull Dog"

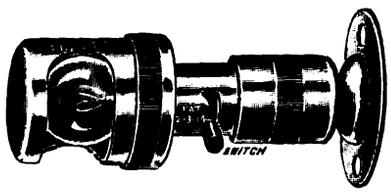


Fig. 3.—Electric Dash Lamp.

lamp. It includes a bayonet-type socket and six-volt, two-candlepower tungsten lamp with convenient switch. The lamp is well protected by the housing which also acts as a reflector to throw the light upon gauge glass or other instruments. The entire outfit is heavily nickel-plated.

Another type of dash lamp is shown in Fig. 4. This lamp is suitable for a variety of purposes. It can be used as

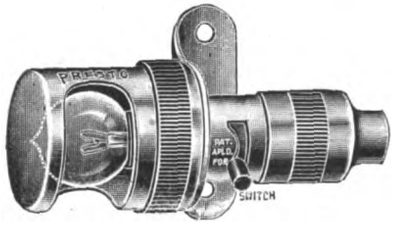


Fig. 4.—Cowl Dash Lamp.

a cowl dash lamp secured under the sloping dash; the light can be turned to any angle desired. This lamp can also be attached to the door of the car for the purpose of lighting the step when the door is opened; it also can be arranged for a tonneau lamp for lighting the car interior; if desired it may also be arranged as a canopy lamp in the touring top.

These devices are typical of the very extensive line made by the Metal Specialties Manufacturing Company, Incorporated, 730 West Monroe Street, Chicago, Ill.

Aluminum Company of America Purchases and Will Complete New North Carolina Plant.

The transfer of a large new American aluminum plant from foreign to American ownership is announced in press reports from Charlotte, N. C. French interests were active throughout the greatest part of 1914 in pushing extensive operations at the Narrows of Yadkin River, near Whitney and Badin, Stanley County, N. C., but as a result of the European war the development of the property stopped and was expected to be at a standstill for an indefinite period. In buying the plant, the Aluminum Company of America, with headquarters at Pittsburgh, Pa., announces that the development work will be resumed, and that the plans of the original designers will be carried out with slight changes.

The work that the Southern Aluminum Company had in progress at Badin and Whitney consisted of a hydroelectric installation of great size for the generation of electric power, an electrolytic plant of large capacity for the production of metallic aluminum, works for the purification of alumina, an electrode factory, and the homes and other buildings necessary for the well-being of the employees.

It was early in 1913 that a contract was let for a concrete dam and power house, for tunnels, and for the grading of the electrolytic plant sites. The plans provide for a dam 220 feet high, 1,300 feet long 160 feet thick at the base, and 20 feet at the crest. Swinging as the arc of a circle of 1,600 feet radius, its construction involves the use of from 550,000 to 600,000 cubic yards of concrete. This great dam will store water to generate from 20,000 to 70,000 kilowatts, according to water stage, and will form a pond of 5,000 acres. With the reservoir full, the river will be held in check for five miles along its course, and the old granite Whitney dam will be entirely submerged.

Before the work on this plant was stopped by the war, there were 2,500 men employed on the construction. After production commences, it has been estimated the number required will be between 1,200 and 1,500.

The Aluminum Company of America has plants at Maryville, Tenn., Niagara Falls and Massena, N. Y., and New Kensington, Pa., and has also acquired interests at Edgewater, N. J.

The growing importance of this metal is shown by the figures relating to exports for the last fiscal year. During the 12 months ended June 30, 1915, the exports of aluminum and its manufactures were valued at $3,245,799, compared with $1,101,920 in the preceding year, and with $1,046,915 in the year ended June, 1913.

Digitized by Google

New Motor-Driven Motion-Picture Projector.

The Precision Machine Company, 317 East Thirty-fourth Street, New York City, has recently developed a new projector, which is illustrated herewith. The mechanism is entirely inclosed in a dustproof and soundproof case designed so that it may be quickly attached or detached from the machine. Large doors on both sides permit of quick, easy threading of the film, oiling, etc.

The intermittent movement is the well known cam and star type. The ratio of movement to exposure is such that the film is not injured, though moved quickly, while the exposure is long enough to bring out all details. The cam and star work in an oil bath. Only one eccentric bushing, hardened and lapped and having a bearing 1.375 inches long, is used. Therefore it is much easier to set than the intermittents, which have two eccentric bushings. All parts are assembled complete and can be quickly removed from or replaced in the machine.

All gears are cut from cast vanadium-iron and mesh into tool-steel pinions, which are hardened where high-speed duty is required of them. The faces are wide and the teeth so cut that they roll together, as in a watch, practically without friction. The bearings have cast-iron bushings and are easily replaced.

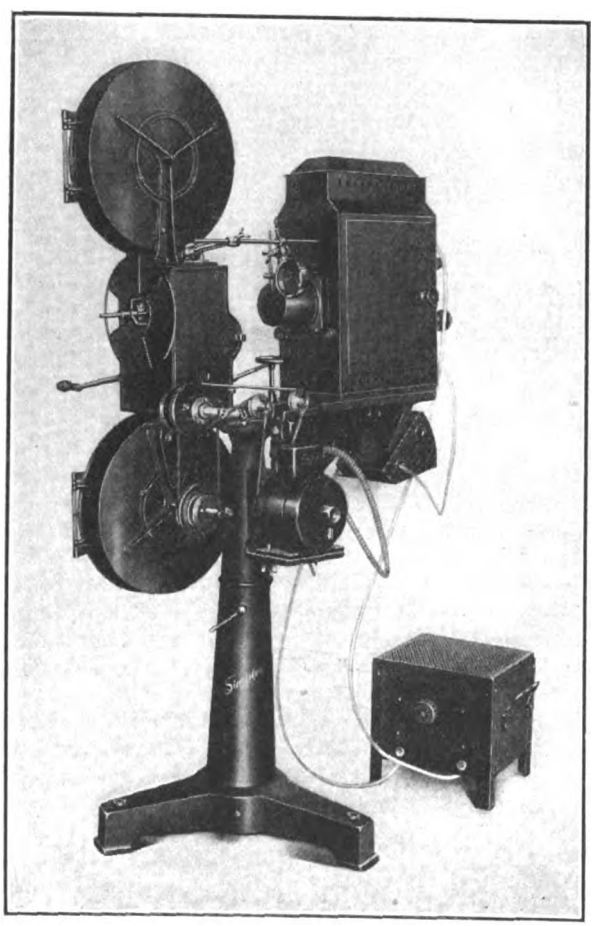
The drop in front of the aperture of the automatic shutter is raised by a centifugal governor, when the machine reaches a certain speed and gravity closes it when the machine stops.

The revolving shutter is placed in front of the moving-picture lens, and is made in two types, namely, the three-wing shutter for direct current and the two-wing shutter for sixty-cycle alternating current. The shutter can be easily and quickly set to eliminate the "travel ghost" or white streaks while the machine is in operation.

The magazines are made of heavy-gauge sheet metal, and are clamped to the top and bottom of the mechanism. Fireproof valves protect the film in the magazines. The upper valve is part of the mechanism, while the lower is built into the magazine. Spring latches hold the door firmly closed. Magazines are furnished for 2,000-foot reels. The take-up is driven from the main driving shaft.

The lens jacket or mount is a part of the Simplex head, and therefore only the lens tube is required. It can be quickly taken out or put back, and is focused by turning a knurled knob conveniently placed on the outside of the mechanism.

The stereopticon lens is of the achromatic type, which is found to give a flat field. It is mounted in a holder suspended by a ball-and-socket joint, from an arm attached to the mechanism. This joint permits of universal adjustment, making it an easy matter to properly register the stereopticon picture on the screen. The lens holder is so designed that the regular double combination jacketed stereopticon lens, either quarter size or half size, may be used if desired.



Motor-Driven Motion-Picture Machine.

The distance between the condensers can be adjusted so as to eliminate the blue spot or ghost which frequently appears in the center of the picture. The condensers rest in a frame, which keeps them in line with each other, but permits their instant removal for cleaning or replacing.

The carrying capacity of the arc is 75 amperes. Carbon holders are furnished for carbons one-half to three-quarter inch diameter and 12 inch upper and 6 inch lower length. The arc lamp can be withdrawn through the back of the lamp house, so that all parts are readily accessible. When it is again pushed into place the back of the lamp house automatically closes behind it.

Ventilation of the lamp house is provided to insure a comfortable temperature, even with a very high current at the arc.

The pedestal is made of heavy cast iron, with enamel finish. It rests on three points on the floor, and forms a rigid support for the machine. It is swiveled so that it can be swung from side to side or pointed up or down as occasion requires. When the right direction is obtained a simple locking device holds it firmly in position. The lamp house has a parallel swinging motion, so that the light is quickly brought into position for either the moving picture or stereopticon lens.

A snap switch is provided on a cast-iron support underneath the lamp house, protected with a heavy metal cover. The rheostat supplied is of the iron-grid type. It is inclosed in a case which allows ample ventilation, and is adjustable from about 22 to 45 amperes.

The machines are equipped with one-eighth-horsepower motors furnished by the Robbins & Myers Company, Springfield, O. The motor is mounted on a cast-iron shelf.

This new machine has been adopted by the United States Government War Department, and was awarded a grand prize at the Panama-Pacific International Exposition.

U-S-L Car-Lighting System Not Affected by Prior Litigation.

A decision, of interest to railroad men and particularly to car-lighting men, was handed down on November 4 by Judge Hazel in the United States District Court, Western District of New York.

It will be remembered that recently Judge Hazel, sitting in this court, sustained the Creveling patent No. 747,686. It was maintained by the owners of this patent that the decision was broad enough to cover the use of the ampere-hour meter system of car-lighting, as put out by the United States Light & Heat Corporation, and it was sought to bring this system into the accounting ordered by the court.

The court held that the present standard car-lighting equipment, involving the use of an ampere-hour meter to control battery charging, as put out by the United States Light & Heat Corporation, does not come under the injunction or the accounting ordered in the prior decision sustaining the Creveling patent.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

BATAVIA, N. Y.—The sum of $23,000 in bonds has been authorized for the purchase and installing of machinery necessary for an electric plant. Address the town clerk.

SANBORN, N. Y. — Sanborn-Pekin Power Company, Incorporated. To generate electricity for all purposes. Capital, $10,000. Incorporators: Henry B. Treicher, J. B. Hudson and B. L. Hudson.

CAMDEN, N. J.—The Victor Talking Machine Company will shortly construct one four-story and one six-story reinforced concrete and steel building at its plant here. The electrical equipment will be thoroughly modern. Ballinger & Perrot, Philadelphia, are the architects.

EASTON, PA.—The Easton Hospital will erect a new $100,000 building shortly. Plans are in progress. William H. Michler, Easton, is the architect.

PHILADELPHIA, PA. — A three-story brick, stone and reinforced concrete building for employees will be erected for the American Pulley Company, at Nicetown, a suburb. The electrical installation will be included in the general contract. Ballinger & Perrot, Philadelphia, are the architects.

PHILADELPHIA, PA. — The Midvale Steel Company will erect an immense brick and concrete machine shop at its plant in the Nicetown section here. It is reported that all machines will be driven electrically.

PHILADELPHIA, PA.—The Baldwin Locomotive Works will erect a four-story brick and concrete electric truck shop at its plant, Eighteenth and Buttonwood Streets. F. Jasperson is the engineer in charge.

PENNSBORO, W. VA. — H. E. Hopkins and others have organized the Pennsboro Ice and Power Company, and will construct a plant for the production of ice and the generation of electric current. The capital stock is $25,000. L.

NORTH CENTRAL STATES.

STEUBENSVILLE (YELLOW CREEK), O.—The Kenohio Electric Company will erect a light and power plant at Yellow Creek, Jefferson County. Address president of the Kenohio Electric Company, W. J. C. Kenyon, 332 South Michigan Avenue, Chicago, Ill.

CINCINNATI, O.—The Board of Education will remodel the electrical work of the Fulton school. C. W. Handman, business manager, will receive bids until December 13. Plans and specifications are on file at the office of the board. L.

CINCINNATI, O.—The Hess Spring and Axle Company will build an addition to its plant at a cost of about $60,000, which will involve a considerable amount of electrical equipment. The addition will be used in the manufacture of automobile axles. L.

CINCINNATI, O.—A municipal electric plant for Cincinnati is the object of the Federated Improvement Associations, which have placed themselves on record to this effect. It is proposed to issue bonds of the city to the amount of $3,000,000, this sum being considered sufficient for the purpose. L.

TOLEDO, O.—The Beverly Service Company; capital, $10,000; electricity, gas and water. Incorporators: Clifford T. Hanson, Andrew F. Camenzind, Donald F. Hiett, William A. Moll and J. W. Lane.

BICKNELL, IND.—J. W. Stewart, of the Stewart Electric Company, Cincinnati, O., will erect a $100,000 power plant. Electric and water-power machinery will be purchased.

HEBRON, IND. — Hebron Light, Heat and Power Company; capital, $25,000; utility service; directors, Fred A. Bremer, Charles B. Alyea, William J. Mulinex, Ralph Alyea, D. B. Fickle.

LAFAYETTE, IND.—At a recent session of the county commissioners it was decided to advertise for bids for the erection of 12 ornamental light posts to be placed around the public square. The date for opening the bids has not been set. It is the intention of the board to have the posts installed not later than the middle of December. Address the county clerk.

DECATUR, ILL.—The Board of Local Improvements has recommended to the city council for passage an ordinance providing for ornamental lights on East Eldorado Street, from Main Street to Front Street, to include 42 three-light standards, at an estimated cost of $3,531.57. Z.

GIRARD, ILL.—A lighting system, to be installed around the town square, is under consideration by the council.

HIGHLAND PARK, ILL.—An ornamental street-lighting system is to be installed under the management of the Business Men's Association. Address the secretary.

MACOMB, ILL.—The Home Electric Construction Company has recently secured contract for the electrical work in the new postoffice building at Beardstown, Ill., and also a contract for a system of 39 five-light curb posts for the city of Bushnell; also an electric elevator job for the St. Francis Hospital at Macomb, Ill.

CLINTON, MICH. — The sum of $5,000 will be expended for additional electrical equipment. Address the town clerk.

MERRIMACK, WIS.—A franchise has been granted to A. M. Farnworth to install an electric light plant here.

FAIRBANKS, IOWA. — Bonds to the amount of $6,000, have been voted for municipal lighting. Address the city clerk.

LOW MOOR, IOWA. — Electric light bonds in the sum of $4,500 have been authorized. Address the town clerk.

SPRINGFIELD, MO.—C. E. White, general manager of the Ozark Water and Power Company, reports a contract, approved by a vote of the citizens, with Monett, Mo., for supplying current for the municipal electric-plant at that place, the term being 10 years.

TRENTON, MO.—The Trenton Gas and Electric Company will expend $100,000 in improvements. Plans are now being drawn for the work. Address the general manager.

MINNEAPOLIS, MINN. — Nearly $4,000,000 will be spent in Minnesota and North and South Dakota in improvements by the Northwestern Telephone Exchange Company during the coming year, according to C. E. Yost, president of the Northwestern group of the Bell Telephone Company.

SOUTH CENTRAL STATES.

CARLISLE, KY. — The Carlisle Light and Power Company has increased its capital from $15,000 to $30,000 and has contracted with a Louisville concern for an ice-manufacturing plant which will be installed at once.

LOUISVILLE, KY.—A large dairying plant is to be erected by D. H. Ewing's Sons which will require 22 motors aggregating 110 horsepower. It is expected that the company will also equip with an engine and generator, as it will probably make use of its own power. Plans are being prepared by John Bacon Hutchings, Columbia Building, Louisville. G.

PROVIDENCE, KY.—The city has voted a $20,000 bond issue to provide for construction and equipment of an electric-lighting plant and system. At present the domestic and commercial demand is being supplied by the Providence Electric Light Company, which is operating without a franchise. The owners established the plant and operated for considerable time before the venture was profitable. It and the city, however, were unable to agree on terms for street lighting and the supporters of the municipal project took the ground that the only way to get lighted streets was to put in a municipal plant. It is stated that negotiations looking toward purchase of the existing plant will be undertaken. G.

MEMPHIS, TENN.—The Board of Aldermen is in favor of a municipal lighting plant. Adress John W. Benee, mayor.

MARKS, MISS.—James Fitzel has been granted franchise for an electric light plant and will furnish lights for this place.

ST. FRANCISVILLE, LA.—Bonds

Digitized by Google

have been voted for a municipal light plant. Address the village clerk.

LAMPASAS, TEX.—The Lampasas Light and Power Company has been organized with a capital stock of $8,000. Incorporators: Emil P. Haby, T. S. Alexander and E. Haby, Sr. It will build an electric light and power plant.

M'KINNEY, TEX.—The city commission has sold the municipal electric light and power plant to the Texas Power and Light Company, of Dallas. The sale is subject to confirmation by referendum vote of the people of the city. D.

ONALASKA, TEX. — The electric light and power plant of the lumber mill of the West Lumber Company here, which was recently destroyed by fire, will be rebuilt. D.

PLAINVIEW, TEX. — Judge I. R. Kelso, of St. Louis, Mo., and associates, have taken preliminary steps towards the construction of a large electric power station here. It is stated the syndicate will invest not less than $1,000,000 in electrical and water works enterprises in Plainview and towns of the surrounding country. Power for operating irrigation pumping plants and other industrial purposes will be furnished. H. C. Randolph, of Plainview, is also interested in the project. D.

WESTERN STATES.

EAST SCOBEY, MONT.—It is reported the Scobey Electric Light Company, owing to an increase of business, will install a larger and more modern plant in this city in the immediate future. O.

HEDGESVILLE, MONT. — Plans are being made for the installation of an electric street-lighting system and modern water works plant. Address city clerk.

YUMA, ARIZ.—The Arizona Power Company is to build another hydroelectric power plant on Fossil Creek.

SALT LAKE CITY, UTAH.—W. J. Lloyd, manager of the mountain district for the Western Union Telegraph Company, says that the company will, within the next year, spend one million dollars in line extensions and betterments in the mountain territory.

SEATTLE, WASH.—Superintendent of Lighting J. D. Ross, in making his report to Mayor H. C. Gill, and the city council, on various power projects he has been investigating for the last three months, to be used as an auxiliary to the municipal power plant, will recommend the acquirement of a developed rather than an undeveloped project. Among the developed projects which Superintendent Ross has investigated, is the Elwha power plant, which has a present capacity of 6,000 kilowatts and which will be developed to 15,000 kilowatts, if the city desires. This project has a development limit of 125,000 kilowatts. It is 90 miles from Seattle by direct route. The undeveloped power projects on which Superintendent Ross will make a report include the Hebb site, on White River, the Cushman project at Lake Cushman, and the Sauk-Suiattle project, near Derrington. O.

FRESNO, CAL. — The Board of Trustees has adopted plans for an electrolier system and has also adopted a resolution calling for the placing of the electroliers.

LOS ANGELES, CAL. — The city has passed a resolution authorizing the sale of bonds amounting to $3,432,000, the proceeds to be used in the acquisition and construction of electric generating works and distributing system for supplying the city with current for light, heat and power purposes. Bonds to the amount of $1,026,000 for the same purpose were recently sold. Power will be developed along the city's aqueduct already constructed.

REDDING, CAL. — L. T. Alward, chairman of the lighting committee of the city council, has notified the California State Railroad Commission that a municipal lighting system will be put in by Redding.

SAN FRANCISCO, CAL.—Among the improvements to be made by the Pacific Gas and Electric Company during 1916, are the following: A new submarine cable across the Golden Gate, to cost $273,000; an office building, in San Francisco, to cost $114,000; plant at Knight's Landing, Cal., to cost $13,000; right of way for tower line from Oakland to Warm Springs, Cal., to cost $22,500; and the installation of meters for all the present flat rate consumers in Sacramento, Cal., to cost $24,000.

WATSONVILLE, CAL. — G. T. Prince, formerly of Oakland, Cal., has bought the T. C. Electrical Works, of this place, from the former owners.

PROPOSALS.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., will receive bids on November 30, 1915, for the following material: Miscellaneous interior communication cable, 700 radio head gear receiver cords; miscellaneous magnet wire, miscellaneous rubber-insulated wire, miscellaneous single-conductor wire, miscellaneous twin-conductor wire, schedule No. 9001, for delivery at Navy Yard, Brooklyn, N. Y.; miscellaneous rubber-covered single-stranded wire, 10,000 feet duplex telephone wire, schedule No. 8999, for delivery at Navy Yard, Brooklyn, N. Y.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,171. DRY BATTERIES.—An American consular officer in Norway reports that a firm in his district wishes to correspond with exporters and dealers in dry batteries for electric pocket lamps.

NO. 19,178. TELEPHONE WIRE.—A telephone company in Norway wishes to buy 3,000 kilograms (6,613.86 pounds) of silicium bronze wire; the diameter of the wire should be 1.3 (0.05118 inch), with 40 per cent minimum conductivity and 154.3 pounds minimum breaking strain per square millimeter, the wire being according to British Post Office specifications. Correspondence in English. Definite terms are wanted.

NO. 19,191. PUMPS AND MOTORS.—An American consular officer in the Canary Islands reports that a firm desires to purchase a number of electrically driven water pumps and electric motors. Prices c. i. f. port of entry, if possible, and payment, cash against documents.

NO. 19,127. ELECTRICAL SUPPLIES, ETC.—The Bureau is informed that a man in Spain desires to represent American dealers in commercial chemicals, electrical supplies, and mining machinery.

NO. 19,141. ELECTRICAL MATERIAL, ELEC.—A business firm in the United States writes that a firm in Portugal desires to represent or buy for its own account electrical material. Reference is given. Correspondence should be in Portuguese.

NO. 19,147. ELECTRICAL GOODS.—An American consular officer in Denmark writes that a man in his district desires to represent American manufacturers of electrical goods. References are given. Correspondence may be in English.

NO. 19,218. ELECTRICAL GOODS. A report from an American consular officer in India states that a business man in his district desires to communicate with manufacturers of electrical goods.

NEW INCORPORATIONS.

LIBERTY, ILL.—The Liberty Electric Company has been incorporated with a capital of $2,500, by Steven G. Lawlese and others.

HEBRON, O.—The Hebron Light, Heat and Power Company has been chartered with a capital of $25,000, by Fred A. Bremer, Charles B. Alyea and others.

LAPORTE, IND.—The Wanatah Electric Company has been organized with a capital of $5,000, by H. H. Keller, A. H. Kimble and Lemuel Darrow.

CONCORDIA, KAN.—The Concordia Electric Light Company has increased its capital from $125,000 to $140,000.

NEW YORK, N. Y.—Chirqui Electric Corporation. Electrical motors. Capital, $150,000. Incorporators: Joseph A. Stapleton, George Jameson, Frank R. Owen.

NEW YORK, N. Y.—International Electric Products Corporation. Capital, $5,000. Incorporators: M. E. McLean, William Dunilier and F. B. Knowlton.

CHICAGO, ILL.—Goodman Electric Construction Company. Capital, $10,000. Incorporators: Lester E. Goodman, Ralph E. Stern and Harold J. Goldberger.

WILKESON, WASH.—The Pierce County Light and Power Company has been incorporated with a capital of $100,000, by F. L. Van Nice, Hiram Davis, W. H. Pringle.

LAMPASAS, TEX.—The Lampasas Light and Power Company has been incorporated with a capital stock of $8,000, by Emil F. Haby, T. S. Alexander and E. Haby, Sr.

NEW YORK, N. Y.—The Simplexite Company, Inc. Electrical devices, etc. Capital, $10,000. Incorporators: William E. Nash, Richard Nash and Henry Goldstein, New York City.

ROCHESTER, N. Y.—Piverside Electric Company, Incorporated. Electrical contracting. Capital, $2,000. Incorporators: Norah K. Ward, Edwin L. North, Walter J. Moore.

BRIGHTON, IOWA.—The Brighton Hydroelectric Company has been organized with a capital of $50,000, by W. B. Kemp, C. S. Woodford, Fred Williams and Bertha Thompson.

Digitized by Google

BRONX, N. Y.—M. & M. Electric Company, Incorporated. Electrical contracting, etc. Capital, $5,000. Incorporators: Stanley W. Mills, Benjamin C. Raymond and Lena F. Mundt.

NEW YORK, N. Y. — American Sewing Machine & Electrical Company, Incorporated. Electrical motors. Incorporators: Julius Halperin, Abraham Nizin, Irving Silverman. Capital, $1,200.

LAPORTE, IND. — The Wanatah Electric Company has been incorporated with a capital of $5,000, by Harry H. Keller, Alfred H. Kimble and others, to manufacture and sell electricity.

WELLSVILLE, N. Y.—The Allegheny County Electric Light, Heat and Power Company has been incorporated with a capital of $25,000, by J. Berger, B. Graham, C. H. C. Beakes, and others.

HOUSTON, TEX.—The Texas Gas and Electric Company has been organized here with a nominal capital stock of $1,000. Incorporators: C. L. Carter, W. A. Parish and Raymond Neilson. D.

SCHENECTADY, N. Y.—Delanson and Quaker Street Electric Light and Power Company, Inc. Incorporators: Frank W. Wilber, Quaker, N. Y.; Earl V. Tompkins, and Chas. E. Washburn, both of Delanson, N. Y.

NEW YORK, N. Y.—G. E. Engineering Company, Inc. Electrical machinery, etc. Capital, $10,000. Incorporators: Geo. M. Wheeler, Lewis J. McDowell, and Franklin L. Harris, 6 Ithaca Street, Elmhurst, L. I.

OLYMPIA, WASH. — The Pierce County Light and Power Company has filed articles of incorporation here. The capital stock of the company is $100,000, the incorporators being F. D. Van Nice, Hiram Davis and W. H. Pringle.

JACKSONVILLE, N. C.—The Jacksonville Electric Light Company has been incorporated with a capital stock of $10,000, by I. M. Avery, E. M. Koonce, and others, for the purpose of engaging in the electric-lighting business.

CHICAGO, ILL.—The Kedzie Fixture Company has been incorporated with a capital stock of $5,000. The company is to manufacture and install gas and electric fixtures. Abraham Slevena, Elsie Slevena and James L. McAuliff are the incorporators. Z.

CHICAGO, ILL. — The Goodman Electric Construction Company has been incorporated with a capital stock of $10,000, to manufacture and deal in electrical merchandise. Lester E. Goodman, Ralph F. Stern and Harold J. Goldberger are the incorporators.

PHILADELPHIA, PA.—The Ocean County Electric Company, New Jersey, has been incorporated with a capital of $525,000, to operate in Ocean County. Joseph P. Murray, Leighton P. Stradley and F. Stanley Saurman, all of Philadelphia, Pa., are incorporators. A.

SALEM, ORE.—The North Coast Power Company, with headquarters at Vancouver, Wash., has obtained permission to do business in Oregon. The new company was organized to take over the properties of the Washington-Oregon Utilities Company, which concern was foreclosed and the properties sold at a receivers' sale. The new corporation is capitalized at $1,750,000. Officers are: Clarence M. Brown, president, Philadelphia; L. J. Morris, secretary, Philadelphia; H. L. Harries, vice-president, Vancouver, Wash.; B. F. Donahue, assistant secretary and treasurer, Vancouver, Wash. O.

FINANCIAL NOTES.

There has been placed on the regular list of the Philadelphia Stock Exchange $3,322,800 additional stock of the American Telephone & Telegraph Company, exchanged for bonds of the company, making total stock listed $375,299,700.

The Kansas City Railway & Light stockholders' protective committee's plan of reorganization, supplemental to the plan of July 30, approved by Judge Hook, Kansas City, has now been announced. W. W. Gurley, Chicago, and John H. Atwood, Kansas City, have been appointed to carry out the plan. Stockholders and creditors must file acceptances by December 20. The plan provides that 80 per cent of the outstanding stock shall determine the basis of division as between the two companies. The stock of these two segregated operating companies shall be deposited with two sets of three trustees each, one to be selected by the preferred stockholders, another by the common stockholders, and the third by these two. They will issue preferred and common beneficial certificates, one for each share of stock now outstanding. The old status as between preferred and common to be maintained as between the preferred and common beneficial certificates, except that the preferred is to be cumulative instead of non-cumulative. A syndicate was formed in August to underwrite the exchange of securities under the plan of July 30 and also to take $3,000,000 to $4,000,000 of the new street railway company first mortgage bonds at par. Opportunity will be given to all stockholders to participate in these underwritings. More than 90 per cent of each class of stock has been deposited with the committee, which voted to submit the entire plan in all its details to the stockholders immediately and in the meantime all non-depositing stockholders will be given further opportunity to participate.

Dividends.

	Term	Rate	Payable
Cent. Miss. Val. Elec. Prop.	Q	$1.50	Dec. 1
Colo. Pw., pf.	Q	1.75%	Dec. 15
Mid. West Util., pf.	Q	1.5 %	Dec. 1

Reports of Earnings.

KEYSTONE TELEPHONE.

	1915	1914
October gross	$ 115,124	$ 110,499
Net	56,480	55,072
Surplus	29,536	29,125
Ten months' gross	1,129,271	1,101,896
Net	566,645	558,655
Surplus	300,322	298,736

AURORA, ELGIN & CHICAGO.

	1915	1914
September gross	$168,334	$183,355
Net	57,272	63,494
Surplus after charges, depreciation, etc.	11,952	19,856
Three months' gross	545,797	611,210
Net	201,151	250,512
Surplus after charges, depreciation, etc.	65,666	119,152

EAST ST. LOUIS & SUBURBAN.

The East St. Louis & Suburban Company has issued the following report:

	1915	1914
September gross	$ 206,405	$ 216,511
Net after taxes	83,952	85,972
Surplus after charges	21,048	21,980
Twelve months' gross	2,424,763	2,718,761
Net after taxes	983,250	1,018,889
Surplus after charges	223,323	363,123
Deficiency after preferred dividends	76,677	*46,457

*Surplus.

VIRGINIA RAILWAY & POWER.

The Virginia Railway & Power Company has issued its report for the year ended June 30, 1915. The combined income account, including subsidiaries, compares as follows:

	1915	1914
Gross	$5,109,622	$5,156,048
Expenses	2,469,074	2,465,908
Net	2,640,548	2,690,140
Other income	80,919	80,910
Total income	721,467	2,771,050
Taxes, etc	298,551	308,112
Balance	2,422,916	2,462,938
Charges	1,136,120	1,108,325
Surplus	1,286,796	1,354,613

AMERICAN LIGHT & TRACTION.

American Light & Traction Company reports earnings for the year ended September 30, 1915, as follows:

	1915	1914
Earnings on stocks owned	$ 4,239,114	$3,661,448
Miscellaneous earnings	745,940	728,835
Total earnings	4,985,054	4,390,083
Expenses and taxes	156,620	148,049
Net earnings	4,828,434	4,242,034
Preferred dividends	854,172	854,172
Surplus	3,974,262	3,337,862
Cash common dividends	1,592,365	1,443,430
Stock common dividends	1,592,365	1,443,430
Balance	789,532	501,002
Total surplus September 30	10,371,970	9,582,438

WISCONSIN-MINNESOTA LIGHT & POWER.

For the twelve months ended September 30, 1915, Wisconsin-Minnesota Light & Power Company, a subsidiary of American Public Utilities Company, reported earnings as follows:

	1915	1914
Gross earnings	$1,085,309	$1,011,944
Expenses and taxes	527,075	519,384
Net earnings	558,234	492,560

MASSACHUSETTS ELECTRIC.

Massachusetts Electric Company reports for the quarter ended September 30:

	1915	1914
Gross	$2,874,745	$2,948,926
Expenses	1,857,152	1,762,642
Net	1,017,593	1,186,284
Charges and taxes	519,585	523,271
Surplus	498,008	663,013

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 15	Nov. 8
American Tel. & Tel. (New York)	127⅞	128
Commonwealth Edison (Chicago)	144	140
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery, common (Philadelphia)	67	71
Electric Storage Battery, preferred (Philadelphia)	67	71
General Electric (New York)	177½	177
Kings County Electric (New York)	120	120
Massachusetts Electric, common (Boston)	7	7
Massachusetts Electric, preferred stamped (Boston)	41	40
National Carbon, common (Chicago)	155	150
National Carbon, preferred (Chicago)	119¾	121
New England Telephone (Boston)	132	132½
Philadelphia Electric (Philadelphia)	27⅜	29¼
Postal Telegraph and Cables, common (New York)	82	83
Postal Telegraph and Cables, preferred (New York)	65½	65¾
Western Union (New York)	87¾	87¾
Westinghouse, common (New York)	69⅞	69
Westinghouse, preferred (New York)	—	143

Digitized by Google

COMMONWEALTH POWER, RAILWAY & LIGHT.

Twelve months ended September 30, 1915:

	1915	1914
Earnings on stocks	$2,405,644	$2,490,687
Miscellaneous earnings	596,394	514,064
Total gross	3,002,038	3,049,486
Expenses and taxes	141,867	144,040
Amortizat.on	28,932	21,043
Interest charges	608,630	651,804
Total income	2,222,608	2,232,598
Preferred dividends	960,000	960,000
Surplus	1,262,608	1,272,598

NEW PUBLICATIONS.

SMELTER FUMES.—The Bureau of Mines has issued Bulletin 98 containing the report of the Selby Smelter Commission. This commission was made up of E. C. Franklin, Ralph A. Gould and the late Joseph A. Holmes, and prepared this report as a result of the litigation arising on account of the offending fumes from the Selby Smelter in Solano County, Cal.

FUSIBLE BOILER PLUGS.—Technical Paper No. 53 of the Bureau of Standards, Washington, D. C., is entitled "An Investigation of Fusible Tin Boiler Plugs," by George K. Burgess and P. D. Merica. This gives the specifications for such plugs and an investigation of their performance. The principal conclusion is that there should be no zinc present in such plugs.

PERSONAL MENTION.

MR. W. R. THURSTON has been appointed manager of the Mine & Smelter Supply Company's Salt Lake City branch. Mr. F. E. Marcy, former manager, will still be associated with the company and devote his efforts in selling and developing the Marcy ball mill.

MR. THOMAS CHEYNE, of Paterson, N. J., has been appointed vice-president of the Reading (Pa.) Transit and Light Company, with headquarters in Reading. This is a new position and the appointee will be assistant to E. W. West, of New York City, the new president and general manager, who assumed the office on November 1.

MR. P. P. HINCKLEY, of Chicago, has joined the sales force of the Connecticut Telephone and Electric Company, Meriden, Conn., and will handle the jobbing trade east of Chicago. The company's connections in Chicago and the west will be managed by Mr. J. W. Fulton, with offices at 1100 Karpen Building, Chicago.

MR. W. J. LAUFENBURG, formerly secretary of the Kansas City Electric Club, has gone to Denver, to take up special sales work with that office of the Western Electric Company. Mr. Laufenburg spent one year with the company at Chicago, and for the past eleven and one-half years has been connected with the Kansas City branch.

MR. RAY PALMER has been elected vice-president and general manager of the New York & Queens Electric Light & Power Company, Long Island City, N. Y. Mr. Palmer was formerly Commissioner of Gas and Electricity in Chicago, Ill., and at the termination of his office, midyear in 1915, in that capacity he established a private practice as a consulting engineer. Mr. Palmer brings to the new position a splendid experience and a highly enviable reputation. While commissioner in Chicago he established a record for efficiency and progress which has seldom been equalled in the conduct of a municipal undertaking of this magnitude.

OBITUARY.

MR. HERBERT MERRILL WHEELER, engineer of electrical distribution, Chicago Surface Lines, died in Chicago on November 5. He was born in Shewano, Wis., in 1876. When only 20 years old he was graduated from the electrical engineering course at the University of Minnesota. For three years he was employed by the Fort Wayne Electric Corporation, Fort Wayne, Ind. In 1899 he became assistant engineer of the North Chicago Street Railroad Company, resigning four years later to take a position as instructor of mathematics and engineering at Lewis Institute, Chicago. On the formation of the Chicago Railways Company in 1907 he became its electrical engineer, and in 1909 was promoted to be assistant chief engineer. When the Chicago Surface Lines took over the operation of the entire street railway system of Chicago in February, 1914, he was appointed to the position he held till his death. Mr. Wheeler was a veteran of the Spanish-American War of 1898. He was a very active member of Company E at the military training camp established a few months ago at Fort Sheridan, Ill.; his death was due to lesion of the brain attributed to excessive exertion at that time. Mr. Wheeler was chairman of the Electrical Section of the Western Society of Engineers and had served on various of its committees. He is survived by his widow and two young sons.

DATES AHEAD.

American Physical Society. Meeting at University of Chicago, Chicago, Ill., November 26 and 27. Secretary, A. D. Cole, Columbus, O.

American Society of Mechanical Engineers. Annual meeting, New York City, December 7-10. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Association of Engineers. First annual convention, Hotel La Salle, Chicago, Ill., December 10-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

John A. Roebling's Sons Company, Trenton, N. J., was visited by another fire recently, but the electrical department was not affected this time. Damage was confined to the department engaged in the manufacture of steel cables.

Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 1000 D, dealing with motor-starting switch condulets. These devices are ironclad switches for starting small three-phase induction motors. They are provided with locking doors, permitting the switch to be locked in open or closed position. They are made in several types and rated at 30 and 60 amperes for 250 and 500-volt circuits.

The Lincoln Electric Company, Cleveland, O., is making special battery-charging sets for use with Milburn "Light Electrics," the lightweight electric vehicles manufactured by the **Milburn Wagon Company,** of Toledo, O. These are described in a recently issued illustrated bulletin, entitled "Milburn Light Electric Charger." The outfit is a very compact and easily controlled motor-generator set similar to the Lincoln battery charger, which was described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of December 5, 1914.

Holophane Works of General Electric Company, Cleveland, O., has ready for distribution catalog No. 303, on Ivanhoe metal reflectors and fittings for multiple Mazda lamps, both vacuum and gas-filled types. Listed in the catalog is a large assortment of metal reflectors and accessories for industrial, railway, commercial and miscellaneous lighting. A group of fixtures for giving daylight colors is also included. A valuable section gives illuminating engineering data and suggestions bearing on the use of Ivanhoe industrial reflectors.

Shapiro & Aronson, 20 Warren Street, New York City, have issued catalog No. 18 on fine-quality lighting fixtures. This comprises 72 large pages, on which are shown some 50 very handsome designs of this well known firm's Roman bronze line of fixtures. There are also shown about 140 miscellaneous fixtures, ranging from highly ornate to the comparatively simple patterns. The large assortment shown in the catalog includes many distinctive types of fixtures. The greatest number are chain-type fixtures, but there are also many ceil-

Digitized by Google

ing, bracket and pendent types. From such a varied assortment it is possible to select equipment suitable for any well furnished room of a residence.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued bulletin No. 62, which is entitled "Economics of Industrial Lighting." This is a very handsomely illustrated publication giving the chief principles of illuminating engineering as applied to the scientific lighting of factories, shops and works as set forth by the leading authorities on the subject. A large number of illustrations show typical installations of factories illuminated by Cooper Hewitt mercury-vapor lamps. The company has also issued bulletin No. 44C, which gives the latest information regarding Cooper Hewitt quartz lamps. Another new bulletin is No. 52 on the quartz lamp laboratory outfit for the production of ultra-violet light. All of these bulletins are printed on glare-free paper.

The Stone Base & Panel Company, a new concern recently incorporated at Columbus, O., will make a substitute for slate used on electric switchboards, etc. The product consists of a peculiar quality of stone quarried in southern Ohio, which is chemically treated in vats, to increase its insulating properties and permit of a polished surface. The advantages claimed for it over slate are that it is about half the cost, is free from any mineral substance that would decrease its insulating property, and is much less susceptible to breakage because more elastic than slate. The company claims to have the indorsement of a number of electrical men. The chemical process is covered by patent. R. E. Hyde, of Cleveland, O., is the discoverer of the process. The president of the company is C. A. Stribling, a leading Columbus architect.

The Richardson-Phenix Company, Milwaukee, Wis., has issued two new bulletins. No. 50 describes the Phenix force-feed lubricator, which is particularly designed for lubricating power-plant machinery. This outfit is very sturdily built and has been found well suited for the purpose. The bulletin describes the various models of this apparatus with the aid of numerous detail views. Typical installations are also shown. The advantages of this equipment are set forth, among which is its moderate price. Bulletin No. 60 is devoted to the Richardson sight-feed oil pump. The correct principles of cylinder lubrication are explained. The construction of the model M sight-feed oil pump is then described and its application made clear. Auxiliaries are also described. The lubrication of gas-engine cylinders is discussed. Many views are shown of various parts of the equipment, typical power-plant installations and important buildings in which they are used.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has issued Booklet B, which is entitled "Battery-Charging Equipment." The types of equipment described include the well known universal unit type for large fleets and public garages; panels and rheostats for individual vehicle charging; and rheostats for charging batteries used on starting, lighting and ignition systems of gasoline cars. The universal unit type of charging equipment consists of a number of self-contained unit sections assembled in frames much as sectional filing cabinets are assembled. Some of the advantages for this type of equipment as pointed out in this booklet are: simplicity and durability, accessibility, ease of installation, ease of operation, ease with which new sections may be added, automatic protection without complication, self-contained construction and compactness. The equipment for individual vehicle charging described consists of four standard types; there are also two standard types for charging batteries used on lighting, starting and ignition systems of gasoline cars.

Record of Electrical Patents

Issued by the United States Patent Office, November 9, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,159,346. Socket Shell. L. W. Andersen, Waterbury, Conn. Manner of securing cap and body together and preventing relative rotation.

1,159,354. Electrical Testing Apparatus. H. J. Blakeslee, Hartford, Conn. For testing meters.

1,159,359. Magneto Hand-Generator. H. P. Clausen, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Has particular brush and commutator arrangement for alternately short-circuiting armature and sending impulse to telephone line.

1,159,361. Electric Switch. R. C. Cole, assignor to Johns-Pratt Co., Hartford, Conn. Knife-blade fuses mounted on cover may be moved out of engagement with stationary clips before cover is raised.

1,159,373. Photographic-Printing Machine. W. E. Grote, New York, N. Y. Light circuit closed by movement of negative and sensitive sheet into printing position.

1,159,376. Process for Producing Acetic Acid from Acetylene by Electrolysis. C. Hansen and A. Weindel, assignors to Synthetic Patents Co., New York, N. Y. Acetylene is oxidized on anode by aid of acid electrolyte containing mercury compound.

1,159,383. Electric Arc Lamp. R. Holsten, assignor to Siemens-Schuckertwerke, G. M. B. H., Berlin, Germany. Arc maintained by combustible, fed between relatively movable electrodes, feeding of combustible and position of movable electrode automatically regulated.

1,159,409. Electric Insulator. A. R. Muller, Walthamstow, England. Series of petticoat insulators, each adapted to carry a wire, screwed together one above another.

1,159,418 and 1,159,419. Projection Lantern. J. T. Roffy, assignor to A K-Ray Corporation, New York, N. Y. Arrangements of lenses and reflectors.

1,159,451. Trolley Harp. C. Wetjen, New York, N. Y. Guard structure passing over wire yields to allow wire to pass in swinging trolley into and out of contact with wire.

1,159,456. Electrical Connector. E. B. Cox, Meriden, Conn. Plug has double pairs of contacts for making side and center contacts in screw socket or making both contacts at end.

1,159,467. Automobile Horn. P. C. Burns, assignor to American Electric Co., Chicago, Ill. Special structure having diaphragm vibrated by motor-driven toothed wheel.

1,159,484. Street and Station Indicator. H. A. Fleck and C. H. Fleck, Jr., Philadelphia, Pa. Sign belt on spring-driven rollers controlled by electromagnet.

1,159,492. Focus Adjustment for Lamps. L. T. Grandy, assignor to C. M. Hall Lamp Co., Detroit, Mich. Particular arrangement for adjusting lamp socket along axis of headlight reflector.

1,159,508. Clock Movement. J. Lemire, Drummondville, Que., Canada. Electromagnetic control of escapement.

1,159,511. Arc-Lamp Electrode. G. M. Little, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Contains titanum oxide and tungstic oxide.

1,159,519. Floating Electric Trolleyway and a Floating Passenger Car. S. C. Menier, San Francisco, Cal. Posts floating in upright position and anchored to sea bottom support trolley wire through which current is supplied to motor of floating car.

1,159,521. Signal Switch. B. Miller, German Valley, Ill. Particular structure of sliding circuit-closer operated by crank.

1,159,536. Current-Collector for Electric Railways. H. Schütte, assignor to Schütte Electric Co., Pittsburgh, Pa. Pneumatically operated collapsible frame supports trolley contact laterally adjustable independent of frame, provision being made for automatically maintaining contact pressure constant.

1,159,547. Electric Switch. G. A. Tate, Chicago, Ill. Circuit-breaker with tripping mechanism held in closed position by fuse.

1,159,554. Pump. C. J. Veley and L. S. Deal, assignors to Comstock Automatic Pump Co., Comstock, Mich. Water pumping system; driving motor and check valve operating magnet controlled by float switches.

1,159,562. Switchboard Apparatus. J. A. Wotton, assignor to Western Electric Co., New York, N. Y. Particular structure of strip of lamp sockets for telephone switchboard.

1,159,563. Safety Device. W. D. Baldwin and G. John, assignors to Otis Elevator Co., Jersey City, N. J. For elevators; electrical and mechanical automatically operable devices for setting the safety, the devices being operable independently, the electrical device controlled by a speed governor and the other device operating independently of the speed.

1,159,567. Joint Insulator. C. O. Burton, Duluth, Minn. Two separable, identical interlocking parts with recess to receive conductor joint.

1,159,578. Safety Apparatus for Railways. T. M. Freeble, Rochester, Pa. Particular arrangement of track circuits in block-signal system.

1,159,586. Elevator-Door Lock. J. D. Ihlder, assignor to Otis Elevator Co. Lock for latch controls circuit-closer and is controlled by passing car.

1,159,587. Automatic Stop-Motion. G. John and D. L. Lindquist, assignors to Otis Elevator Co. Limit-switch apparatus and manual controller for elevator combined on car.

1,159,590. Dashpot Accelerating Device. D. Larson, assignor to Otis Elevator Co. Electromagnetic switch with dashpot effective at beginning and end of movement.

1,159,595. Telephone-Exchange System. F. R. McBerty, assignor to Western Electric Co. Has key-controlled sequence switches for connecting operator's set with connecting circuits.

1,159,602. Thermal Circuit-Closer. J. F. Scheuer, Two Rivers, Wis. Rosette-like structure for securing to wall having circuit held open by fusible member.

1,159,603. Telephonic Device. H. E. Shreeve, assignor to Western Electric Co. Electromagnet acts on granular microphonic element to relieve pressure on granules upon tendency to pack.

1,159,612. Controlling Apparatus. A. Sundh, assignor to Otis Elevator Co. Nonreversing, alternating-current driving motor controlled, and transmission mechanism driven thereby controlled in both directions, by a master switch.

1,159,655. Terminal Structure. C. W. Davis, assignor to Standard Underground Cable Co., Pittsburgh, Pa. Vertically disposed structure mounted on cable end for connecting bridle wires. (See cut, next page.)

1,159,668. Safety Device for Electric Switches. F. C. Harris, Duluth, Minn. Nonconducting casing inclosing metal parts of switch, has slot through which handle projects and has provision for preventing accidental displacement of handle.

1,159,674. Electric-Circuit Regulator. G. Honold, assignor to firm of Robert Bosch, Stuttgart, Germany. Electromagnetically operated compression resistance device.

1,159,678. Trolley-Wheel Guard. W. L. James, West Homestead, Pa. Pull on rope removes guard fingers from above trolley wire and catch is provided on pole for holding them removed.

1,159,682. Electric-Lamp Guard. J. Kaufman, New Castle, Pa. Cage surrounding bulb has sliding rings to adjust the wires about bulb and spring members bearing against bulb to position it in cage.

Digitized by Google

1,159,699. Water-Purification Apparatus. J. A. Murdock, assignor of part to J. H. Hirst and C. A. Murdock, Los Angeles, Cal. Tubular, unitary structure comprising insulated electrodes for immersion in receptacle.

1,159,701. Plug-Socket. W. C. Neahr, assignor to Protective Signal Mfg. Co., Denver, Colo. Combined socket and cutout switch, insertion of the plug opening the switch.

1,159,704. Aerial Bomb. A. Parsons, Saranac Lake, N. Y. A bomb-carrier from which bomb may be released is suspended from aircraft and comprises a magnet operating a signal when attracted by iron vessel.

1,159,714. Electrical Selective Mechanism. A. H. F. Schaar, assignor of one-half to H. W. Bishop, Oakland, Cal. Single line, telegraphic selective system operated by arrangements of currents of different polarity.

1,159,723. Electric Safety System for Railroads. J. Skinderviken, Chicago, Ill., assignor of one-half to J. Gibbs. Electrical brakes on train controlled by devices spaced along track.

1,159,724. Train-Control System. S. G. Smith, Corpus Christi, Tex. Clock-controlled signal circuit on train is set in operation by track device to operate signal repeatedly and after certain number of signal operations train is automatically stopped.

1,159,730. System of Automatic Signaling for Electric Railways. F. Townsend, assignor to General Railway Signal Co., New York, N. Y. Block system has polyphase source, one phase actuating car, one phase impressed on track and relay operated by all phases, one of which is transmitted through trackway, at least two of phases being different from car-actuating phase.

1,159,752. Starter for Internal-Combustion Engines. F. E. Fisher, Detroit, Mich. Relates to gearing of electric machine and engine shaft.

1,159,765. Arc Lamp. C. Henrichsen, assignor to General Electric Co., Schenectady, N. Y. Particular circulatory ventilation system for inclosed flame arc.

1,159,769. Device for Indicating the Horsepower of an Engine. W. H. Hollstein, Lakewood, O. Pressure indicators vary rheostat, indicator being operated by the potential variations thus produced.

1,159,770. Coil Construction. R. M. Hyde, assignor to General Electric Co. Transformer windings built up of disk coils spaced apart by blocks built up of laminas. (See cut.)

1,159,793. Automobile Signal. J. C. Perry, Ocean Grove, N. J. Electromagnetically operated indicator controlled by push button on steering wheel.

1,159,798. Inulating Tube. A. B. Reynders, assignor to Westinghouse Eletric & Mfg. Co. Machine for forming tube by winding strip spirally.

1,159,800. Maximum-Demand Indicator. L. T. Robinson, assignor to General Electric Co. Indicating member moved by watt-hour meter and controlled by indicating wattmeter.

1,159,807. Trolley. F. Sczavnyicki, Bridgeport, Conn. Structural details of harp and spring-pressed guard fingers extending over trolley wire.

1,159,818. Electromagnetic Switch. J. J. Wood, assignor to General Electric Co. Particular structure having closing and holding-out gaps.

1,159,826. Machine for Counting Paper Money. J. P. Buckley, Washington, D. C. Bills passing singly between rollers interrupt circuit of counter.

1,159,853. Machine for Making Arbors for Incandescent Lamps. H. D. Madden, assignor to Westinghouse Lamp Co., Pittsburgh, Pa. Details of machine.

1,159,855. Special-Service Telephone System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Automatic system; special service set bridged across line at central is disconnected by automatic switch operated in response to a call.

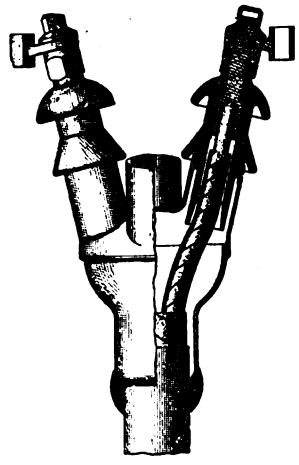
1,159,869. Vapor Electric Device. Y. Sakai, assignor to Westinghouse Electric & Mfg. Co. Mounting of terminal in casing wall.

1,159,884. Electrode-Cooling System. L. M. Aspinwall, assignor to Westinghouse Electric Mfg. Co. For rectifier; cooling fluid passed successively through cathode jacket and a number of hollow anodes.

1,159,892. Electrical Protective Device. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. Time-limit circuit-breaker controlled by resistors of different temperature gradients.

1,159,900. Vapor Electric Device. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Current rectifier; cooling fluid passed successively about casing and through anodes.

1,159,903. Electrode-Cooling System. D. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Cooling stream passed successively through and its effect equalized at a number of anodes in rectifier.



No. 1,159,655.—Cable Terminal.

1,159,904. System of Electrical Distribution. H. P. Davis and F. Conrad, assignors to Westinghouse Electric & Mfg. Co. Feeder system for number of sectional trolley wires having circuit-breakers at section ends.

1,159,905. Fire-Alarm System. W. L. Denio, Rochester, N. Y. Has alarms at central and local stations which are operated simultaneously or the local alone.

1,159,908. Electric Gas-Lighter. R. F. Dowdy, Roanoke, Va. Igniting spark jumps to frame of gas device when electrode projecting from handle is brought near; handle has push button for closing circuit.

1,159,910. Cooling System. G. M. Eaton and S. W. Farnsworth, assignors to Westinghouse Electric & Mfg. Co. For rectifier; cathode and anode maintained at predetermined difference of temperature by regulating cooling fluid therefor.

1,159,911. Spark Plug. A. Eckhardt, Sutton, Neb. Central electrode bifurcated and each leg has a spark cap.

1,159,914. Starting Electrode for Vapor Electric Apparatus. S. W. Farnsworth, D. E. Carpenter and L. E. Frost, assignors to Westinghouse Electric & Mfg. Co. Adjustable mounting for electrode.

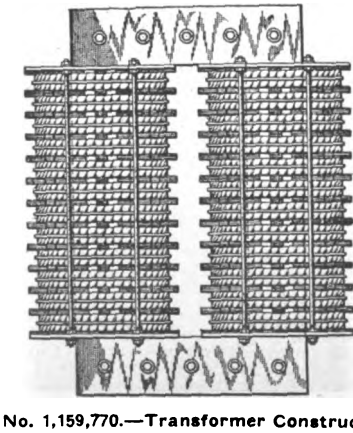
1,159,915. Starting Electrode for Vapor Electric Devices. S. W. Farnsworth and O. P. Schuster, assignors to Westinghouse Electric & Mfg. Co. Electrode is manually or electromagnetically adjustable.

1,159,916. Electrode Shield for Vapor Electric Apparatus. S. W. Farnsworth, D. E. Carpenter, L. E. Frost, D. H. Rose and E. F. Sipher, assignors to Westinghouse Electric & Mfg. Co. Details of structure for rectifier.

1,159,920. Trimming-Indicator for Arc Lamps. R. Fretzdorff, assignor to Korting & Mathiesen Aktiengesellschaft, Leutzsch, Germany. Indicator controlled by position of carbon holder.

1,159,922. Vapor Electric Device. L. E. Frost, assignor to Westinghouse Electric & Mfg. Co. Shield is placed about operating means, in the casing, for the movable electrode.

1,159,936. System of Electrical Distribution. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Before overloaded feeder circuit is cut out, resistance is thrown in between generator and busbar.



No. 1,159,770.—Transformer Construction.

1,159,944. Vapor Electric Device. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Structure and arrangement of anode shield for rectifier.

1,159,947. Mechanism for Winding Insulated Electric Cables. G. A. Johnson, Newark, N. J. Arrangement of winding dies.

1,159,969. Detector for Wireless Telegraphy. C. O. Lorenz, Port Arthur, Tex. Comprises contacting bodies of chalcocite and zinkite.

1,159,994. Spark Plug. J. Rick, assignor to Triune Engineering Co., Newark, N. J. One of the sparking points is a loose ball carried in sparking chamber in end of casing.

1,160,013. Railway Signal. R. H. Todd, Philadelphia, Pa. Locomotive cab signal controlled by circuit through car wheel and track wire.

1,160,063. Electric Lamp Socket. F. P. Gates and G. A. Gauthier, assignors to Arrow Electric Co., Hartford, Conn. Key-operated lock for securing lamp in socket, key being disabled after locking is completed.

1,160,064. Key. F. P. Gates, assignor to Arrow Electric Co. Details of key for above.

1,160,072. Method of and Means for Translating Sounds. R. E. Hall, assignor of one-half to C. A. Robertson, Portland, Oreg. Vibratory diaphragm controlled by sound-varied air jet controls electric indicating circuit.

1,160,087. Dynamo-Electric Machine. A. H. Neuland, assignor to Neuland Electric Co., New York, N. Y. Inductor machine having toothed pole pieces and rotor arranged to simultaneously and similarly vary the flux through each pair of pole pieces.

1,160,092. Electrical Control System. W. Stull, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Electric railway operating on different voltage has devices insuring multiple connection of car lights on low voltage and series connection on high voltage.

1,160,094. Indirect-Lighting Fixture. H. C. Adam, St. Louis, Mo. Arrangement of reflectors, socket, supports, etc.

1,160,097. Telegraph Repeater. W. Finn, assignor to Western Union Telegraph Co., New York, N. Y. Special arrangement comprising polar repeating relays.

1,160,100. Method of Manufacturing Tubes. A. B. Reynders, assignor to Westinghouse Electric & Mfg. Co. Modification of No. 1,159,798.

1,160,101. Machine for Perforating Master Sheets for Typewriter Operators. L. E. Roberts, assignor to Underwood Typewriter Co., New York, N. Y. Electromagnetically operated, key-controlled perforators.

1,160.115. Time-Service-Controlled Mechanism. W. H. Thompson, assignor to United Development Corporation, Memphis, Tenn. Apparatus comprising driving motor circuit controlled by time, service and credit elements.

Reissue 14,007. Apparatus for Cleaning Articles. E. L. Couch, assignor to Couch-Dean Corporation, Hartford, Conn. Articles are carried on belt of electrolytically active material into chamber confining chemicals reacting with the electrolytically active material.

Patents Expired.

The following United States electrical patents expired on November 15, 1915:

614,076. Alternating-Current Motor and Mode of Operating Same. C. S. Bradley, Avon, N. Y.

614,082. Intermittent Electric Surface Conductor. F. Burger, Fort Wayne, Ind.

614,124. Electric Switch Mechanism for Electric Railways. J. M. Murphy, Torrington, Conn.

614,161. Electric-Car Truck. E. Cliff, Newark, N. J.

614,190. Magnetic Chuck. O. S. Walker, Worcester, Mass.

614,207. Telephone-Exchange System. W. E. M. Jackson, Chicago, Ill.

614,225. Electric Meter. L. Gutmann, Peoria, Ill.

614,228. Method of Charging Secondary Batteries. C. O. Mailloux, New York, N. Y.

614,270. Insulated Supporter for Electric or Other Wires. C. K. King and G. A. Mead, Mansfield, O.

614,275. Apparatus for Heating and Agitating Air. E. F. Porter, Boston, Mass.

614,321. Trolley Controller. J. Dolan, Dayton, O.

614,373. Arrangement for Exciting Magnets of Dynamo Machines. M. Derl, Vienna, Austria-Hungary.

614,394. Starting Resistance for Alternating-Current Motors. E. L. K. F. Kahlenberg, Berlin, Germany.

614,404. Signaling Apparatus. M. Martin, Walden, Mass.

614,412. Electric Switch-Operating Mechanism for Railways. L. E. Watkins, Springfield, Mass.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 22. CHICAGO, SATURDAY, NOVEMBER 27, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
- Desirable Intensity of Illumination..... 959
- Enter the Psychologist..... 960
- Electrical Prosperity Week..... 960
- War Taxes on Electricity..... 960
- Ignition of Inflammable Gases..... 961
- Organization 961
- Notable Electrical Safety Record..... 961

DEPARTMENTS:
- Commercial Practice 967
- Electrical Construction..... 972
- Dollar Wiring Kinks..... 975
- Public Service Commissions..... 976
- Questions and Answers..... 978
- Among the Supply Men..... 980
- New Electrical and Mechanical Appliances..... 989
- Latest Approved Fittings..... 995
- Current Electrical News..... 996
- Record of Electrical Patents..... 999

LEADING ARTICLES:
- Electricity in Marble Quarrying..... 963
- Locating Faults by the Drop-of-Potential Method.—By H. S. Percival..... 983

BOOK REVIEWS..... 988

MISCELLANEOUS:
- Missouri Telephone Men Hold Annual Convention..... 962
- Electrical Exports for September..... 962
- National Electric Light Convention to be Held in Chicago 962
- The Faraday Society..... 962
- Offices That Invite Public Confidence..... 967
- Ohio New-Business Men Hold Profitable Convention..... 967
- Electric Motor Prevents Water Famine in Brownwood.... 968
- Janesville Company Participates in Trade Celebration.... 969
- Spectacular Gas and Electric Sign in Louisville Attracts Attention 969
- Denver Company Conducts Strenuous Prosperity Week Campaign 970
- An Electric Range Advertisement That Sold 22 Ranges 971
- Meeting of Wiring Committee of National Electric Light Association 972
- Kansas City Contractors..... 973
- A Cheap 110-Volt Alternating-Current Voltmeter.—By Alfred E. Oswald..... 973
- Driving Belts.—By William T. Estlick..... 973
- Among the Contractors..... 974
- Lightning Arrester for Brick Plant.—By A. P. Broadhead 974
- A Method for Measuring Earth Resistivity..... 980
- Celebration Features of Electrical Prosperity Week Unique and Interesting..... 981
- Wichita Prosperity Week Plans..... 982
- Regulation of Public Utilities..... 986
- Results of Electric-Furnace Operation in an Alaska Mine.... 987

Copyright, 1915, by Electrical Review Publishing Company, Inc.

DESIRABLE INTENSITY OF ILLUMINATION.

Early illuminating-engineering practice was directed largely toward determining the minimum intensity of illumination which would be satisfactory and permit good seeing, and installations were designed with an idea of not greatly exceeding this value, the motive of course being one of economy. With the great development in electrical illuminants and the greatly increased efficiency of light production, there has been a marked tendency to increase illumination intensities above these minimum values and provide conditions which will be pleasant and stimulating, as well as permitting necessary work to be accomplished.

Many compilations have been made of intensities which are desirable in different kinds of structures and in rooms devoted to different purposes. It is not well to follow such values too blindly in any particular case, as it must be remembered that the most desirable intensity is influenced by a great many conditions which will vary from one case to another. The furnishings of a room, the color of wall and ceiling, the percentage of window space, are generally recognized as variables which should receive consideration. There are other variables, however, which should enter into a consideration of the case, but which are frequently neglected.

Among these are the fact that work can be done more quickly under a fairly high intensity than under a lower one. An intensity which may be entirely comfortable where work is done slowly and there is no haste, may prove entirely inadequate where it is necessary to take in a large field or many details at a glance. The eye can work at a rapid rate without fatigue under high intensities when it would not be able to do so under more moderate ones. Again, the intensity of illumination which is most suitable depends to a certain extent upon the size of a room. To see well at longer distances, higher intensities are necessary than to see close at hand. Intensities which are entirely sufficient to see objects close to the observer may be entirely inadequate for distinguishing detail at the other side of a large room. This is well recognized in illuminating the stage of the theater, where high lights are the regular order of the day. A third condition which may be mentioned here is the relation between the necessary intensity and the amount of detail in the work to be accomplished. Within a reasonable range, acuity is greater the higher the intensity, and this should be remembered in planning conditions for any work which involves a discernment of considerable detail.

Only by giving attention to all the physical condi-

Digitized by Google

tions involved and to the purposes to which illumination is to be applied, will it be possible to plan the most suitable installation, both as to the intensities and to the form of equipment for supplying it in any particular case.

ELECTRICAL PROSPERITY WEEK.

On other pages of this issue report is made concerning the plans which the electrical and allied interests have made for the celebration of Electrical Prosperity Week, November 29 to December 4.

There have been obstacles to overcome, some natural and others forced, but upon the whole the country has responded in hearty fashion. From one end of the land to the other in many forms of attention-compelling display, the advantages of the use of electrical energy and the availability of electrical apparatus to do the work of the world, will be brought in spectacular fashion to the direct notice of the American public.

Any speculation we might make as to the returns which shall be available to those who will bear the brunt of expense and effort would be futile. However, we need not be optimistic in any degree to expect that the rewards will be great. Of course, many who have not contributed in any way will benefit, and those who have carried the burden will in turn be benefited more greatly, for in the future they will have assistance instead of resistance upon the part of those not so easily converted.

Coming as it does just when the country appears to be looking forward to a period of great activity and material prosperity, the date for the celebration appears to have been happily selected. We may all sincerely hope that not one of the expectations of those behind and for the enterprise may fail of realization.

ENTER THE PSYCHOLOGIST.

An interesting instance of the value of collateral scientific research in public utility operation is afforded by tests recently conducted by Dr. J. W. Baird of the department of psychology, Clark University, for the New York Telephone Company. Facing the difficult problem of adding 35,000 names to the directory without reducing the size of type almost to the vanishing point or increasing the number of pages in an already bulky volume, the company requested Dr. Baird to render what assistance he could, based on a broad knowledge of the psychology of optics and printing.

Dr. Baird chose 32 men and women differing in age, sight, education and station in life and by some 4,000 stop-watch tests determined the speed with which numbers could be selected from the directory, comparing various dummy sheets and type arrangements. These showed that the average length of time to find a number in the old three-column book was 10.35 seconds, compared with 9.28 seconds for the new arrangement, which is a four-column book with the type compressed horizontally rather than vertically. There are 11 listings per inch in place of the 12 formerly used and the book actually contains 150 less pages than its predecessor.

Such an instance of the practical success of laboratory methods applied to a purely commercial problem points the way toward other applications of experimental psychology in the public-utility field. The studies of Professor Munsterberg in the direction of employee selection suggest new lines of attack on the riddle of the personal equation, and more is likely to be heard from these methods in the future. It is to be expected that complaints will be registered in the New York case for the reason that some natures always oppose change of whatever kind; but it is hard to see how the company could have done more to solve the problem than this recourse which it took to expert advice.

WAR TAXES ON ELECTRICITY.

One of the inevitable consequences of a costly war is the raising of additional revenue by the Government, and this is usually done by imposing taxes wherever it can be done without creating too stubborn opposition. All manner of taxes arise in war times and they are not always lifted upon the conclusion of peace. One principle of procedure in taxation is to lay taxes most heavily upon those most able to bear them; that is, upon those best able to pay. This is followed out in the case of an income tax, but a great many taxes bear most heavily upon those least able to pay. This is true of all taxes upon the production, importation or merchandising of the necessaries of life or articles in common use. All such taxes upon industry and trade, indeed almost every tax except one upon land values, are shifted to the ultimate consumer, and the largest proportion of consumers in any country are poor people. In spite of the fact that business and industry are most upset in time of war, governments do not hesitate to burden them with taxes, usually overlooking the fact that a tax upon land values would occasion no burden to industry, could not be shifted, and moreover is easy of collection and difficult of evasion, two intensely important points in connection with any revenue-raising policy.

It is not at all surprising, then, to find the Russian Government turning to the electrical industry of that country to find a victim capable of supplying additional revenue. Such a course has been considered in times past, but it was not until the present crisis that the Government finally determined to impose this tax. The tax is based upon the output of electric energy in both public and private power plants and the seller of energy from whom the tax is collected is expressly authorized to add it to the bill of the consumer, which is tantamount to an increasee in the rates for energy supply.

The tax is a graduated one, varying from 0.5 to 4 kopecks per kilowatt-hour. The upper limit applies to residence and office lighting, theaters, etc. The lower limit applies to energy used for heating and industrial power. This practically raises the price of electric

Digitized by Google

energy from 0.25 to 2 cents per kilowatt-hour. Private plants having a capacity of less than one kilowatt are exempt.

Since the tax falls ultimately upon the consumer, the only direct effect upon the industry is to discourage the use of electricity, and thus reduce the volume of business which would otherwise be transacted. Such reduction might easily reach serious proportions. The total consumption in Russia during 1913 was about 2,000 million kilowatt-hours. This may be compared with the 11,500 million kilowatt-hours in the United States in 1912 supplied by central stations alone. Electric railways and private plants would enormously increase this aggregate. This indicates the undeveloped condition of the industry in Russia, which will be still further retarded by the imposition of the new tax. Taxing an industry never encourages development.

In England the Government has proposed an "excess profits tax," which may bear unjustly on certain elements of the electrical industry. To quote from *Electrical Industries:* "Electric tramway and electric supply companies are subject to limitation of tenure with expropriation at the 'then value' of the plant alone. They are thus on a totally different footing from the ordinary commercial enterprise or from the railway and gas companies, all of which enjoy an unlimited tenure. Most supply and traction undertakings are approaching middle age; they have passed the years of comparatively unprofitable development; and the profits they are now making are to a large extent ear-marked with a view to conserving capital against the day of expropriation. To treat such undertakings on precisely the same level as one which has all eternity before it is obviously unjust. The Excess Profits Tax will not be simply a slice out of abnormal profits; it will be an excessive drain upon both capital and profits."

NOTABLE ELECTRICAL SAFETY RECORD.

By completing four consecutive years without an accident, the electrical department of the famous establishment of the Brown & Sharpe Manufacturing Company, at Providence, R. I., has attained a record unequalled in all other branches of the concern and has furnished an object-lesson of the safety of electrical work when intelligently handled which would be difficult to surpass. Two points of interest occur in this connection. In the first place, the machinery of the plant is group-driven in nearly all departments, a condition naturally resulting in a multitude of shafts and belts which would seem to make minor accidents at least occasional among repairmen. Secondly, the peripatetic nature of the electrical work in such a plant takes the employees of this department through every nook and corner, a factor which is a decided contrast to the conditions surrounding a workman who goes to the same tool or group of tools from day to day, and whose tasks are to so large a degree repetitive. That electrical repairmen should have surpassed all other employees in their freedom from accidents in view of these circumstances, is a tribute both to the care and skill of their work as maintainers, and to the inherent safety of a well installed motor layout and distribution system.

IGNITION OF INFLAMMABLE GASES.

The danger which exists where direct-current commutating machines are operated in an atmosphere containing gases, dust, or other material which may be inflammable, has long been recognized, and in many cases alternating-current motors have been selected in preference to a direct-current installation on this account. This applies in coal mines, in flour and textile mills, and in many other places where dust is created.

It should be remembered in this connection, however, that alternating-current motors are not entirely free from similar possibilities. In the case of machines with slip rings there is a possibility of sparking at the brushes, even though such behavior is much more rare than in the case of direct-current machines. In the case of squirrel-cage rotors there is the possibility of trouble at the points of connection between bars and end rings. Occasionally high resistance at such points may result in the melting of a soldered connection and consequent sparking. Of course such occurrences are extremely rare, whereas the sparking of direct-current machines is extremely common. But it is well to remember that such possibilities exist even in the case of alternating-current motors and care should be taken that the equipment does not reach a condition through neglect where such things may be expected to take place.

ORGANIZATION.

Little is achieved without organization. Individuals may give birth to ideas and propagate them, but accomplishment of results is seldom secured unless men come together and organize and co-ordinate their efforts toward a desired end. This is as true in the electrical industry as elsewhere; and electrical men have recognized it and profited by their perception.

Greater efforts for co-operation between the various elements of the electrical industry have been made during the last few years than ever before. Far-sighted leaders are discerning that better results for all concerned can in the long run be secured if the different elements in the industry pull together than if they are working at loggerheads. There is so much to be done yet in building up the industry and extending the use of electricity, and each element in the total process of manufacturing, delivering and installing equipment and supplying energy for operation can be of so much assistance to the others in extending their respective spheres of usefulness that it seems inane to work otherwise than in harmony. No doubt much of the disposition to do otherwise has come from personal misunderstandings, but much of the friction arises from lack of organization.

Only through organization can each branch of the industry master its own problems and put itself in a position to co-operate with other branches in meeting common problems.

Digitized by Google

Missouri Telephone Men Hold Annual Convention.

The Missouri Telephone Association held its annual convention in Kansas City, at the Coates House, November 16 and 17, with an attendance of 300. The program began with an address of welcome by R. L. Redpath of the Commercial Club. S. T. Neill of Clinton responded. W. S. Vivian, secretary of the Independent Telephone Association of America, told of the value of association work in the telephone industry.

Hon. John M. Atkinson, chairman of the Public Service Commission of Missouri, delivered an address, in which he carefully explained the purposes of the Commission, and its desire to promote industrial and commercial development, without harrassment of utilities. He expressed gratification that there seemed an increasing tendency towards co-operation by utilities with the Commission.

F. B. MacKinnon, secretary of the National Independent Telephone Association, talked on "Interstate Affairs." W. C. Polk, chief engineer of the Gary System, gave technical and valuable pointers on the cost of building and rebuilding exchanges. C. A. Bennett, auditor of the Gary System, talked on "Accounting for Class C Companies."

The election of officers resulted in the selection of all the former officers, and the executive committee, to serve again, with the exception of the several vice-presidents. The roster now is as follows:

President, Houck McHenry, Jefferson City.

Vice-presidents, A. M. Benedict, Richards; S. D. Thompson, Cameron; C. A. Pratt, Flat River; H. H. Hallman, Warrenton.

Treasurer, A. B. Clarke, Kansas City.

Membership secretary, G. W. Schweer, Windsor.

Secretary, W. W. Johnson, Jefferson City.

Executive committee—H. C. Todd, Maryville; J. A. Hudson, Columbia; C. M. Boutin, Cape Girardeau; C. J. Myers, Kansas City; S. T. Neill, Clinton; M. L. Golliday, Holden; R. A. Guthrie, Macon; G. V. Ross, Kansas City; W. H. Bassett, St. Louis.

Lynn Section Meeting.

On November 17, H. H. Barnes, Jr., of the General Electric Company, New York, spoke on "How New York Gets Its Electric Light and Power," before the Lynn Section of the American Institute of Electrical Engineers. Some 300 were in attendance at the lecture, which was illustrated by lantern slides. One view showed a 30,000-kilowatt turbine. Mention was made of the vast quantity of coal needed, as there are no water powers near New York City. The New York Edison has on hand a supply of 160,000 tons of coal at all times, and the combined stations use about 600,000 tons per year.

The large storage-battery equipment for use in emergencies was referred to and several million dollars have been invested in this. These batteries would take care of the maximum load for a period of seven or eight minutes, if needed, without any aid from the other generating units.

On December 1, J. W. Powell, of the Fore River Ship Building Company, will speak before the section.

Electrical Exports for September.

The following facts regarding the September electrical exports of the United States are obtained from the monthly summary of the foreign commerce of the country just issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C.

During last September the total value of the electrical shipments exceeded that of every month since October, 1913. For the four electrical classes for which the number of articles exported is given in the government reports, there were exported in September the following: electric fans, 2,364; arc lamps, 32; carbon-filament lamps, 59,515; metal-filament lamps, 791,407. The latter is believed to be the largest number of these lamps ever exported from the United States in any one month.

The following table gives the detailed figures for September and for the corresponding month a year ago:

Articles	Sept. 1915	Sept. 1914
Batteries	$ 123,377	$ 38,425
Dynamos or generators	109,990	119,756
Fans	33,193	18,029
Insulated wire and cables	318,478	91,375
Interior wiring supplies, etc. (including fixtures)	57,871	34,156
Lamps—		
Arc	397	1,465
Carbon-filament	7,041	9,960
Metal-filament	118,464	30,988
Meters and other measuring instruments	51,044	14,375
Motors	417,375	315,115
Telegraph instruments (including wireless apparatus)	5,681	3,791
Telephones	37,180	158,922
Transformers	76,433	26,871
All other	906,767	685,240
Total	$2,263,291	$1,548,468

The total value of all electrical exports for the first nine months of 1915 was $17,240,731, compared with $15,203,037 for the corresponding period of 1914, and $21,203,489 in 1913.

National Electric Light Convention to Be Held in Chicago.

Announcement has been made by E. W. Lloyd, president of the National Electric Light Association, that the next annual convention will be held in Chicago, early in June.

The Faraday Society.

At the annual general meeting of the Faraday Society, held on October 19, the following officers were elected to serve for the year 1915-16:

President: Sir Robert Hadfield.

Vice-presidents: K. Birkeland, Bertram Blount, W. R. Bousfield, F. G. Donnan, Eugene Haanel, A. K. Huntington, T. Martin Lowry.

Treasurer: F. Mollwo Perkin.

Council: W. R. Cooper, C. H. Desch, J. A. Harker, Emil Hatschek, Cosmo Johns, Alfred W. Porter, E. H. Rayner, A. Gordon Salamon, George Senter, M. E. Stassano.

The following papers were taken as read:

"The Transference of Electricity by Colloidal Particles," by F. Powis.

An attempt is made to calculate the charge carried by the particles of a colloidal solution produced by sparking, (1) from a modification of Stokes' formula, (2) from the increase in conductivity on making the solution. Although the data available for the calculations are not very satisfactory, the second method gives a value much greater than the first. The author believes this is because the particles are not like the ions of an electrolyte solution, but that anions and cations are absorbed on their surface in such a way that the concentration of each gradually decreases with increasing distance from the particle, until each finally becomes equal to that in the bulk of the surrounding medium. The ions are so arranged, however, that with a negative colloid the layers nearer the particle contain an excess of anions, and those further away an excess of cations, while with a positive colloid this is reversed.

"Electrolysis of (A) Nitric Acid, (B) Sulphuric Acid, (C) Orthophosphoric Acid, Using a Gold Anode," by F. H. Jeffery.

"Electrolysis of Concentrated Hydrochloric Acid Using a Copper Anode," by F. H. Jeffery.

"The Thermal Decomposition of Hydrogen Peroxide in Aqueous Solution," by William Clayton.

Electric Club Nominates Officers.

At the meeting of the Electric Club Jovian League of Chicago on November 18, P. R. Boole, chairman of the Nominating Committee, presented a report nominating the following ticket:

President, V. H. Tousley.
Vice-president, H. A. Mott.
Vice-president, J. C. Manley.
Secretary, L. C. Spake.
Treasurer, H. Ehrlich.
Trustees: A. J. McGivern, J. N. Pierce and R. I. Phillips.

Rejuvenation in Kansas City.

The Jovians in Kansas City, Mo., will hold a rejuvenation on the evening of December 4 at the Coates Hotel.

Digitized by Google

Industrial Power Series—Article No. 145

ELECTRICITY IN MARBLE QUARRYING.

This article describes the installation in the marble quarries and finishing plants of the Vermont Marble Company. There are at present in service a total of 570 motors with an aggregate rating of approximately 14,000 horsepower. A portion of the energy used is purchased from a transmission company.

The use of electric drive in modern industry is coming to be well-nigh universal. On account of the scattered nature of marble mining operations, and the heavy and more or less crude tasks involved in manufacturing and finishing, it might seem as if the use of a more rudimentary form of power application would be more appropriate to the work. The plants of the Vermont Marble Company, are, however, entirely electrified, and the quarrying is also done with the exclusive use of motored machines.

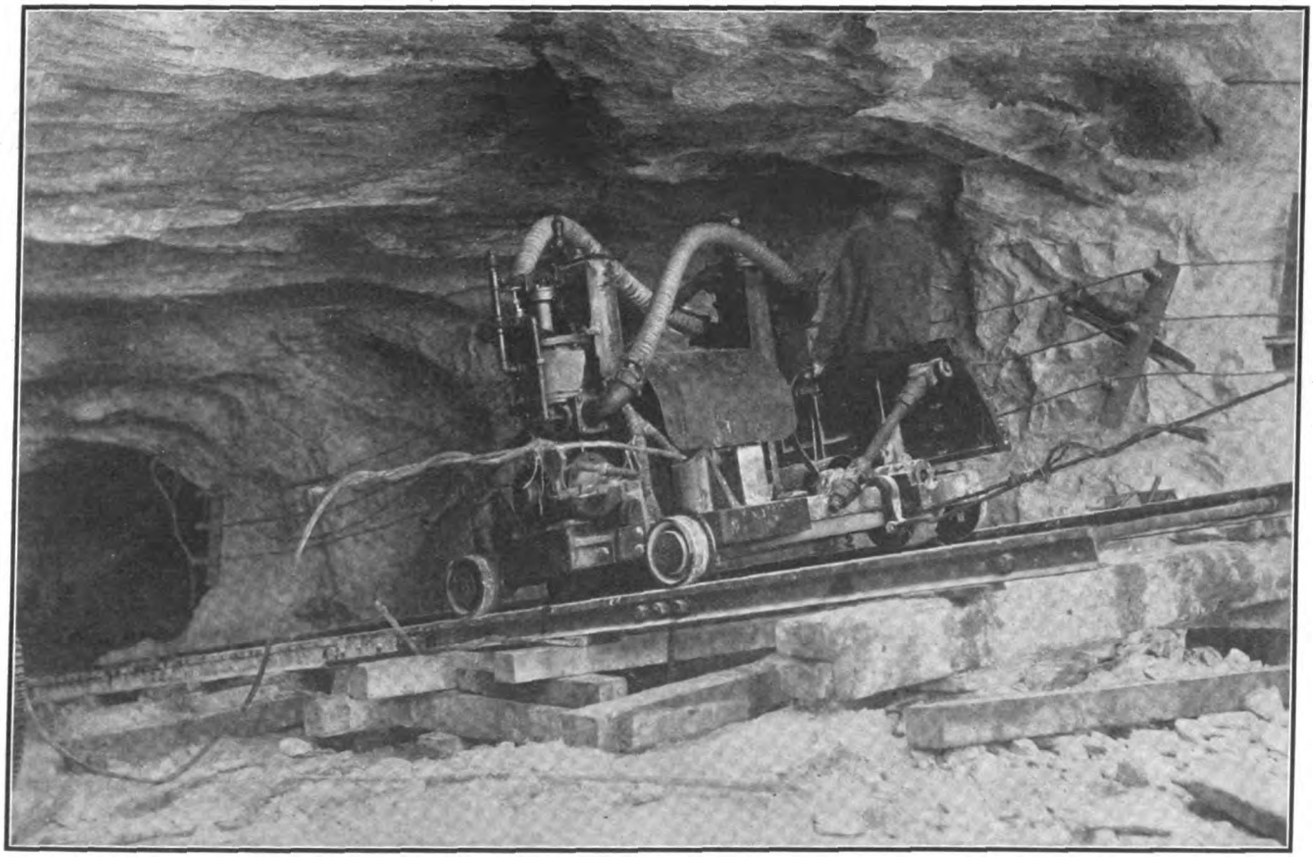
This company is said to be the largest producer, and its product the finest, in the world. Vermont marble ranges from the purest white, rivalling the Grecian, to variegated stone of high value for interior decorative purposes. The Vermont Marble Company's output is about a million cubic yards a year, it being shipped over almost the entire globe, in polished, sculptured and natural forms.

A birdseye view of the plant is necessary to a proper appreciation of the extent of the industry. On the western side of the Green Mountain State, extending for about 50 miles, are many outcroppings of marble, and other deposits are hidden under the earth, in the river valleys. The Vermont Marble Company owns 26,500 acres of the finest marble bearing lands, which are an adequate source of supply for many years to come.

Generally, the quarries and plants are near the valley of Otter Creek, a swift stream, which flows northward through western Vermont and empties into Lake Champlain. The remarkably large fall has been taken advantage of as a producer of power, and four hydroelectric plants have been built to generate electrical energy which is sent over a network of transmission lines more than 100 miles in extent, besides secondary feeder lines, which serve the various quarries and mills.

By this means, quarries, shops, finishing mills and transportation agencies are provided with a flexible source of power, capable of handling the motor installation of about 14,000 horsepower, scattered through 75 quarries, and a dozen shops and mills having floor space of 27 acres. The operation of some of the largest motored machines is very intermittent. Hoists, which lift the stone from the deep quarries to ground level have short, but strenuous duty. This is adequately cared for, however, by the running of partly loaded synchronous motors which supply a compensating leading current and maintain a power factor of 80 to 85 per cent.

There are in all 570 motors, mostly operating on 440 volts, 3-phase energy.



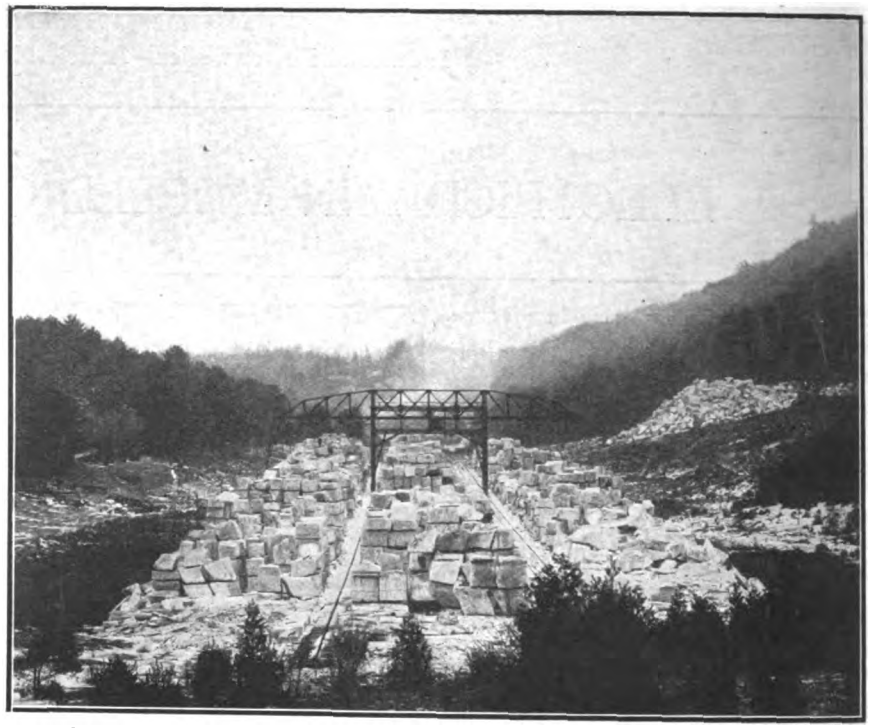
Channeler at Work at Wall of Quarry—Vermont Marble Company.

Digitized by Google

These run saws and finishing machines in groups, and are of varying capacities up to 250 horsepower. Drilling, hoisting and locomotive work is performed mainly by direct-current motors operated from motor generators located in various stations, and in certain instances 2,300-volt induction motors are operated, notably in connection with the shaft drive of an entire mill. For example, a 150-horsepower, 2,300-volt alternating-current motor is a chief power equipment of the Belden mill, and a 200-horsepower induction motor drives the Ripley mill and a 100-horsepower motor of the same type is installed at Brandon.

For quarry use 220-volt windings operate pumps, hoists, channelers and pulsators for air drills. Roughly, most of the monumental work is done at the largest mill, at Proctor, the bulk of the finishing for interior display is done at Center Rutland and switchboard and monumental work are both carried on at Florence. Danby has one of the busiest quarries of the system. Here the outcroppings of marble are on a mountain side and a railway about a mile long, with balanced cars, brings the marble blocks to the base of the mountain from the quarry above. The line has a drop of 1,200 feet, the maximum grade being about 45 per cent. Each of the cars has a capacity of 50 tons, and they are run by a cable and drum operated by a 75-horsepower motor on 220-volts pressure.

At West Rutland is a quarry 300 feet deep, with tunnels extending laterally 2,200 feet. A Baldwin electric locomotive is used to haul the blocks, weighing about 15 tons each, from the end of the mine to the foot of a hoist by which they are elevated to the surface. The locomotive is operated on 220 volts direct current supplied to a feed wire erected on posts about 18 inches high, on one side of the track. Hoists are operated either with direct current or phase-wound rotor 440 and 220 volts alternating current, the latter the more general type. All hoists and derrick motors are provided with variable speed control.



Gantry Crane at West Rutland Storage Yard—Equipped with Five Motors.

Lines are carried from pole lines at the brink of the quarries to crossarms attached to the walls of the quarry by lag screws, as shown in an accompanying illustration. Triple-braid weatherproof wires are used in quarry work, and where cables are required they are rubber covered.

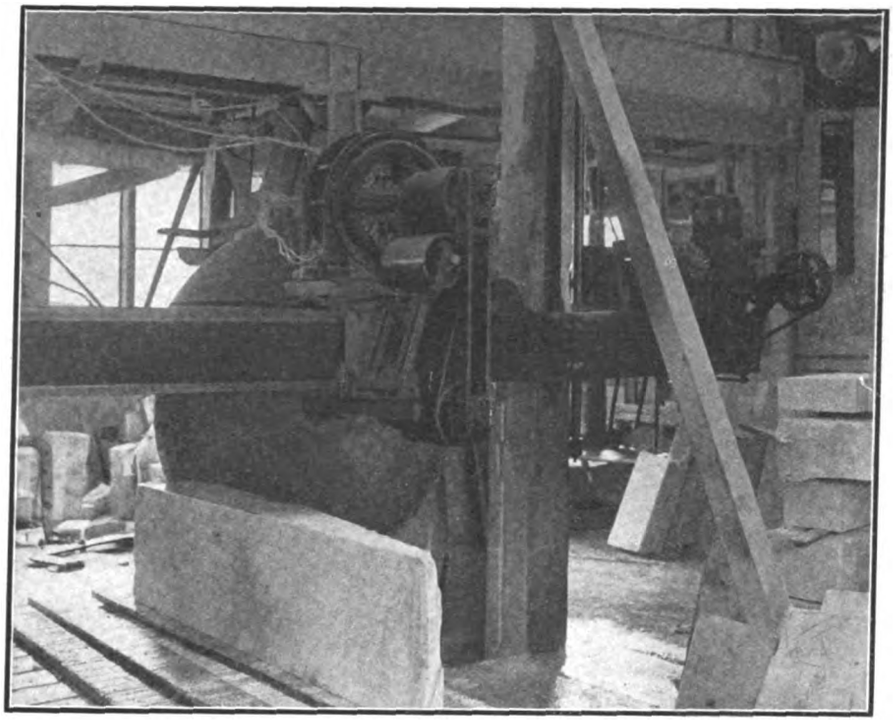
Electric lighting by 250-watt Mazda lamps is provided where natural light is insufficient. These units are mounted on weatherproof sockets, and some units have been connected across 220-volt power circuits with fairly good result, and two lamps in series have also been tried on power circuits. The minimizing of power lines in quarries and tunnels is of course an advantage to be desired.

The process of mining marble is first to operate a channeler, which is mounted on a car running on a temporary track along the quarry floor. The machine is provided, in most cases, with a single chisel gang which is given a positive reciprocating motion by means of compressed air supplied by a motor-driven compressor equipped with a 12-horsepower induction motor mounted on the car carrying the compressor and other equipment, and operating at 720 revolutions per minute on 220 volts. A new type of chisel gang can channel both on level surfaces and on slopes, and in this way is a great advance over the earlier type of double-lever machine which could operate only on level surfaces. The strata of marble in general lie in a nearly horizontal position, but sometimes are at an angle. Of the double-lever channelers there are now about 25 in operation, each driven by a 12-horsepower railway-type direct-current motor installed about 20 years ago and still giving unimpaired efficiency.

The channeler, as the name implies, moves forward constantly, cutting a deep groove in the stone. Afterward cross channels are cut, about four

Channeling Machine and Pump Driven by 12-Horsepower Motor.

Digitized by Google



Diamond-Disk Circular Saw for Cutting Marble.

feet deep, and the base of the blocks is drilled and wedged and the block thus broken off, at its natural cleavage in most cases. After the first, or key block has been removed, the remaining squares of marble can be taken out whole with little mechanical difficulty. Blasting has no place in modern marble quarrying.

The drills used operate under air pressure, each from a motor-driven air compressor geared to a two-speed 5.5-horsepower induction motor, both drill and compressor being mounted on low wheels and readily moved along the quarry floor. There are about 220 quarry machines of the various types in use at the Vermont Marble Company's quarries.

Derrick hoists equipped with hoisting motors of 25 to 165 horsepower are used in elevating the blocks, with a 5 or 6-horsepower motor connected to swing the derrick. There are about 80 of these units in operation.

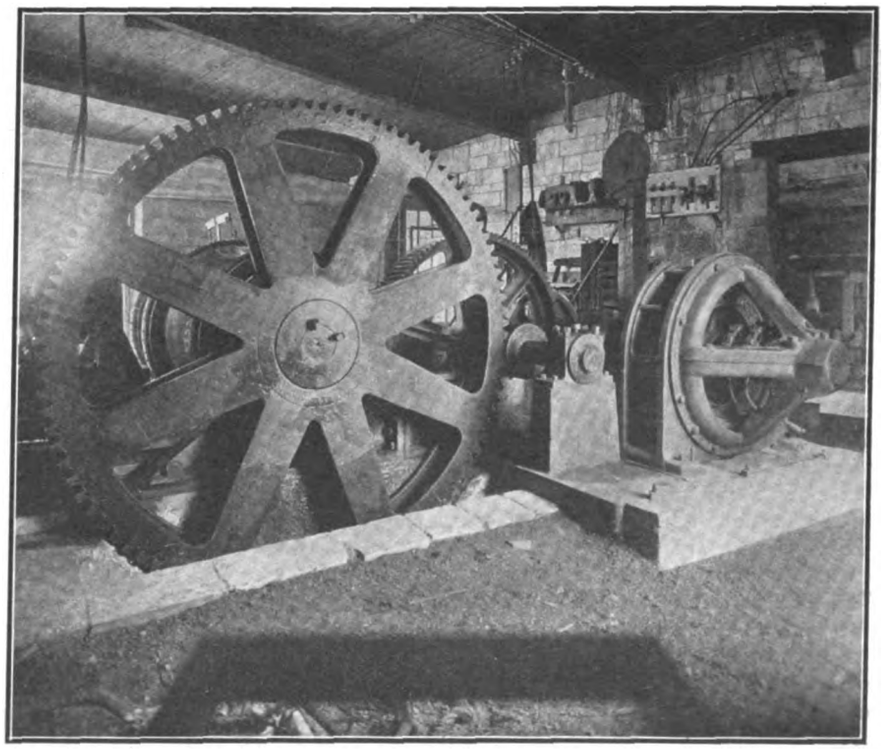
When brought to the surface, the marble blocks are deposited on flat cars and hauled to the mills or placed in storage yards by electrically-operated cranes. About one year's output of marble is generally kept in reserve in the yards.

One storage crane of the Gantry type which serves the block pile at West Rutland is equipped with five motors, one of 35 horsepower for the bridge, two hoist motors of 30 horsepower each, and two 7.5-horsepower motors for the trolleys. The crane has a bridge span of 160 feet and a capacity of 50 tons.

The mills at which sawing of marble is done are equipped with gang saws, consisting of toothless iron blades, 4 inches wide and one-eighth inch thick. These are suspended on a swinging frame which is actuated by belting connected to counter shafts overhead. From 12 to 40 saws operate in a group from a single shaft driven by a motor of 75 to 250 horsepower. An average of 100 horsepower for 14 gangs, is required, which includes the necessary power to operate sand pumps, which deliver sand and water to the cuts as the saws wear their way through the block. Some idea of the hardness of the stone may be gained from the fact that it requires anywhere from three to ten days of 24 hours' continuous sawing to slice an average block into slabs. The time depends on the number of blades in the gang, the hardness and the size of the block. Some blocks contain quartz or other material which renders them almost impervious to the action of the saws, and hence have to be abandoned.

There are 436 gang saws in all the company's plants, and they are operated night and day. Owing to the simplicity of the mechanism the saws require little attention, they having to be watched from time to time to note the progress of the cutting and to see that bearings, etc., are lubricated. The connected load in motors running saws is about 2,500 horsepower, the usual motor being of the constant-speed squirrel-cage type.

A noteworthy feature of the cutting processes is a diamond disk circular saw about five feet in diameter. There are 50 teeth set in the rim, each provided with two or more diamonds, which are imperfect stones that have been rejected for other purposes. They represent in all a cost of about $400. The saw operates at 400 revolutions per minute, is driven by a 25-horsepower motor and a three-horsepower motor on the feed, and is used chiefly to split small blocks and slabs that require prompt handling. A block, say 5 feet long and 12 inches square, can be given one lengthwise cut in about 15 minutes, whereas with the cross-cut saw perhaps a whole day would be consumed. Teeth are re-set after



Derrick Hoist Operated by 165-Horsepower Motor.

Digitized by Google

worn smooth, the diamonds being changed so as to present a fresh corner, or else renewed. A view of this machine is shown in one of the accompanying illustrations.

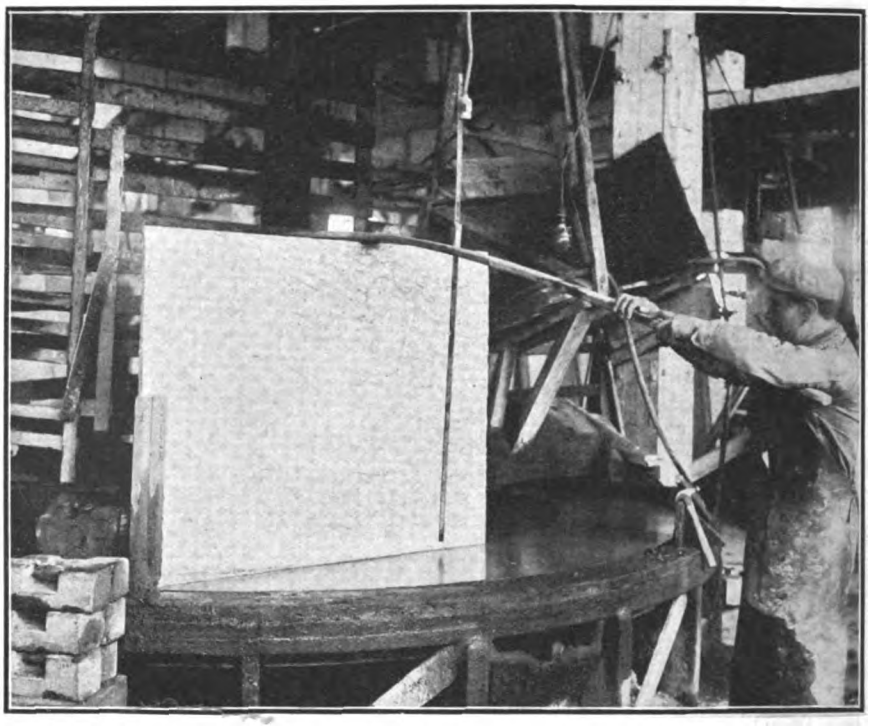
In the cutting processes a great amount of sand is required. This is brought to the Proctor plant from a deposit of sharp quartz sand suited to the purpose, about 2.25 miles distant, and is transported thence across a valley and over a hill by means of a suspended cable way. Buckets holding 500 pounds are hauled to the mill at the rate of one every 50 seconds. During a day of 24 hours' operation 1,728 buckets full enter the mill. The cars are propelled by means of a motored drum located in the upper story of the mill, near where the buckets are emptied.

The finishing shops are equipped with 65 rubbing beds operated in groups of 5 or 6 machines, from counter shafts by 50-horsepower motors, though some of the latest installations are individually motored. Lathes for turning columns as long as 32 feet are equipped with motors of about 10 horsepower each, or for two lathes, a relatively small amount of power being required, owing to the slow speed at which the columns are turned. Carborundum beds, used to cut grooves in pieces of marble, with slow reciprocal travel like that of a planer, are driven individually by motors of about 20 horsepower.

There are also a large number of pneumatic hand tools used in the shops, air being supplied at about 50 pounds pressure by motored compressors.

A new adaptation of electric drive will be the motor equipment of a lime hydrating and burning plant now under construction at West Rutland. Waste marble will be crushed and rolled, and converted into lime. About 23 motors, some of large capacity, will be installed to perform the various duties that require power, such as crushing, grinding, hoisting, conveying, etc.

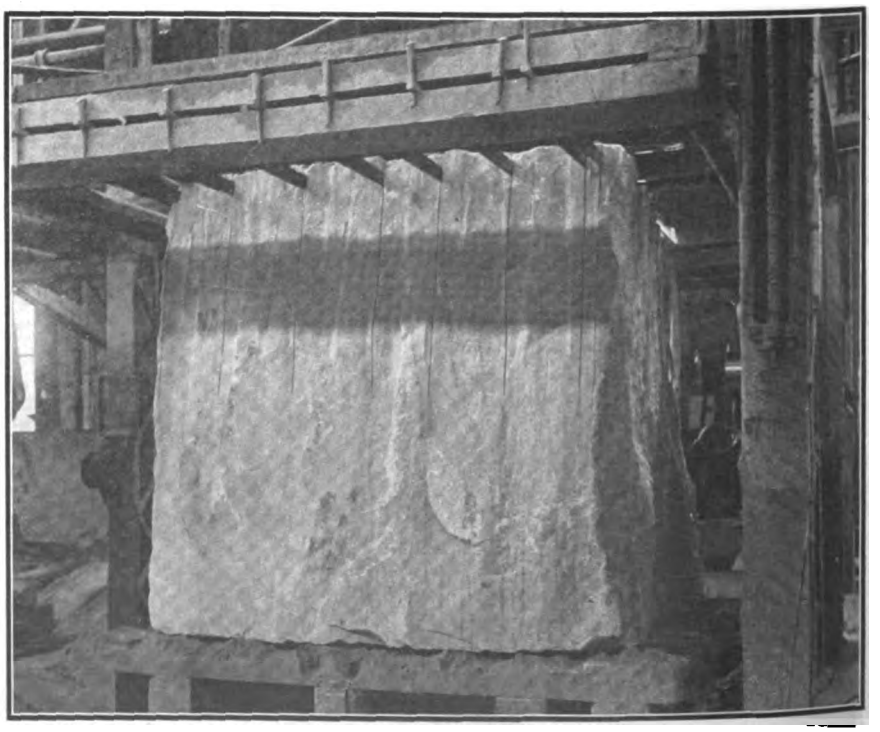
The principal generating station from which the Vermont Marble Company obtains its electrical energy is at Proctor, near the large monumental works, and here a 120-foot head is utilized. In the early days mechanical drive was availed of, but now the plant, as well as three newer stations on the same stream, Otter Creek, are utilized as hydroelectric stations. In the Proctor station are installed three 750-kilowatt, 480-volt, 514 revolutions per minute vertical-shaft generators direct-connected to I. P. Morris water wheels of 1,200 horsepower each. There are three 500-kilowatt 480/11,000-volt single-phase transformers for supplying



Motor-Driven Rubbing Bed.

the 11,000-volt inter-plant line, one 1,250-kilowatt, 11,000/13,200-volt three-phase transformer for stepup for supplying the connecting line to Mendow station of the Rutland Railway, Light & Power Company, and a 150-kilowatt motor-generator set for supplying direct-current energy to hoists, elevators and cranes in the Proctor plant.

Other generating stations are: a 1,500-kilowatt hydroelectric station at Huntington Falls, where a 40-foot head is utilized; a station of the same capacity at Beldens, operating under the same head, and a 275-kilowatt station at Center Rutland, under a 30-foot head. The Huntington and Beldens stations generate 2,300-volt energy, and the Center Rutland station 460-volt energy. By means of a 44,000-volt tranmission line 60 miles in length the various plants are tied in together, and also connected with two small auxiliary steam stations used merely for standby service. An 11,000-volt line ramifies to substations at the various quarries and manufacturing plants, where are located transformers for stepdown to voltages suitable to the local conditions of motor service.



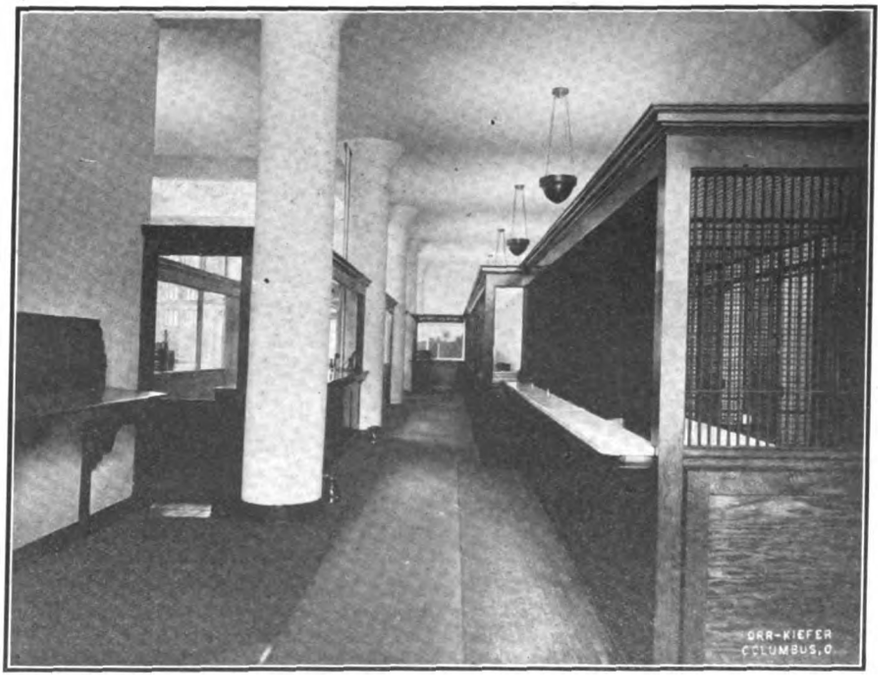
Motor-Driven Gang Saw.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Offices that Invite Public Confidence.

The accompanying illustration shows a section of the new-business department offices of the Columbus Railway, Light & Power Company, Columbus, O. The significant point in the construction of these offices is that all partitions are of clear glass, thus enabling a visitor to see at a glance whether an employee they wish to see is engaged or not. Further, it is not necessary to send a card or name to anyone. The visitor is always permitted to walk unannounced into any of the offices.



Section of Offices of Columbus Company Where Clear-Glass Partitions Are Used.

W. A. Wolls, manager of the commercial department of the company takes particular pride in the arrangement of offices and believes that it is an important step in dispelling criticism to the effect that a utility business is mysterious and that utility officials are difficult to interview.

Heating-Pad Campaign at Augusta.

"A real comforter" is what the Central Maine Power Company, Augusta, Me., terms the electric heating pad, in advertisements in local newspapers. Pain can be eliminated by the application of heat, it says, and the most convenient and reliable source, day or night, is the electric pad.

Ohio New-Business Men Hold Profitable Convention.

About 50 representatives of central stations from Ohio and vicinity were in attendance at the convention of the Committee on New Business Co-operation of the Ohio Electric Light Association which was held in the Club Rooms of the Middletown Gas & Electric Company, Middletown, O., on Wednesday, November 17.

Chairman J. E. North, commercial manager of the Springfield Light, Heat & Power Company, Springfield, Ohio, opened the meeting and introduced L. C. Anderson, a member of the Executive Committee of the Ohio Electric Light Association, and the general manager of the Middletown Gas & Electric Company, who extended a very hearty welcome to the delegates to Middletown, and expressed the wish that they would all benefit by the papers that would be presented. Mr. Anderson expressed the belief that at this time the United States was enjoying a period of prosperity and that in his mind the electrical industry was possibly benefiting, or going to benefit the most.

The first paper was by W. A. Wadsworth, assistant commercial manager of the Union Gas & Electric Company, Cincinnati, entitled "Electrical Advertising."

In the discussion that followed the presenting of the paper, Mr. Wadsworth stated that the practice in Cincinnati of installing large type "C" Mazda lamps in front of stores was being discontinued and that efforts were now being made to secure an electric sign or exterior decorative lighting. F. C. Morrison of the Ohio Light & Power Company, Newark, stated that the use of large type "C" lamps on the exterior of the stores in Newark had not affected the window-lighting business. Mr. Wadsworth also stated that in Cincinnati at the present time, an active campaign was in progress to secure window lighting and that trial installations were being made.

Following the discussion on this paper, Chairman North asked what arrangements had been made by the different cities represented in connection with Electrical Prosperity Week, and Mr. Wadsworth told the plans for Cincinnati; Mr. North regarding Springfield; A. L. Young, manager of the Toledo Railways & Light Company, about Toledo, and Thomas F. Kelly, commercial manager of the Dayton Power & Light Company, regarding Dayton.

The next paper presented was by H. J. Kunz, of the Toledo Railways & Light Company, entitled "Power Sales Problems."

In the discussion following this paper, Mr. Wadsworth outlined the importance of not over-estimating a proposition to a prospective power customer. He also stated that he believed that the greater portion of the sales effort should be made on the person who would have the signing of the contract, rather than on the engineers and firemen. He also claimed to be a believer in employing power salesmen instead of power engineers, and was a great advocate of the trial period for securing power business.

F. B. Steele, commercial engineer of the Dayton Power & Light Company, said he was heartily in favor of trial periods of from 30, 60 to 90 days. Mr. Steele stated that he believed in studying the conditions in the plant of a power prospect, because such data, when presented to the prospective customer, secured his attention and aroused interest. Mr. Kunz stated

Digitized by Google

that he believed that a power salesman would necessarily have to have practically the same qualifications as a power engineer.

The convention adjourned at the noon hour. Luncheon was held at the United States Hotel, and the afternoon session started at 2 o'clock, when a paper was presented by F. S. Dellenbaugh, Jr., Westinghouse Electric & Manufacturing Company, entitled "Increasing Small Motor Loads on Central-Station Circuits."

Mr. North in opening the discussion brought out the fact that most central stations were not in the merchandise business and therefore he questioned whether the sales expense would warrant much time being spent in endeavoring to sell small electric motors.

Mr. Lafferty, of the Robbins & Myers Company, Springfield, said the sale of small motors should be made through the combined co-operation of the manufacturer of the apparatus using the small motor, the small motor manufacturer and the central station.

Mr. Dellenbaugh, Jr., in the discussion stated that he estimated 250,000 pieces of apparatus operated by small electric motors had been sold in 1915 by 263 manufacturers of motor-driven apparatus.

Mr. Steele of Dayton told of an interesting installation of six 0.25-horsepower, three-phase motors that were being installed in Dayton by the C., H. & D. Railroad Company, for lowering and raising gates at grade crossings.

Following the discussion on this paper, the delegates were conveyed in automobiles to the plant of the American Rolling Mills Company, where by arrangement of Mr. Anderson, and through the courtesy of the officers of the mills, the delegates were shown through the entire plant.

Mr. North, when adjourning the meeting, announced that the next convention of this committee would be held at Akron, Ohio, on Wednesday, January 19, and promised a very interesting and educating program on this occasion.

Electric Motor Prevents Water Famine in Brownwood.

On Thursday, November 4, trouble was experienced at the Brownwood (Tex.) city pumping plant with one of the cylinders on a producer gas engine. The plant was in bad shape and only recently the city had ordered new equipment, it having been decided to change from producer gas and steam to electric power. Soon after the trouble started the cylinder cracked so badly as to make the engine inoperative and the city faced a water famine.

Within a few hours after the accident an emergency installation of a motor which happened to be in Brownwood was made. Fearing, however, that trouble would be experienced on account of the heavy overload which it was necessary that this motor carry, Manager Murphy, of the Texas Power & Light Company, got in touch with the Dallas office of the company in hopes of getting a larger motor. By evening a 100-horsepower motor and pulley had been located and a crew was set to work getting same ready to put abroad a passenger train the next morning.

The motor weighing nearly 5,000 pounds left Ferris, Texas, the next day by express and so urgent was the case that it was necessary to hold up two passenger trains a total of 45 minutes. The Texas & Pacific passenger train was held in Dallas 25 minutes to enable the motor to be transferred and again in Forth Worth the Frisco passenger was held 20 minutes for transfer at that point.

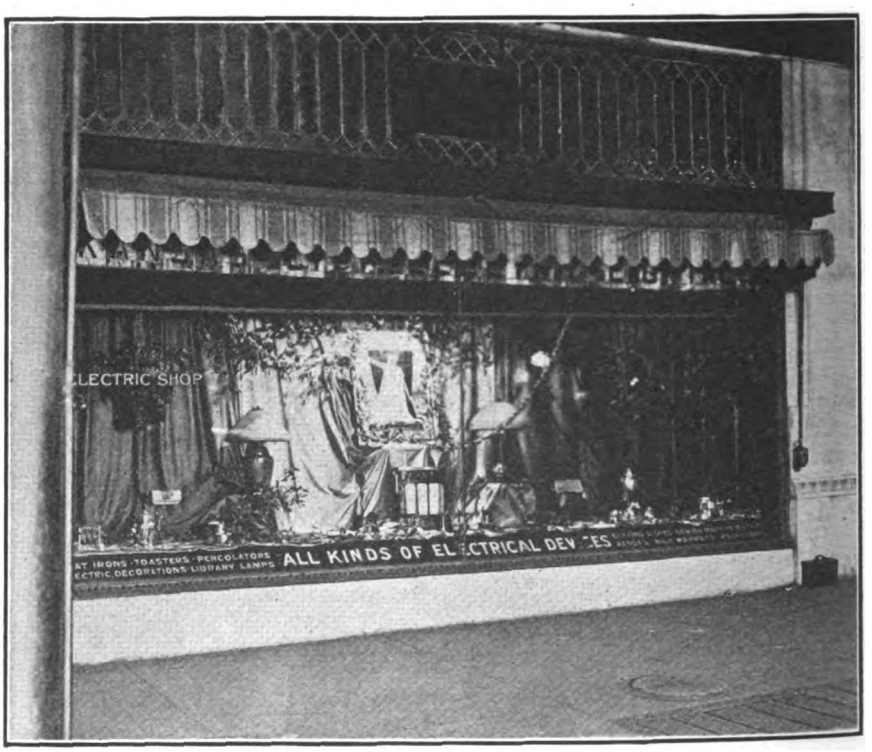
The big machine arrived safely in Brownwood without delay and was met at the station by a crew of men who took it to the water works and installed it. It was started Saturday afternoon at four o'clock and ran continuously until six o'clock Sunday night, raising the supply of water in the reservoir some four feet.

An electric cable has been laid for industrial power-transmission purposes between Helsingborg, in Sweden, and the opposite coast of Denmark. It is capable of transmitting energy at 40,000 volts.

Window Displays to Boost Electricity.

Kansas City will exploit electricity in some way in every downtown and suburban display window. This prospect is assured by the promise of co-operation with the window-display program, by the Merchants' Association of Kansas City. F. B. Uhrig, chairman of the committee of the Jovian Electric Club of Kansas City, took the matter up with the Merchants' Association, and received assurances that all the members of that association would make special displays.

The windows of electrical contractors, dealers in electrical goods, and merchants who handle any electrical devices, will have a uniform system of display. The sample window upon which the others will be modeled was prepared November 19 by the Kansas City Electric Light Company. A view of this window is shown in the accompanying illustration.



Model Window Display of Kansas City Electric Light Company.

Municipal Plant Inadequate to Supply Power Needs of Merrimac.

The inadequacy of isolated generating plants, built for small town lighting purposes, to meet the power situation where large blocks of electric power are in demand, is shown in the case of the municipal plant at Merrimac, Mass., where a large foundry company which has important orders to fill, says that it must move to a new location unless it can secure a sufficient supply of electric power. The solution of the difficulty seems to be to resort to purchased energy, from

Digitized by Google

the Amesbury Electric Light Company, and a committee, consisting of the selectmen and electric light commissioner of Merrimac, is considering the matter.

Here is a situation where syndicate plants having physical connection and inter-relations have a marked advantage. Many of the larger industrial centers of New England are thus provided, notably in Maine, where three large companies, all utilizing water power generation, serve a myriad factories once using hydraulic or steam power. Other similarly situated industries are those on the Connecticut River, in Vermont and Massachusetts, which draw on the recently developed power resources of the Deerfield and Connecticut Rivers for their electricity.

The difficulty of a small steam plant to stand alone is accentuated by such sudden demands for service as the foundry company referred to has made.

Janesville Company Participates in Trade Celebration.

The accompanying illustrations show two views of the booth of the Janesville (Wis.) Electric Company at the recent celebration of "Made in Janesville" week.

The company equipped an electric kitchen and had a lady demonstrate the merits of the electric stove and percolator by serving cup cakes and coffee. An electric laundry was also equipped.

There was an exceptionally fine line of reading lamps and cooking utensils. The color scheme was black and white which materially aided the lighting effects and the display of the cooking devices.

Vacuum cleaners, sewing machine motors, fireless cookers with automatic electric heating devices, electric fixtures and boudoir lamps were among the many articles on display.

Comfortable chairs served to entice those interested in electrical goods to spend more time at the booth.

The company expects to reap many sales as a direct result of this exhibit. The new-business department is under the management of H. R. Wagenknecht.

Spectacular Gas and Electric Sign in Louisville Attracts Attention.

The combined gas and electric sign of the Louisville Gas & Electric Company, which is shown in the accompanying illustration, is attracting considerable attention in Louisville. This is declared by the sign experts to be the first combined use of gas and electricity in a sign of this character. It is the idea of Robert Montgomery, manager of the commercial department

Combined Gas and Electric Sign of Louisville Company.

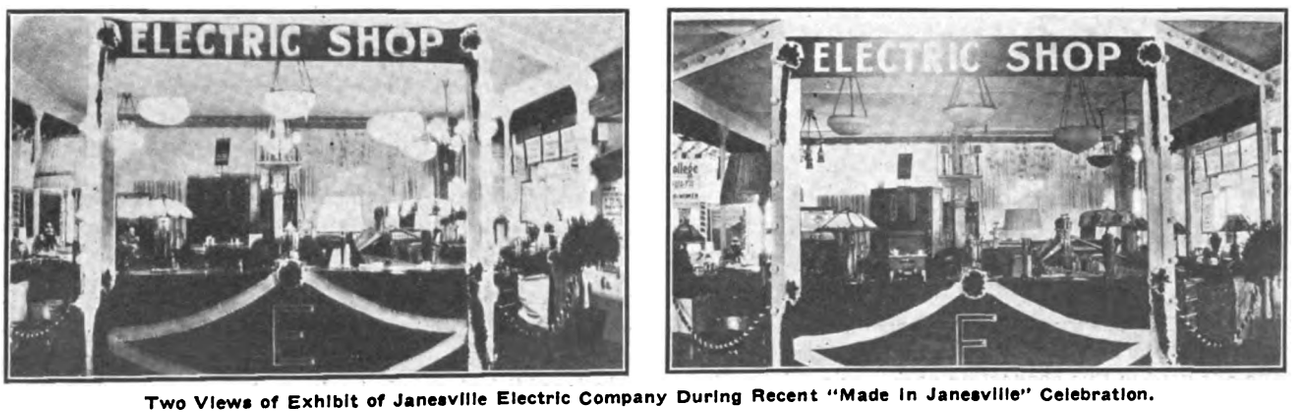
of the Louisville company, and was built according to Mr. Montgomery's plans. From the outset it attracted a great deal of attention and is one sign in which Louisville people, when they get down town, never fail to look for and to read.

The electrical part of the sign is not unusual in its general aspects. But combined with the gas torch it is novel and striking and should certainly, if there is efficacy in advertising, get results. From the night view a general idea of the sign can be determined. It is erected on the top of the general offices of the Louisville Gas & Electric Company, on Chestnut Street. In dimensions the sign is about 35 feet in height from the bottom line to the top of the torch and 25 feet in width at its widest point. The gas torch, with a flare at the top, is outlined with small lamps and painted red to mark it from the remainder of the framework. The flambeau shows first, on still nights rising to a height of 20 feet. It is followed by the first section, "Use Gas for Heat" and that by "Electricity for Light and Power." The whole repeats and is followed by twinkling of the stars which show as small lights.

The gas flame at the top is fed by a 1.5-inch supply pipe, the flow of gas being regulated by a butterfly valve, which is controlled by a lever arm attached to a flasher, especially made for this job. The butterfly valve is so connected to an induction coil that as it opens, the current is set up and a spark created which ignites the gas. The letters are all 16-inch porcelain-enameled letters, with the exception of those in the word "Electricity" which are 24-inch, also porcelain enameled. There are 437 10-watt, 110-volt Mazda lamps used, and the whole is in operation for an average of six hours a night, from dusk to midnight.

The idea in using gas in this manner is to create the impression that there is plenty of it—which with a natural gas supply and more or less popular uncertainty as to how long the supply will hold out, is considered an important item. Several actual instances are on record of comments on the sign which put the emphasis on the statement that there must be a lot of gas available or the company could not afford to burn it that way.

As a matter of fact only a small amount of gas is used, the consumption averaging approximately 2,000 feet a day. At the prevailing retail rate of 35 cents, after a given quantity has been consumed, this means that the cost for the gas is 65 or 70 cents a day. Before the spark-ignition system was installed, a pilot flame was kept burning to light the gas, and during that period a consumption at the rate of 8,000 cubic feet was the rule. The spark, igniting the gas, released at a pressure of five ounces to the inch,



Two Views of Exhibit of Janesville Electric Company During Recent "Made in Janesville" Celebration.

Digitized by Google

obviates the big consumption, and, according to Mr. Montgomery, the gas used costs considerably less than the electric current.

Another interesting feature of this sign from the viewpoint of the electric salesman, is the fact that the more or less customary "lightning flashes" are conspicuously absent from the sign. That is one of Mr. Montgomery's cardinal electricity advertising principles. There is still too much tendency on the part of the general public to confuse electric current and lightning, he feels, and, although a simulated lightning flash may be graphic, it gives a wrong impression to lots of people, who do not appreciate the degree of safety with which electricity is handled. That is the explanation for the stars instead of electric flashes.

Denver Company Conducts Strenuous Prosperity Week Campaign.

The main celebration of Electrical Prosperity Week in Denver, Colo., will begin Monday, November 29. For six weeks an advertising campaign to acquaint the people of the state and of the city of Denver with the nation-wide electrical movement has been conducted by John M. Connelly, publicity manager for the Denver Gas & Electric Light Company.

Every proposition that would give the people an idea of the monster celebration of electrical prosperity has been utilized. Newspapers, booklets, billboards and Denver magazines have been used to bring the celebration before the attention of the people. An electric show, conducted under the auspices of the Colorado Electric Club, the allied electrical interests of the city, the Denver Gas & Electric Light Company and the various manufacturers, will be a main feature of the week. At this show electricity, its adaptability to manufacturing, its use in the home as a lighting, cooking and a medium of reducing household work will be shown.

On the eve of the opening of the show, it gives promise of being the most successful exhibition of the uses of electricity that has ever been held in Denver. Every foot of floor space in the Auditorium, a building covering a full half square, has been sold and the various manufacturers with branches in Denver will attempt to demonstrate the uses of electricity in a manner that has never before been shown here.

Early in the advertising campaign to give publicity to the use of electricity, the idea was conceived that business men, local manufacturers and housewives must be interested. To this end a unique advertising campaign was instituted. The newspapers were used extensively to attain this end.

The ads used in this connection probably are unique examples of what may be done to interest the manufacturer in the use of electric energy and at the same time gain his good will. It was the aim of those who conceived the idea to give the various manufacturers as much publicity as was given the electric show and "Electrical Prosperity Week."

Certain of the bigger manufacturers of the city were selected and advertisements with the heading "Electrical Prosperity Week," a few words about the show and then a lengthy discourse on the particular business of the manufacturer spoken of and the uses to which electricity had been put in the particular line of manufacturing, were used in all advertisements.

These were placed in newspapers and considerable space was used. This, in the opinion of Denver electrical men, had the advantage of gaining the good will of the manufacturer so advertised and it also pleased the newspapers in which the advertisements were inserted, causing them to give wider publicity to the electric show and "Electrical Prosperity Week."

In order to get away from the thought that the electric show was to be a purely mechanical exhibition of the work performed daily by electric current, the electrical men considered that some feature that would make a general appeal and attract attendance to the Auditorium during the week of the exposition was considered.

As a result the suggestion was made that an electrical queen be selected. For several weeks before the queen, who was called "Electra," was chosen extensive publicity notice was given by all the Denver newspapers. The queen, whose name will not be revealed until opening night, was selected several weeks before the opening of the exposition in the club rooms of the Colorado Electric Club.

Nearly 100 young women of the city responded to the appeal for beautiful women to qualify for the honor of being "Electra" queen of "Electrical Prosperity Week." Those who competed in the plan were selected by five of Colorado's best known artists, men and women who also have national reputations. The winner of the competition was given a prize of $25 by the electrical men.

Photographs of the young woman finally selected as "Electra" were published in all the Denver newspapers. Her facial features were not revealed to the general public, as she wore a mask to cover them. This plan, it was believed, would serve to attract hundreds of persons to the electric show to get a glimpse of the queen of "Electrical Prosperity Week."

Meanwhile, the Denver Gas & Electric Light Company had published a booklet advertising the "Prosperity Week," electrical appliances and the queen of the electric show. The booklet attracted wide attention and served a triple purpose. It advertised every electrical appliance used in the household, gave publicity to the electric show and also the week.

This booklet was mailed to every person considered a prospective buyer of appliances. The plan served to bring the attention of the women of Denver to the use of electric current and electrical appliances. The booklet was published in colors and with attractive illustrations, calculated to catch the eye of every woman in the city.

New York Electric Car Campaign.

Excellent success has been achieved in the special sales campaign in behalf of the Ward Special, a 750-pound-capacity electric delivery wagon. This campaign and the special offer made with it was restricted to Greater New York, nearby New Jersey, Long Island and Westchester County and was to end October 31.

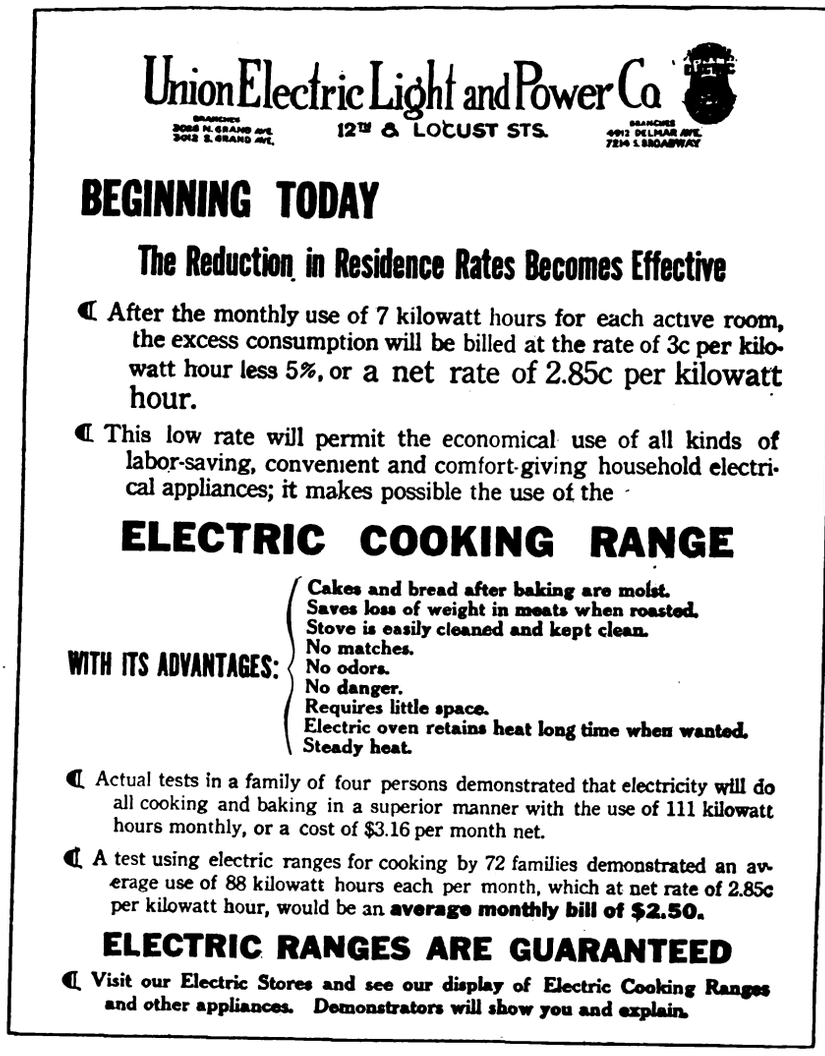
So many inquiries have been received, however, that it was impossible to attend to them within the allotted time. At the unanimous request of all the co-operating companies, the Ward Motor Vehicle Company agreed to extend the period of the special offer to December 4, which is the final day of Electrical Prosperity Week.

There are a number of special features connected with this novel sales campaign. The work is jointly shared by the manufacturer and the electric light and power companies operating in the territory covered. The vehicle in whose interests it is conducted, is the first low-priced electric placed on the market. The price, $875, includes a year's rental of an Edison storage battery. The rental charge for the battery after the first year will be $10.50 a month with an additional charge of 1.75 cents a mile, for monthly mileage in excess of 625. Another feature is the arrangement for time payments.

This campaign is especially directed toward the neighborhood merchant, who uses one, or perhaps two horses, with an occasional need for another. Cost data have been carefully prepared and presented. For instance, it is shown that there are 50 stables on Manhattan Island where one of these Ward Specials can be stored and washed for $10 a month. The cost for current, for more than the distance that a horse delivery wagon makes each day under favorable conditions, would be another $10. Against this is the cost of $28 or $30 a month for stabling and feeding a horse. The cost of tires just about equals the cost of shoeing a horse.

Digitized by Google

The real advantage of the electric vehicle, however, is that it can readily cover about 45 miles a day and the only real cost increase is in current consumed. This fact was proven in the long cross-country run made by one of these Ward Specials last month from New York to Cleveland. With such tangible figures showing marked economy in delivery cost, it is not strange that this campaign succeeded in interesting the small merchants as well as many doing business on a large scale.


Union Electric Light and Power Co
12TH & LOCUST STS.
BEGINNING TODAY
The Reduction in Residence Rates Becomes Effective
After the monthly use of 7 kilowatt hours for each active room, the excess consumption will be billed at the rate of 3c per kilowatt hour less 5%, or a net rate of 2.85c per kilowatt hour.
This low rate will permit the economical use of all kinds of labor-saving, convenient and comfort-giving household electrical appliances; it makes possible the use of the
ELECTRIC COOKING RANGE
WITH ITS ADVANTAGES:
Cakes and bread after baking are moist.
Saves loss of weight in meats when roasted.
Stove is easily cleaned and kept clean.
No matches.
No odors.
No danger.
Requires little space.
Electric oven retains heat long time when wanted.
Steady heat.
Actual tests in a family of four persons demonstrated that electricity will do all cooking and baking in a superior manner with the use of 111 kilowatt hours monthly, or a cost of $3.16 per month net.
A test using electric ranges for cooking by 72 families demonstrated an average use of 88 kilowatt hours each per month, which at net rate of 2.85c per kilowatt hour, would be an average monthly bill of $2.50.
ELECTRIC RANGES ARE GUARANTEED
Visit our Electric Stores and see our display of Electric Cooking Ranges and other appliances. Demonstrators will show you and explain.

Range Advertisement of St. Louis Company Which Brought Results.

An Electric Range Advertisement that Sold 22 Ranges.

Coincident with the reduction of rates of the Union Electric Light & Power Company, of St. Louis, Mo., a campaign was inaugurated to give greater impetus to domestic electric cooking, the net rate for the average customer being but 2.85 cents per kilowatt-hour.

The accompanying advertisement which was published in the St. Louis papers for September 15, was the first step in the company's campaign and the results from this single publicity effort indicate that the electric cooking load will form an important part of the company's business in the future.

Commenting on the results from this advertisement, C. E. Michel, manager of the office sales department, says:

"The results achieved, while not of very large proportions, were satisfactory, when it is considered that this is the first time in our history that we have made any effort to promote the sale of electric ranges. The advertisements resulted in orders for 22 ranges during one week's time, ranges placed on trial and customers agreeing to pay installation charges, providing they decided not to keep the range at the end of the trial period. At least ten of these trials will result in sales, and since the trial period closed we have received orders for about five ranges on straight sales."

Sale of Municipal Plant Proposed.

The town of Hull, Mass., is considering the sale of its municipal electric plant and has received an offer from the Weymouth Light & Power Company for its purchase, at $115,311, with a proposition to furnish street lighting for $9,483, and public building lighting at $816 per year. The Weymouth company would keep the Hull station in reserve as an auxiliary.

The Hull plant consists of three boilers, with total of 500 rated horsepower, four engines totaling 895 horsepower, and four generators with an aggregate capacity of 955 kilowatts. There are about 1,600 poles set, and 826,000 feet of wire. For the year ended June 30, 1914, 629,450 kilowatt-hours were generated, of which 76,382 were sent out for street lights and 346,632 sold to commercial csutomers.

Municipal arcs numbered three units; incandescents, 581; commercial lighting load was 1,585 kilowatts and power load 297.5 kilowatts. The plant is the least successful of the municipal lighting undertakings in the state, in 1914 showing a loss in operation of about $50,000. The town is chiefly summer residential, it being located on the sea coast.

Commercial Engineering Course for Central-Station Employees.

The Commercial Section of the National Electric Light Association, through its Committee on the Education of Salesmen, has instituted an educational course for employees of member companies. The object of the course is to assist those connected with central stations, who either are already associated or contemplate association with the commercial end of the business, to keep pace with the rapid development in the uses of electricity so as to enable them to prepare for advancement. The course as laid out comprises 17 lessons, which are given by correspondence, supplemented by local class meetings, usually of company sections. One lesson is given each month for a period of 17 months. The tuition is $12, payable in advance.

The first six lessons deal with selling, taking up salesmanship; selling campaigns; locating and following up prospects; advertising; merchandising; relations to customers. Then follow two lessons on meters and metering and on rates. The next six lessons deal with the subject of lighting, as follows: Illuminants; comparative costs of different illuminants; the principles of illumination; lighting practice in residences, theaters, stores, factories, streets, etc.; electric signs and display lighting; wiring. The last three lessons deal with power subjects as follows: Motors, steam, gas and oil engines; isolated plants. The chairman of the committee in charge of this work is Fred R. Jenkins, 72 West Adams Street, Chicago, Ill.

Digitized by Google

Electrical Construction

Meeting of Wiring Committee of National Electric Light Association.

The Committee on Wiring of the Commercial Section of the National Electric Light Association, of which R. S. Hale is chairman, held a meeting at the Mohawk Club, Schenectady, N. Y., on November 12, at which 15 members were present. The following business was transacted.

Bare Concentric Wire.—The first business was to inspect the board of fittings for the bare concentric wire, as manufactured by the General Electric Company. Circulars with the prices of the fittings were shown, and Mr. Sargent stated that these would be sent out on request, but that instructions had been given to solicitors not to solicit any business.

The question of having the Underwriters' Laboratories make a report on the fittings was referred to Mr. Sargent and the General Electric Company for such action as they thought wise.

The question of further action by the sub-committee of the Electrical Committee of the National Fire Protection Association was brought up, and the matter was left that Mr. Sargent should report to that committee that the General Electric Company had the fittings ready.

The question of the further promotion of the bare concentric wire was discussed, and it was the idea that the central station should attempt to guide the matter so far as proper so as to keep the work in the hands of only competent workmen.

The question of other manufacturers making the fittings was spoken of, and it was the opinion of the committee that it should be made clear that the General Electric Company had been doing the various development work in response to the request of the committee and that the committee hoped that other manufacturers would do likewise, also that the committee intended to co-operate with any other manufacturer that would come forward, just as it had co-operated with the General Electric Company.

Solid Neutral.—Mr. Sargent reported that through misunderstanding the Sprague Electric Company had prepared a panelboard especially designed for use with bare concentric wire, but had not arranged for using a solid neutral on ordinary installations, and that after this had been cleared up there had not been time to prepare the board showing how the solid neutral would be used with ordinary installations. He said that the company would go, ahead and make up such a board and prepare a bulletin giving the prices, etc., for panels for different numbers of circuits, similar to the ordinary bulletin, so that a wireman could order a panelboard for a solid neutral as easily as he could order the old kind.

The idea was that the members of the committee would then use these bulletins in calling to the attention of the wiremen in their districts the saving that could be made by the use of the solid neutral.

Standardization of Plugs and Receptacles.—The chairman reported on the meeting of the manufacturers October 25, and read a letter from Harvey Hubbell Company. It was then voted as follows: "The committee being strongly in favor of standardization, is glad to note the report of progress in that direction on the part of manufacturers of plugs and receptacles, and hopes that the sentiment already started will bear fruit in the near future."

Safety Code.—The chairman reported at some length on the conference of electrical interests held in New York in regard to the Safety Code that had been prepared by the Bureau of Standards, stating his opinion that such a code would ultimately be established, and that he thought it best for the interests affected to co-operate to make the code as good as possible.

Cushing's Manual.—The chairman stated that arrangements had been made with Mr. Cushing to continue the chapter on House Wiring in his book to be published with co-operation of the committee. Mr. Cushing will receive suggestions as to the revision, make the revisions and submit the matter to the committee for its approval. It was voted that after this is done the chairman should appoint a sub-committee to take action on the matter submitted.

It was also voted to request Mr. Cushing to include in his publication a short chapter describing the bare concentric wire, with such statements as Mr. Cushing might feel necessary to show that the wire had not been approved by the code for general use, but had only been referred to a sub-committee to obtain further field experience.

Color of Neutral Wire.—The chairman stated that he had received a communication from the manufacturers of wire to the effect that they preferred to have the colors black and red rather than black and white.

Wallace Clark, of the Wire Department of the General Electric Company, who was present by invitation, stated that the reason was that the white wire was more likely to get dirty during manufacture, and might require some slight extra expense in a few cases. He stated that at one time the company had been charging fifteen cents a thousand feet more for white wire.

Mr. Davenport, of Providence, stated that black and white were the colors used in Providence for a long time, and that they had proved very satisfactory, and he thought that red would be by no means as satisfactory. Members of the committee generally expressed themselves as in favor of black and white as better than black and red.

The committee voted that in its opinion the potential-carrying wire should always be black, and that the neutral wire or grounded wire should be readily distinguished, and that the committee preferred a color that was essentially white.

The matter was then left that each member of the committee should consult the wiring contractors, etc., in his city, and also the jobbers, so as to get an idea of what would be the best decision, and should advise the chairman of the results. The idea of this is that such a report from each member of the committee, whether it is unanimous or whether some of the reports are in favor of red wire, would be a much safer basis for a decision than a resolution by the committee.

In the same way it was understood that Mr. Clark should get similar opinions from the manufacturers, finding out from them what actual troubles and costs they have had from such shipments of white wire or red wire as they had made in the past.

Standardization of Both Ends of Portable Cords.—The question of standardizing the end of the cord that would be attached to a flat-iron or other device was brought up, and the committee voted that it recommend that this should be done, so that any cord for use with devices of 660 watts and under could be used with any of such devices. The committee also voted that it *suggested* that this standardizing should adopt the same form of plug as the plug on the other end of the cord to be attached to the lamp socket.

Digitized by Google

The chairman was requested to take this matter up with the manufacturers.

Miscellaneous.—The following questions were brought up and discussed generally to the advantage of the members, but it was considered that they were not matters on which the committee should taken any action at the present time at least:

Service location and proper notification to wiremen.

Licensing contractors.

City ordinances.

Kansas City Contractors.

The Electrical Contractors' Association of Kansas City, Mo., has decided to hold a business meeting one evening each week at the headquarters of the Builders' Association, with which the electrical contractors have recently affiliated. A program of educational discussions is being prepared and it is expected that many of the problems of the electrical contractors will be thoroughly talked over and solved to the benefit of all. The members believe that in no other way will prices and conditions be bettered. Conditions in Kansas City, as in many other cities, have been such that unintelligent competition and ignorance of proper methods of obtaining costs have made it hard to maintain high standards.

Heretofore the contractors have been meeting together at noon on Saturdays at the Kupper Hotel. The spirit of cooperation prevails to a great extent. The secretary, A. J. Burns, is one of those who have been instrumental in forming the local Builders' Association, which occupies spacious and comfortable quarters on the second floor of the Midland Building. The association has for its purposes the promotion and protection of the interests of its members and the maintenance of just and equitable treatment in their relations with each other and with their employees. It aims to further the educational, social and fraternal interests of its members and of the building trades generally. W. L. Hutchinson, first vice-president of the National Electrical Contractors' Association, is another one of the leaders in this movement.

The president of the Kansas City Association is A. P. Denton, who is a hard and enthusiastic worker and has shown wonderful ability in holding his organization together during one of the most trying years in its existence.

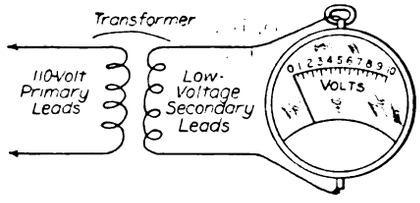
There will be a general meeting of all contractors of Kansas City, Mo., on Monday evening, December 6, at which time George W. Hill will speak on the subject of contractors' accounting and the problems of the mechanical contractors, based upon his experience in traveling among them in the interest of better conditions.

A Cheap 110-Volt Alternating-Current Voltmeter.

A very cheap voltmeter, for use on 110-volt alternating-current lighting circuits, may be made in a short length of time for as low as $2.40, by purchasing a bell-ringing transformer, primary 110 volts, and secondary about 8 volts, and a pocket voltmeter of the battery type. The pocket voltmeter must be one of such construction that its operation depends on a solenoid attracting a movable core which is attached to the needle. One that depends for its operation on a permanent magnet will not do, as this type of construction will not permit the meter to operate on alternating current. The full-scale reading of the voltmeter should be about 10 or 11 volts.

After getting the different devices, it is then a matter of making the proper connections, which are shown in the accompanying illustration.

A meter of this construction is only good for intermittent service, as it heats up if kept on circuit more than a few minutes at a time. A meter of this combination can be made to take up a very small space as small transformers are made for ringing bells that will fit into an ordinary switch box, and also other types that are not much larger than an ordinary socket, being used for lighting automobile lamps from a 110-volt socket. The transformer and meter can be assembled in a small neat box and will be of valuable service to trouble hunters and experimenters after being calibrated for 110 volts. Other voltages will then be in proportion to the calibration as originally marked on the meter dial.



Extending Range of Voltmeter.

The writer has a practical model which is giving good results in connection with experimental work. The meter is almost dead beat in its action.

Alfred E. Oswald.

Driving Belts.

Most users of dynamos and motors have experienced belt troubles either from breaking, slackening or slipping. Good belts should be made so that when a joint is made while the belt is in its place, it ought to present the appearance of an endless belt. After having been taken up once or twice during the first year, good belts, such as should be used in these cases, require very little attention (with the exception of being kept clean and lubricated) during the subsequent years of their long life. If the belt is running in a warm engine room it ought to get a coat of Currier's dubbing three times a year.

All belts having much work to do ought to present a clammy face to the pulley, and this condition is best maintained by applying one coating of dubbing and three coatings of boiled linseed oil once a year. This oil oxidizes and the gummy surface gives the belt a smooth, elastic driving face. A belt looked after in this way will run well slack and the wear and tear will be inconsiderable. On the other hand, dry belts have to be kept tight, otherwise they slip and refuse to do the work. This friction between the driving pulley and the belt "burns the life" out of the belt as long as the slipping goes on.

As to which side of the leather should be placed next the pulley the following may be said: It is well known that by running the grain or smooth side next the pulley, there is considerable gain in driving power. However, by using boiled linseed oil, as before mentioned, the fleshy side will become as smooth as the grain side in a short while, and the driving power will be fully as good. A belt working with the grain side next the pulley really has a much shorter life than the belt running on the flesh side. The reason is the one is working against the natural growth of the hide, while the other is working according to nature. If you take a narrow cutting of belt leather, pull it well, and lay it down, you will at once observe that it naturally curves flesh side inwards. Nature, therefore, as a teacher, tells us to run the flesh side next the pulley, and practice proves this to be correct.

Whether the belts are new or old, a properly made joint is of the first importance to all users of belting. A well-made butt joint with the lace holes punched in a row of diamond shape, answers the purpose fully as well as any. Care should be taken that the holes do not come in a line across the belt, as this weakens the belt considerably, especially where the holes are fairly close together. A good lace, however, properly applied, will last a long time and will cost but little. If a lap joint is made, time should be taken to thin down the ends of the lap. Joints of this sort should be made to the curve of the smallest pulley over which the belt has to work.

Dust should never be allowed to gather into a cake on the pulley or the belt, for if it does, the fiber of the leather gets very much strained. The belt is prevented from doing its work because this stranger defies the at-

Digitized by Google

tempts made by the belt to get a good hold of the pulley. Therefore good belts lubricated carefully and run as slack as possible without slipping, give good service. Tight, dry belts are not so economical, because the bearings get hot, which makes the shafting harder to turn. Such belts will leave the pulleys or possibly break, or slip so as to endanger its life. If an accident happens because of the belt coming off, or breaking, those in charge will take up time consulting as to what should be done. Meanwhile the cause of the trouble gets time to cool, and the source of annoyance is never discovered. Before a new start is made, the bearings are well lubricated. All goes smoothly, yet someone is blamed for the breakdown.

The above hints should be valuable to those who, though constantly using driving belts, may be unacquainted with the principles of their action.

William T. Estlick.

Window Displays.

Work your windows steadily. Change their dress frequently, daily if need be, and change it so materially that they cannot be recognized. Keep constantly changing their appearance, so as to make them attract, and do not lose that big percentage of passersby who, having once become accustomed to your display, never give it a second glance, even though it be months afterwards. Make people go out of their way to see your window. Make them expect changes and then do not disappoint them. Work your window hard and persistently, but don't overwork it by crowding your displays.—*Electrical News.*

Among the Contractors.

F. A. Clegg & Company has been awarded the contract for the electric wiring installation, etc., in the Louisville Salvation Army Citadel, which is being constructed at a cost of $25,000.

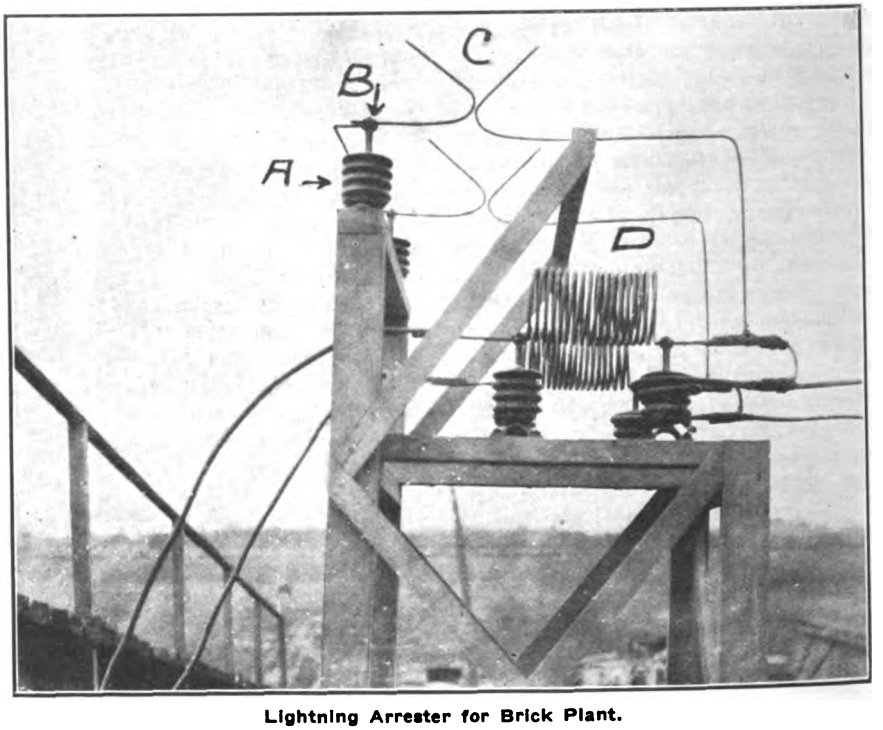
The Nashville (Tenn.) Machine Company has been awarded the contract for the electric wiring of the new West Nashville school building, which is under construction.

The Kaw Valley Drainage Board has let the contract for the 1,000-horsepower electrical installation on the dredge to be used in clearing the channel of the Kaw River, to the Squire Electric & Construction Company, Kansas City, Mo. There will be a 750-horsepower motor on the dredge, and smaller motors on other pumps and on the cutter and drums for handling the suction apparatus. The dredge probably will be put into operation during December.

Lightning Arrester for Brick Plant.

In a large brick plant, of which I am the electrician, the power circuits are 250 volts direct-current, and are installed for the most part on poles between the various buildings, and also on top of the buildings. They are exposed to the antics of lightning, which is very severe in this locality, probably on account of the plant being situated just below the Lachine Rapids of the St. Lawrence River.

Having had considerable experience with lightning arresters of various kinds for alternating current, I decided to construct a horn-gap arrester with choke coils for installation on a feeder supplying various motors in the plant. The accompanying illustration shows how it was built.



Lightning Arrester for Brick Plant.

A is one of six 2,500-volt busbar supports which were available.

B is the adjustable end of the horn gap. This can be slid in or out, according to requirements.

C is one pair of horn gaps, which were set about one-quarter inch apart; when the photograph was taken the gap was purposely increased to show it clearly.

D is one of the choke coils, which were bent up of bare copper wire.

The supporting frame was made of wood thoroughly painted with good weatherproof paint.

The adjustable ends, *B*, of the horn gaps are tied together and thoroughly grounded.

This equipment was installed on the power-house roof, and has acted remarkably well during the severe storms of the past season.

A. P. Broadhead.

Methods of Electrolysis Mitigation.

A paper giving a brief general statement regarding electrolysis and corrosion, and presenting a detailed discussion of the various methods of electrolysis mitigation that have been proposed or tried for protecting underground structures, has just been issued by the United States Bureau of Standards. Methods of mitigation are treated under two heads, namely, those applicable to pipes and those applicable to the railway return system. The conclusion is drawn that while certain of the methods applicable to pipes, particularly pipe drainage and insulating joints, are often valuable, they should in general be used as auxiliary measures only, the chief reliance being placed on reducing potential drops in the railway return to reasonably low values. Where return feeders are necessary for accomplishing this, insulated feeders are preferable, because more economical.

In the last chapter there is presented a discussion of the principles on which regulations concerning electrolysis mitigation should be based, and the responsibilities of owners of underground utilities as well as of the railway companies are emphasized.

Copies of this publication (Technologic Paper No. 52) may be obtained without charge from the Bureau of Standards, Washington, D. C.

Corundum mining in the United States has ceased, while Canadian production dropped from $239,091 in 1912 to $72,176 in 1914. Artificial abrasives made in the electric furnace have displaced the natural products.

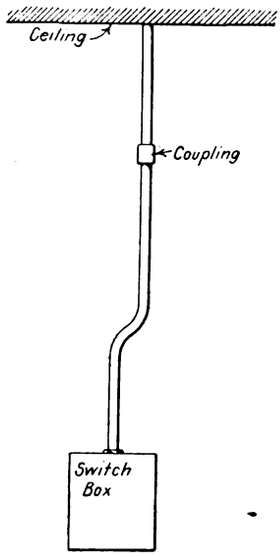
Digitized by Google

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Adjusting Conduit to Switchbox.

On conduit work, when extending conduits to switch outlets in walls and partitions, I find that by bending an offset in the conduit near the box the setting of the box is facilitated. The box will then not tend to pull away from the wall, as is the case when conduits are brought down straight and



Adjusting Bend in Conduit.

sprung into place. The accompanying illustration shows this bend. The pipe may be turned with a wrench and the box adjusted to the exact position desired. J. H. Lamoureux.

Instrument for Testing.

In a recent issue one of your contributors showed a scheme for connecting ammeters and wattmeters in a circuit, which requires a dead fuse for each size of block to be tested. For many years I have had occasion to do testing on live circuits and preferred to do so by twisting the instrument leads to the contacts at the top and bottom of a fuse block which is in service. The instrument thus forms a jumper over the fuse when the meter is in circuit. The fuse itself acts as a switch to be left closed in its usual position when the meter reading is not required, as in starting alternating-current machines. By removing the fuse from its clips the current is sent through the meter. This scheme obviates the necessity of breaking the circuit or shutting down any machine to insert the instruments. It also obviates the necessity of carrying any more equipment than the meter and its connecting cords.

In order to minimize the equipment necessary we have had developed for our own use a combination volt-ammeter having voltage scales of 150 and 750 volts and current ranges of 10 and 150 amperes. This instrument can be used for either direct or alternating current. By using shunts and transformers in addition, any other range necessary may be secured. By using both current and voltage coils at one time it is possible to make a rough test for frequency. This is done by connecting the voltage winding to the line and short-circuiting the current terminals, as the instrument has separate windings for these two purposes. On direct current there is no difference in the voltage reading when the current terminals are short-circuited. With alternating current the reading is altered, being reduced about 5 per cent at 25 cycles, 10 per cent at 60 cycles, and 20 per cent at 133 cycles.

This instrument is inexpensive and its weight is about 5.5 pounds, which makes it very convenient for general testing.

W. M. Price.

Static Shocks From Belts.

While installing lamps in a machine shop I was annoyed by severe static shocks while I was working around the belts. Immediately over the pulleys ran a water pipe and from this I suspended a copper wire until it reached about a half inch above the belt. The wire carried off the static charge and no further annoyance from static was experienced during the installation.

Arthur H. Terry.

Bushing in Canopy.

In various conduit box covers and brass canopies a standard hard-rubber socket bushing is installed for cord to pass through for drops. Many of the covers are drilled and tapped the proper size to take the bushing, but many times it is necessary to drill the covers, and canopies especially. As they are of such thin metal they cannot be tapped, and where locknuts of the proper size to secure the bushing are not at hand, I find that by holding a lighted candle or match on the bushing, on the inside of the canopy or cover, it can be made soft and pressed all around and made secure and firm, so that it cannot come out.

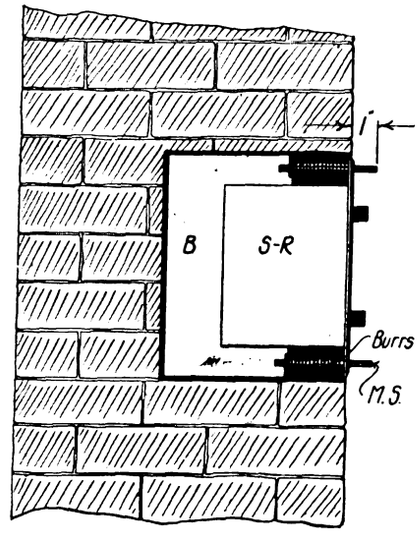
Otto Weber.

Testing Fuses.

When testing fuses on a motor branch of a 220-volt, three-wire circuit with a grounded neutral, it is common practice to use a 220-volt lamp. As these lamps are special and seldom on hand, a 110-volt lamp can be pressed in use by testing between ground and one line. A. Heaney.

Installing Flush Switches and Receptacles.

Where a switch or receptacle box (B) is installed too far behind face of wall and switch or receptacle (S-R) needs to be shimmed out to come even with face, take two 6/32 machine screws (M-S) with heads cut off and long enough to project about one inch outside of wall when screwed into ears in box. Put screws in ears and fill space between box and face of wall with burrs placed on machine screws. Place switch or receptacle in position on screws and press firmly against burrs to hold burrs in position. Take out one of the head-



Use of Burrs to Bring Face of Switch Flush With Wall.

less screws and put in screw of proper length to hold switch or receptacle. Then take out the other headless screw and put in another permanent screw.

Frank C. Petersen.

To Clear Dirt From Molten Solder.

To clear the surface of low-melting-point solders such as the bismuth solders has always been a tedious job and unless the dross is cleared off there is experienced considerable difficulty in tinning. This is especially so with solders melting at 212 degrees Fahrenheit, or lower. I have solved this difficulty by dropping a pinch of resin in the ladle. The dross will immediately clear to the edges of the ladle leaving the surface bright. The surface will remain clear as long as an exceedingly small amount of resin remains in the ladle.

H. E. Weightman.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

IDAHO.

Northwest Light & Water Company. Upon the complaint of James H. Taylor, as mayor of the city of Wallace, the Commission has investigated the rates for electric service charged by the Northwest Light & Water Company.

Two valuations were submitted, one for the complainant and one for the company. The Commission, for lack of sufficient funds, did not conduct a separate investigation to determine the value of the property, but took the estimate which appeared to be the more reasonable of the two; or in the case of land, where a number of estimates were submitted, took an average of the values of all the witnesses. The Commission says: "We dislike to have to resort to this method of fixing values, as it resembles too closely the abominable practice of juries in settling difficulties in the jury room."

Accrued Depreciation. The Commission found that part of the plant and equipment had been discarded and could not be included in the estimate of value. The company has set aside a depreciation fund which is sufficient to cover in large part the amount of depreciation in this non-used property. The balance is to be amortized by an annual allowance and considered as an operating expense. An allowance is figured which would extinguish this remaining value within the balance of the life of the franchise. "The Commission feels that this plan is much more reasonable than that of amortizing the remaining value of this non-used property during the balance of the estimated life of the units."

Allowance for Depreciation. "From the reports and testimony of the engineers the Commission finds that the weighted average annual rate of depreciation, based on the straight-line formula, is six per cent of the value of the depreciable property."

Rate of Return. The Commission finds that, taking into account the risks and hazards in the present case, a rate of return of 10 per cent is reasonable. The Commission reaffirms its position as opposed to a fixed rate of return which it set forth in the Sandpoint Water Company case. (Reported in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, November 13, 1915, page 897.) The Commission says: "It must be distinctly understood that the rate of return allowed in this case shall not be considered as the fixed rate of return for all utilities of this character. The rate of return in each case shall be determined after due consideration of the hazard and risk connected with the operation of the utility, the efficiency in operation and economy in management, giving to that utility showing the highest efficiency in operation and the greatest economy in operation and furnishing service to the consumer at the lowest possible cost, the highest rate of return. This policy will encourage the management of all utilities to keep their plants up to the highest point of efficiency, to practice all economy possible in operation, and to reduce the cost of the commodity to the consumers to a minimum."

Taxes. The Commission estimated the value of the property for rate-making to be $107,000. In determining the amount to be allowed for taxes in normal operating expenses, the Commission points out that the State Board of Equalization assessed this property for the year 1915 at the sum of $180,000, and on this the Commission says: "This valuation may be fair, considering what the net earnings of the company have been in the past. If the net earnings of the company in the future do not exceed the estimate made herein, then the valuation for taxation purposes, in no event, should exceed the valuation herein made, and then only when all other property is assessed at 100 per cent of its value. In other words, when the valuation of a public utility has been determined on a scientific plan for rate-making purposes, and a schedule of rates fixed in accordance with such valuation, then that valuation and the valuation for taxation purposes should be practically the same, provided, of course, that all property is assessed at its full value. There is no justice or equity in the practice of assessing boards for taxation purposes in fixing excessive valuations on public utilities where the valuation for rate-making purposes has been determined. In case an excessive valuation for taxation purposes is made, the burden will eventually fall directly upon the customers of that utility."

Purchase of Current. It was urged by the complainant that the entire generating plant and equipment and the water rights should be eliminated from the value of the plant for the reason that electric energy can be purchased from the Washington Water Power Company for less money than it costs to generate it at the company's plant. The company is purchasing a part of its current from the Washington Company at present. From the Commission's comparison of the cost of generating with the probable cost of purchasing all current from the power company it appeared that the latter would be cheaper provided the present contract rates were reasonable. The Commission says: "In order for this Commission to be justified in discarding this property at this time, it would have to conclusively find that the rate now charged under this contract between the Washington Water Power Company and the Northwest Light & Water Company is reasonable. That presumption might prevail, but this Commission would not be justified in putting into effect such a drastic order on a mere presumption. It is possible that the rates of the Washington Water Power Company will be determined in the near future, in which event, there would be nothing to prevent a further consideration of this matter when the Commission would have positive evidence at its command. There is one particular advantage accruing to the public by reason of defendant generating its own electric energy and that is, less liability of interruption in service. The stockholders of the defendant company invested their money in this enterprise in good faith and at a time when it was absolutely necessary to obtain electricity by means of its own generating plant and, under all the circumstances in this case, this Commission does not now feel justified in ordering it 'junked'."

Rates. The Commission ordered the following rates put in effect for residence and commercial lighting: 10 cents per kilowatt-hour for the first 20 kilowatt-hours consumed per month, 9 cents for the next 30, 8 cents for the next 40, 7 cents for the next 60, 6 cents for the next 80, 5 cents for the next 100, 4 cents for the next 170, 2 cents for the next 500, and 1 cent for all excess, subject to a minimum of $1.00 per month and a prompt-payment discount of 10 per cent.

The rates for general power are made up of a demand or service charge of $1.00 per month per horsepower of maximum demand, and an energy charge of 5 cents per kilowatt-hour for the first 20 kilowatt-hours per horsepower of demand; 3 cents per kilowatt-hour for the next 30 kilowatt-hours per horsepower of demand; and 0.5 cent per kilowatt-hour for

Digitized by Google

all excess, subject to a minimum charge of $1.00 per horsepower of maximum demand.

Flat rates are also included for residence lighting, sign lighting and special services.

Domestic or commercial cooking service is to be furnished only on a meter basis, with separate meter, at the following rates: 5 cents per kilowatt-hour per month for installations having a connected load under 2,000 watts, and 3 cents per kilowatt-hour per month for installations having a connected load of 2,000 watts or over.

Small heating and single-phase motor appliances may be used on this circuit when the connected load is 2,000 watts or over, but cannot be considered as part of the connected load in obtaining the benefit of this schedule.

Minimum monthly charge under this schedule shall be $1.00 for each meter installed.

INDIANA.

Laporte Gas & Electric Company. The Public Service Commission has approved a contract between the electric company of Laporte and Charles G. Kimble, of Laporte, whereby the company will provide electric current to Kimble, "delivered at the city limits of Westville, Ind.," sufficient to supply the requirements for electric current at Wanatah, Lacrosse, Kouts, Union Mills and Wellsboro. The company is to sell the current at rates which shall be at all times under the jurisdiction of the Commission, according to the order. The rates, which are at present approved by the Commission, range from four cents to two cents per kilowatt-hour, plus a readiness-to-serve charge of $1.00 per month per kilowatt of maximum demand. If bills are not paid promptly, one-half cent per kilowatt-hour for all current consumed during the month is to be added.

NEW YORK—Second District.

Paul Smith's Electric Light, Power & Railroad Company. The Second District Commission has approved an agreement between the village of Lake Placid and the Paul Smith's Company, under which the municipal electric plant operated by the village will be connected with the company's system. The municipal plant has become inadequate, and additional current brought from the company's generating plant in the village of Saranac Lake will be purchased to make the supply adequate.

The Northern New York Utilities, Incorporated, was authorized to issue $76,700 par value of securities to finance extensions and improvements of its system in and about Watertown. The company will issue $55,000 par value of its five-per-cent, 50-year first mortgage bonds at 87.5, to net $48,562.50 and $21,200 par value of its seven-per-cent cumulative preferred stock at par.

PHILIPPINE ISLANDS.

The Philippine Railway Company. A complaint was brought before the Board of Public Utility Commissioners of the Philippine Islands, which called in question the right of a public service company to engage in collateral business undertakings. (Strachan & MacMurray, et al. v. The Philippine Railway Company, September 15, 1915.)

It has been the practice of the railway company to take a certain amount of outside work in its machine and lumber shops, which has brought it in competition with the complainants. The complaint sets forth that the railway company has been able to engage in such business at prices which the complainants cannot possibly meet, and that the railway company is favored by the government's guarantee of four per cent on its original investment. The Commission discusses the different phases of the situation presented, and concludes:

"Although the defendant company is not expressly authorized, either by its franchise or by its articles of incorporation, to engage in the business mentioned, yet, considering that it is not prohibited from doing so, and that it is, on the other hand, advisable and profitable for it to engage therein, we hold that this is included among its incidental powers implicitly authorized by its franchise to enable it to successfully manage its affairs, because the defendant company has engaged in the business mentioned for the sole purpose of making temporary use of the parts of these shops which at times it does not need in connection with the operation of its railways, in order to use the portion of its property so lying idle in such manner as to produce gain or profit which is a right that every corporation is acknowledged to possess as one of its incidental powers for the proper and suitable administration of its property. . . .

"From the legal point of view the defendant company has, therefore, a perfect right to continue doing commercial work in its shops, as it has been doing until the present, regardless of whether in doing so it competes with the local shops of Iloile and Cebu, because the factor of the competition must not be considered in the determination of such right, competition being always advantageous to the public as a regulator of reasonable rates and being an ordinary and current thing in ordinary business and in all business authorized by general legislation. As to the government guarantee invoked by the petitioners, the same is also a factor which does not enter into the consideration of the present case, because the government cannot, despite its guarantee, deprive the defendant company of the right to manage its property as the head of the family ought to manage that entrusted to his care. . . .

"It is evident that the defendant company has a right to engage in the lumber business as set forth, without any limitation other than that this shall not interfere with the operation of its railways, and it is in this respect only that the business referred to is subject to the control of this Board."

Utility Commission Created in Canadian Province.

The Province of Alberta has just created a utility commission consisting of three members. It will exercise a general supervisory control over all public utilities in Alberta, and also act as an advisory board on municipal improvements involving bond issues. The chairman receives a salary of $7,200 and each of the other members $6,000. This utility commission is unique in the Dominion of Canada.

Proposed Revision of Rules of Practice of Patent Office.

Commissioner of Patents Thomas Ewing has proposed a considerable number of amendments to the Rules of Practice of the United States Patent Office to go into effect January 1, 1916. These amendments cover over six pages of the *Official Gazette* in the November 9 issue of which they were published. A number of the old rules relating to caveats, being now obsolete, are abolished; the other amendments are proposed to correct certain inaccuracies in the present rules and to bring about certain needed reforms in the practice of the Patent Office. Mr. Ewing announces that he will consider any further suggestions on this line that are submitted to him before December 10.

Water Power in Vermont.

United States Senator W. P. Dillingham addressed the Burlington (Vt.) Merchants' Association, November 11, on the water powers of the state. He pointed out their great value, saying that if one-half the two million horsepower that engineers estimate are now running to waste were utilized for industrial purposes, something like $250,000,000 of distributed wealth would be added to the state, as each horsepower used in manufacturing in the United States represents $248 paid to labor and $1,152 in the value of the goods produced.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 315.—Motor-Driven Motion-Picture Machines.—About what percentage of our large cities having over 100,000 population permit the use of motor-driven motion-picture machines?—S. P. L., Topeka, Kans.

No. 317.—Wiring for Electric Ranges.—In wiring an apartment building for electric ranges, each of which has a maximum possible load of two kilowatts, what is the best arrangement of the special range circuits so as to economize wire and reduce the voltage drop to the minimum? Meters to be in the basement.—D. A. T., Chicago, Ill.

No. 318.—National Electrical Code Changes.—On what date do the changes made in the National Electrical Code every two years go into effect? I have been told it is on January 1 following the year of revision; others have told me different dates and I have even been told there is no fixed date—C. C., New Haven, Conn.

No. 319.—Center Suspension of Street Lamps.—In what cities in this country, if any, is there used to any extent the system of suspending street lamps over the center of the street by means of cables between the opposite houses, no posts at all being used? This method is very successfully used in London and some other European cities, but to my knowledge little or not at all here. What is the objection to it?—P. N. V., Albany, N. Y.

Answers.

No. 311.—Simple Rate System.—Has any system of rates for residence customers of a central station ever been devised which, though based on actual or assumed maximum demand and including primary and secondary rates for, say, 30 hours' use of this demand, can be fully explained to any customer without using the words "30 hours' use," "demand" "maximum demand," or even "kilowatt-hours?" If such a simple system is as yet too ideal, what is the nearest approach thereto that has been attained?—W. H. T., Ann Arbor, Mich.

Perhaps no subject has received so much attention in recent years as that of rate-making, and the reason for this is because it is coming to be better understood that many existing rates are illogical. There are an endless number of rates in existence, varying from the simple charge of so much per kilowatt-hour to that which takes into consideration a charge for service, plus a charge for actual energy used—the rate for which depends upon the class of service, whether lighting, power, cooking, etc.—plus modifying clauses governing such matters as maximum demand, load-factor, power-factor, and whether the load overlaps the peak or is off-peak load.

A logical rate is necessarily complex and rate-making abounds with intricateness; it may be said that the more logical a rate is the more complicated will it be. This statement is rather loose, and, like all generalities, may not be strictly true to any and all cases without some modification. However, it is safe to say that the more thought given this matter of rate-making the more complicated are the schedules, which usually means the larger the company the greater the variety and the refinements used in setting its rates. This does not necessarily mean that the customer's bill is more complicated, because in many cases it is possible to estimate within close limits the conditions obtaining from other similar installations. Thus while the statement of the bill may be comparatively simple, the means of obtaining it is far from being so. Rate-making is a science in itself—a fact not recognized until quite recently. That this subject is one of paramount importance to the electrical industry must be apparent from the large amount of interest being given it by central-station companies and public utility commissions, the latter often setting rates after careful investigation of investment, operating costs, depreciation, etc.

A very interesting paper entitled "Rates and Rate-Making," by Paul M. Lincoln, appears in the *A. I. E. E. Proceedings* for October of this year, and querist is strongly recommended to read it, for it shows that a logical rate can be obtained only after taking into account many factors. In summarizing it is stated, among other things, that: "(1) A logical and just rate for electric service cannot be based on kilowatt-hours alone. (2) Load-factor must be recognized in some manner in order to arrive at a logical rate. (3) In order to recognize load-factor it is necessary to measure both kilowatt-hours and maximum demand." The National Electric Light Association has a standing Committee on Rate Research which is doing a magnificent work in connection with this subject, and the results are chronicled each week in a bulletin entitled *Rate Research*. This bulletin contains information pertaining to rates, public service regulation, etc., and is a compendium of extremely valuable information. There are many books dealing with the several phases of rate-making, and to these querist should refer, because it would be impossible to cover any one of them here.—K. R., Chicago, Ill.

No. 314.—Talking Signs.—What means are used in electric "talking" or word-spelling signs to prevent injurious arcing at the contacts where the current is continually changed from lamp to lamp?—A. F. B., New York, N. Y.

At the present there are found on the market a great many different types of so-called talking signs and it can be said according to their characteristics they may be put into two distinct categories: (1) The kind where the letters or words are flashed "on" one after another for short, steady intervals; (2) the kind where the light-letters and words are traveling continuously across the lamp-field. In the first-named class the disposition is generally such, in order to eliminate the arcing referred to, that the current as a whole is turned "off" just a moment before the arcing on the individual contacts would take place; this is done for various reasons. Even when the mechanical part of the construction is made with all possible care, it is not possible to get such a precision that a few thousand contacts would operate at the same identical instant; this therefore naturally would permit some lamps to be extinguished sooner or later than others. On the other hand, during the period of changing the word or words and consequently the grouping of lamps to be lighted next, it would happen that intermediate lamps would be lighted, which would result in considerable confusion of lighted lamps, until the final group was fully in action for the next word. This is the main reason why the general circuit is broken and not the individual one of each lamp contact, with current flowing. In some types of these devices there exists one set of contacts and in others two or more, which are in action alternately; that is, while one flash is visible, the next is in preparation, and if the main current were not broken between the flashes great confusion would arise. It is therefore obvious that the numerous contacts and brushes are not subject to any arcing at all and are good for a long time. According to the particular construction they are subject to more or less wear and tear, through friction against the part their springy effect works, during the time no current passes.

The second class referred to is entirely different in its main principle: here each individual lamp is lighted many more times than in the former

Digitized by Google

class and it may be said that the contact-making and breaking as a whole is about thousandfold in proportion. As there are two different methods of obtaining the same effect for word-spelling signs it will be interesting to know the elements used in each kind. One way is to make a member of some sort of insulating material travel under the brushes, or between the brushes and the common return pole; this member has in this case holes or slots where the brush enters while passing and makes the lamp light up. Here naturally an arcing is produced when the current is closed and when same is opened, which consequently must affect the member more or less during the time it is used. But as the current is rather feeble the arcing is of not much harm to it. The other type is where the common pole is represented by metallic letters which travel across the brush sections and each individual brush works as a simple single-pole switch. Here it is advisable to let the whole be submerged in an insulating oil basin, which will minimize the arcing and entirely kill it, besides it will provide for longer life of the elements at work, as the friction is reduced by the effect of the oil between the metals. In this class of sign in which the words and letters seem to travel across the entire sign by successively lighting up neighboring letters, the speed of motion is limited by the definite time interval required to light up each individual lamp to full brightness. This also tends to decrease the arcing.—G. F. B., Chicago, Ill.

No. 316. — Protecting Lightning Grounds.—What is the best method of protecting lightning rods and the ground wires of lightning arresters where the wires are exposed to injury near the ground? I understand that iron pipes are objected to by some authorities.—L. F. B., Wilmette, Ill.

A ground wire or rod may be protected for either of two reasons, or both. A wire may be protected to prevent objects coming in contact with it, and thereby suffering possible damage; or it may be protected, itself, against damage from external causes. The first of these is usually accomplished by using insulated wire, weatherproof or rubber-covered, according to circumstance; the second by covering the wire with a separate sheathing. This sheathing may be of wood or of metal, depending upon the conditions that prevail or are to be expected.

Usually a ground wire is covered with wooden beading as it goes down the pole to earth, and this beading is fastened to the pole by staples driven into the pole at suitable intervals. This wooden covering should extend from below the ground level to eight feet or more above. Where poles are jointly used by two or more companies it is well to extend this covering up to the full length of the ground wire. In running a ground wire down a pole it should always be installed on that side of the pole which is not used for the linemen's climbing irons; in this way it will not be so liable to suffer damage nor interfere with the men at their work.

Where a ground wire is liable to be damaged by wagons, and other similar objects, a metallic covering is often used instead of, or in addition to, the wooden covering. One would, of course, at once suppose that such a metallic casing would seriously impede the flow of current to ground, but experience indicates that under certain conditions the presence of a metallic covering has little effect. At low frequencies, commercial and even considerably higher, surrounding a wire with iron pipe materially increases the inductance of the path to earth, but at very much higher frequencies—the frequencies of lightning—there is little effect resulting from the iron pipe. The reason for this is that eddy currents set up in the iron pipe prevent the magnetism reaching more than a comparatively small value; in fact at one definite frequency there will be no effect whatever due to the iron pipe, whereas at still higher frequencies the inductance will be even lower. This is a matter of academic rather than practical interest, however.

In running a ground wire through a pipe care should be taken that the ground resistance of the earth wire be not higher than that of the iron pipe, otherwise the lightning discharge is liable to jump to the pipe. The same thing occurs when the iron pipe is not grounded.

Protect a ground wire with wooden beading wherever it suffices, but where safety to the public or the system requires use an iron pipe. Ground wires should always be insulated, weatherproof wire being satisfactory for pole work.—K. R., Chicago, Ill.

Auxiliary Radio Equipment on Steamer Tested.

A report on the test of the auxiliary radio equipment installed aboard the Merchants & Miners Transportation Company's steamship *Howard* has been made by the United States Bureau of Navigation. This test was made because of the difference of opinion and the absence of any official information as to whether or not certain types of auxiliary apparatus and their sources of auxiliary power supply fully comply with Section 1 of the act of June 24, 1910, as amended July 23, 1912.

The United States Department of Commerce believes it to be necessary that the various types should be officially submitted to tests from time to time, to furnish the desired information. The test on the steamship *Howard* was conducted from July 13 to 19, 1915, en route from Norfolk to Boston, and return from Boston to Baltimore, by F. A. Kolster, of the Bureau of Standards, and R. Y. Cadmus, radio inspector of the Bureau of Navigation.

The Edison battery installed on the steamship *Howard* consists of 100 cells type B-4-H. W. S., rated at 80 ampere-hours. This battery supplies power to run a 110-volt motor, which drives the 0.5-kilowatt, 500-cycle generator of the radio transmitting equipment, and also supplies power for 25 or more deck lights. The voltage of the battery when fully charged is 140. It is necessary, therefore, to have a resistance in series with the battery in order to cut down the voltage at the terminals of the motor to 110. The resistance supplied for this purpose is adjustable, so that as the battery voltage gradually drops the voltage at the motor terminals can be kept at 110 by decreasing this resistance.

One test of the battery was made, using only 90 instead of 100 cells. The initial voltage of these 90 cells after charge was about 125. No resistance was used in series.

The Bureau states that the 90-cell battery apparently meets the four-hour and six-hour service requirements of the act of June 24, 1910, amended July 23, 1912, and the London International Convention, respectively.

The motor-generator set furnished with this equipment is of the inductor type. The radio transmitter furnished is of modern design, efficient, and easily operated. Provision has been made for the use of wave lengths of 300, 450 and 600 meters. The transmitter may be set for any of these wave lengths by means of a simple switch. The antenna current was found to be about 6 amperes for 450 and 600 meters and about 4 amperes for 300 meters.

Under these conditions it is believed that the requirement of 100 miles communication will be fulfilled, as indicated in the range tests conducted while en route from Norfolk to Boston and return to Baltimore.

Manufacturers of Supplies.

A meeting of the board of governors of the Associated Manufacturers of Electrical Supplies will be held at the Hotel Biltmore, New York City, on December 2.

A meeting has been called for December 2, at 3 p. m., at the Hotel Biltmore, by the manufacturers of inclosed fuses to consider the formation of a section, acting under the approval of the board of governors of the Associated Manufacturers of Electrical Supplies.

Digitized by Google

A Method for Measuring Earth Resistivity.

A knowledge of earth resistivity may be of value in determining something of its composition, such for example as moisture content, whether or not it contains oil or ore of high conductivity, etc., or in the calculation of damages to pipe systems by the return current of street railway systems.

For those cases in which we desire the resistivity of a fairly large portion of earth, extending to a considerable depth, or where there are reasons why the measurement should be made without disturbing the portion to be measured, the following method is suggested by Frank Wenner in the *Journal of the Washington Academy of Sciences.*

Four holes are made in the earth approximately uniformly spaced in a straight line. The diameter of the holes is not more than 10 per cent of the distance between them and all extend to approximately the same depth, which is usually that at which we are most concerned with the resistivity. In each hole is placed an electrode which makes electrical contact with the earth only near the bottom. Two of these electrodes serve as current terminals and two as potential terminals in the measurement of the resistance.

Knowing the resistance, the depth of the holes and the distance between them we have data from which the effective resistivity in the vicinity can be calculated.

In case a is the distance between the holes, b is the depth of the holes, ρ is the resistivity, and R the measured resistance, then

$$\rho = \frac{4\pi aR}{1 + \frac{2a}{\sqrt{a^2+4b^2}} - \frac{2a}{\sqrt{4a^2+4b^2}}} = \frac{4\pi aR}{n}$$

where n varies between 1 and 2 according to the ratio of the depth of the electrodes to their distance apart.

If the holes are not in a straight line or are not of a uniform depth or spacing the resistivity is easily calculated from the depth of each of the holes and the distance of each from each of the other three.

Concerning the resistance measurements there is in general no need for a high accuracy. There is, therefore, no reason why we may not use an ammeter for measuring the current and a voltmeter for measuring the resulting difference in potential between the potential terminals providing no current is drawn from these terminals. As the voltage to be measured is low and the resistance between electrodes and earth high, errors would be introduced if the ammeter-voltmeter method were used in the ordinary way.

The following potentiometer arrangement, using alternating current to obviate the more serious difficulties which might arise on account of polarization with direct current, seems to answer the purpose fairly well. The current terminals or electrodes are connected to a source of alternating voltage of suitable value, and across the line is connected a step-down transformer, the low-voltage side of which is connected to the ends of a slide wire. One of the potential terminals is connected to one end of the slide wire and the other through a vibration galvanometer to the adjustable contact on the slide wire. An ammeter is connected into a lead to one of the current terminals and a voltmeter across the ends of the slide wire. On account of the polarization at the current electrodes a variable inductance is connected into one end of the leads, for the purpose of bringing the test current in phase with the voltage of the low side of the transformer.

If then adjustments are made so that no current flows through the galvanometer, the position of the sliding contact, the value of the test current, and the voltage across the slide wire are read, we have data from which the resistance R is readily calculated.

From the measured resistance, and the depth and distance between electrodes a value may be obtained for the effective resistivity as explained above. The value depends mainly upon the resistivity in the neighborhood of and between the potential electrodes and very little upon the resistivity at distances from either of these electrodes equal to half the distance between the current electrodes.

So far the method has been used only for determining resistivities in a region very close to the surface, a few meters or less in radius.

Among the Supply Men

The Marketing of a New Electrical Toy.

The toy market at its best is a hard one to break into. The problem is multiplied when a new toy is to be put before the public. The toy in question is the miniature practical electric range which cooks, bakes and broils, just like the full-size types; this Junior range has been described and illustrated in former issues. It is meant to be used as an active part in the nursery tea party, and is so built that none of the embryo cooks could possibly get a shock. The price of $8 is far above the average toy price. This feature hindered the placing of the toy on the market. Yet, there were other factors in favor of it. The boys had their electrical and mechanical toys, but nothing new had been offered for girls since the advent of the sleeping doll.

Another phase of this Junior electric range is that it is an entering wedge for the "Do It Electrically" doctrine, and the educational value of this toy range is not a small factor in the campaign.

The Western Electric Company, which is putting this Junior range on the market, laid two advertising campaigns. The first naturally was an appeal to the electrical trade. A mailing folder was prepared outlining the features of the range and calatoging the sales helps which the company offered free to the dealer who wished to take on this new line. These included newspaper electrotypes, folders, window displays, and small cook books. This folder also offered to send a sample of the toy range for pre-inspection to any central station or other electrical merchants. This direct mail advertising was supplemented by a generous use of full pages in the advertising sections of the leading electrical papers.

To help electrical merchants create a market for this new toy, a comprehensive national advertising campaign was laid, full-page advertisements appearing in such popular magazines as *St. Nicholas,* and half-page advertisements in the *Saturday Evening Post.* This range was also demonstrated at the New York Electrical Show, and formed a part of the equipment of the New York School of Domestic Science exhibit, attracting no little attention.

Electrical dealers throughout the country are going to find the miniature practical electric stove a most popular holiday specialty.

Digitized by Google

Celebration Features of Electrical Prosperity Week Unique and Interesting.

An entire country awaits the dawn of a most unusual week of electrical celebration. When leaders in the thought and progress of electricity almost a year ago, decreed the elimination of those who cry "hard times" and set November 29 to December 4, 1915, as a six days period of rejoicing and extension of everything electrical, there were those who were skeptical of the plan.

During the long months of tireless work by those who have the management of the campaign there have been many evidences of this skepticism. Overcoming what obstacles that such a campaign was bound to meet, Electrical Prosperity Week, on the eve of its inaugural justly lays claim to the greatest trade-building campaign in America's industrial history. It has had no rivals either in the point of nation-wide participation by interests in and out of the industry or in the co-operation of all branches of the industry to make it a success.

It is bound to achieve a primary purpose of refreshing the minds of Americans with thoughts of the nation's welfare—it has done so already. It began the campaign when dark clouds flitted over the land. It celebrates the Week with the country enjoying unprecedented prosperity in every particular.

It will accomplish all its other purposes. Every branch of the industry will have "sales made" reports to turn in after this week. Every branch of the industry will benefit by the unparalleled education the campaign has embraced within its program. Every man in the industry will have reasons to be proud of the part he has played to speed the dawn of the day when all things will be done electrically. For all times the irresistible strides of the electrical industry and the enterprise of the men at its helm have been established. It is doubtful if any industry in the world could have conceived such a campaign and conducted it along the lines Electrical Prosperity Week has enjoyed.

One has but to examine the character of celebration and the wholesome participation by the public at large in these programs to sense the completeness and the effectiveness of this Week.

Los Angeles, Cal., will be illuminated during the Week as never before. Electrical floats will parade through the streets. The electrical dealers, will take advantage of the "cash-in" opportunities which the celebration will offer, by making attractive displays of their appliances. In a rousing proclamation, read to the Jovians recently, Mayor Sebastian placed himself on record as enthusiastically in favor of the celebration.

San Francisco's downtown district will be transformed into a great white way of light. More than 500,000 pieces of literature have been sent out by the Exposition advertising the Week and calling on all of California to be present on the closing day of the Exposition. On December 1, a Prosperity Ball will be held in the Civic Auditorium; special electrical decorations will be provided.

In Cleveland, Ohio, one of the many features which is attracting attention to the celebration is an essay contest which is being conducted by the Cleveland *Plain Dealer*. From present indications, the list of contestants working for the 42 cash prizes aggregating $145 will exceed the number that have participated in any other previous contest of a similar nature ever held in that city. The subject of the essays is "Electricity in Everyday Life."

Hot Springs, Ark., will have a "Fete Day" and night when there will be electrical displays of extraordinary character. It is also proposed to hold an auto parade with cars beautifully decorated with electrical effects. A "Calathumpian Night" and grand ball will be given with spectacular electrical decorations. The stores of the city will be beautifully illuminated.

Indianapolis, Ind., is planning some unusually attractive features in connection with its electrical exposition to be held during the Week. The show will be highly flavored with the Christmas atmosphere. The exhibitions themselves will be made up of an almost endless variety of appliances for Christmas gifts, and a part of the exposition decoration, which is to be on a lavish scale will include a number of brilliantly lighted spruce trees.

Cincinnati, Ohio, will have an elaborate electrical display on Gilbert Avenue, Viaduct. The exhibition will be held at 8:30 p. m. Saturday, December 4. The latest inventions in electric advertising, illuminating, etc., will be shown. The bend in the Viaduct will provide the most advantageous spot from which to view the spectacle.

Milwaukee, Wis., will stage an electrical show on the first and second floors of the University Building. The first floor will be devoted to the heavier apparatus such as motors and power-plant equipment. The second floor will be devoted to fixtures and household appliances. On Monday, November 29, a formal opening will take place, the doors being open on each day of that week from 10 in the morning until 11 at night. Tuesday has been designated as "housewives' day," Wednesday as "illumination day," Thursday as "Wisconsin day," Friday as "industrial day," and Saturday as "children's day."

Galveston, Texas, will hold an electrical parade which promises to be one of the most attractive events ever held in the city. The parade will be one of contrast—the old being compared with the new. For instance, the old-fashioned method of hauling cotton by mule power will be shown, followed by electric vehicles typical of the present-day, modern method of transportation of such commodities. It is expected that probably 20 electric trucks and some 30 electrically driven pleasure vehicles, besides a few old-fashioned conveyances to effect the contrast, will participate in the parade.

A feature of the parade will be a wireless control. A stationary wireless plant will be placed in the city hall; portable wireless apparatus will be carried at the head of the parade and also in the center of the line, and orders will be issued by radio.

In Pittsburgh, Pa., four miles of downtown streets will be gorgeously illuminated. Prizes will be offered for window displays and bargains will be offered by the principal electrical stores for each day of the Week. One of the big features of the Week will be a monster night parade in which all the electrical jobbers, contractors, manufacturers and central stations will participate. It is estimated that several thousand men will be in line together with large numbers of beautifully decorated floats.

In Asheville, N. C., practically every display window on Patton Avenue, from Haywood to Pack Square, will be used to display the various uses of electricity, as applied to domestic and commercial uses. Competent decorators will be in charge of the arrangements of each window. Another feature of the celebration will be a parade of decorated electric vehicles which is being arranged by the committee in charge. These vehicles, including everything from dainty electric coupes driven by ladies to the big motor trucks which will haul several tons without trouble, offer great possibilities in the way of decorations, and as valuable prizes will be offered for the most artistic vehicles in the parade, a splendid pageant is expected. An outdoor exhibition of moving pictures dealing with electrical subjects will be shown, and illustrated lectures will be given dealing with electrical science in a practical way.

In Dayton, Ohio, seventeen dollars will be offered in prize money to Dayton school children by the Jovian League for the best essay on electricity, as one of the features of the Week. An electric pleasure vehicle sociability run will be held which will wind

Digitized by Google

up with refreshments at the Dayton Country Club. A special meeting of the Dayton Advertising Club will be held during the celebration at which a lecture upon "Electricity for Advertising Purposes" will be given. The Jovian League of Dayton will hold a rejuvenation and initiation which, for the members of the League, will be the event of the Week.

Denver, Colo., has recently selected a Queen Electra to preside over a big electrical prosperity show to be held in the auditorium. She was selected from among one hundred beauties. Her identity is a secret. No one knows her and not until the opening ball on Monday night, November 29, will her identity be disclosed. On that night before hundreds of people Electra will unmask and thereafter during the week of the electric show will rule supreme over all things electrical. She will radiate brilliancy and electricity, for she will be gowned in an exquisite robe in which will be concealed myriads of small electric lights. Other prominent features of the Week for which extensive preparations are being made will consist of an electric-vehicle parade and electric automobile races. The widespread interest which is being manifested in these events would seem to indicate that they will be of unusual interest. There is also to be provided in connection with the celebration a giant electric flag, 125 feet by 150 feet. This flag is to be made up of red, white and blue electric lights, and will be placed in front of the Gas and Electric Building. The veterans of the Civil and Spanish American Wars are to participate prominently in the celebration upon one day of the week to be known as "patriots' day." The school children will participate in the events of "patriots' day" by singing National hymns.

Elaborate plans are being completed for celebration of the week in Chicago by the Commonwealth Edison Company. Special appliance campaigns will be carried on.

Nashville Jovians Plan Big Celebration.

Elaborate preparations will be made by the Jovian League of Nashville, Tenn., for observing Electrical Prosperity Week. A committee composed of J. Pink Lawrence, James A. Shingleton, A. G. Maddux, L. R. Ritter, J. H. Ansley and James E. Carnes has been named to look after the detail of the celebration locally. As worked out these plans provide for illumination of important buildings, electrical demonstrations and exhibits of a nature that will interest the public, etc. The Nashville Railway and Light Company will co-operate in the celebration, putting up special electric signs and issuing special informative booklets.

Wichita Prosperity Week Plans.

The electrical industries of Wichita, Kan., have prepared elaborate plans for the celebration of Electrical Prosperity Week. There are to be three parades. The first to be held on November 29, at night, consisting of all the officials and employees of the combined electrical industries of the city. The novel features of this parade are that the Bell telephone, Western Union Telegraph Company, street railway and interurban interests are also included. There will also be included a great number of decorated illuminated floats, entered by all local manufacturers and dealers who are also promoting a "Made-In-Wichita" campaign, also about ten decorated street cars, belonging to the Wichita Street Railway. Special street illumination will be provided by means of spans of incandescent lights strung across one of the main business streets every hundred feet for ten blocks, also flood lighting by means of projectors. It is planned during the progress of the parade to turn off the Magnetite arc White Way system and then turn it on again immediately after the parade.

On Wednesday night, December 1, there will be a parade of electric pleasure vehicles, these to compete for two prizes of $25 each for the best decorated and illuminated interior, and the best decorated and illuminated exterior. Second prizes consisting of two Frantz Premier electric cleaners are to be awarded. There are 120 electric cars registered in Wichita, of which number at least 75 are expected to parade.

On Saturday night, December 4, the parade will be devoted to the Jovian Order, which is strongly backing the entire celebration. This will consist of specially decorated floats, carrying the officers of the Order, one officer on each float, these to be decorated in accordance with the character represented. The candidates for rejuvenation to be held on the same night, to the number of 20, will be confined in a barred cage float attended by the balance of the membership attired as Imps and other satellites.

The leading business men of the city have entered into the spirit of the occasion and will compete for specially illuminated and trimmed windows. Cash prizes are offered by the electrical interests to be given to the window trimmers competing. Splendid support has been given by the leading newspapers, especially the Wichita *Beacon*, and there will be a special edition published on November 27, containing five electrical pages devoted to advertisements, and publicity of all local electrical industries. No electrical show has been provided for, as one was held in Wichita the latter part of October, it being a part of the Fall Wheat Show, from which much good publicity was derived.

It is also planned to have an illuminated balloon ascension. The Wichita Aero Club will use its new balloon "Wichita I," and it is hoped that this will be piloted by Captain E. H. Honeywell, of St. Louis, providing the weather conditions are satisfactory. This is to be illuminated with colored lights, arranged on the basket, and the bag proper to be lighted up with several electric searchlights.

The Wichita *Beacon* has also offered three prizes to the ladies of the city writing the best article on "Electric Appliances in the Home."

Electric Steel in Germany.

The total production of electric steel in Germany in 1914 was 90,000 tons and only 5,800 tons less than the total output of crucible steel. Twenty electric steel plants were in operation, 10 having Siemens-Halske furnaces, seven Heroult furnaces, two Nathusius furnaces, and one a Keller furnace. Of these 20 installations, eight are producing high-grade electric steel to supplant crucible steel, and the remaining 12 use the electric furnace to melt ferro-manganese. A number of steelworks are said to be contemplating the installation of electric furnaces. Of a total of 44,000 tons of electric steel produced in furnaces controlled by Siemens and Halske, 34,400 tons were made in induction furnaces, 7,400 tons in Girod furnaces, and 2,250 tons in radiation furnaces. As regards the 12 plants used to melt ferro-manganese, four are of the induction type, three are Heroult and two are Keller furnaces, while one each of the Rombach, Girod and Nathusius types are employed.

New Electrical Companies in Chile.

The Compañia Eléctrica Caupolicán (address: Rengo, Chile,) has been organized with a capital of 800,000 paper pesos (about $130,000 American gold) to take over certain electrical machinery already installed and to purchase the concession for lighting the towns of Rengo,, San Fernandom, Rancagua, Peumo, San Vincente, and eight others.

La Compañia de Luz Eléctrica de Constitución has been organized, with a capital of 60,000 Chilean paper pesos (about $10,000 United States gold), for lighting and providing power to the town of Constitución, located in the Province of Maule, on the coast. Constitución has a population of about 6,500 and is a popular seaside resort.

The addresses of directors in these two companies may be had upon application to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices.

Digitized by Google

LOCATING FAULTS BY THE DROP-OF-POTENTIAL METHOD.

By H. S. Percival.

The location of a circuit fault such as a "short," "cross" or "ground," is usually determined with the aid of a Wheatstone bridge, but if a bridge is not available, recourse may frequently be had to the drop-of-potential method. This method requires only a source of current and a suitable voltmeter, and while the results are not ordinarily so accurate as may be obtained with a bridge, it can be used to advantage in many cases, if the length of the circuit is known.

The purpose of this article is to describe the theory of the drop-of-potential method and to discuss its application in certain typical cases.

Theory.—If a source of direct current be connected to the terminals of a circuit of uniform resistance, Fig. 1, there will be a fall of potential along the conductor, proportional to the current flow and to the conductor resistance. By connecting a voltmeter V across the terminals AB of the circuit, the total fall of potential or "drop" can be read on the instrument, or by connecting the voltmeter, Fig. 2, between one terminal and any point C, along the circuit, the drop in the part of the circuit AC between the voltmeter terminals will be indicated on the instrument. Since the drop is proportional to the conductor resistance, which is in turn proportional to the length, the ratio of the drop over the total length ACB, to the drop over the part AC, is equal to the ratio of the total length of the conductor to the length of the part, viz:

$$D:d::L:X \qquad (1)$$

where

D = deflection when drop is taken over the total length $A\ C\ B$,

d = deflection when drop is taken over $A\ C$,

L = total length of the conductor $A\ C\ B$,

X = length $A\ C$.

Stating the proportion (1) in the form of an equation, we have:

$$D/d=L/X \qquad (2)$$

from which

$$X=dL/D \qquad (3)$$

Therefore, if the total length is known, the length of the part may be calculated from equation (3).

Now, if the conductor is crossed with another at any point, the latter may be used, in effect, as an extension of the voltmeter lead, to measure the drop between the end of the conductor and the cross. For example, let the conductor ACB, Fig. 3, be crossed with the conductor FE at the point C. Then, if current from any convenient source is passed through the circuit ACB, the drop D over the entire circuit may be read by connecting the voltmeter V to the terminals AB, as shown by the full line, and the drop d from A to C, by connecting the instrument between A and F. Therefore, if L, the length of the circuit ACB, is known, the distance from A to C may be calculated from formula (3).

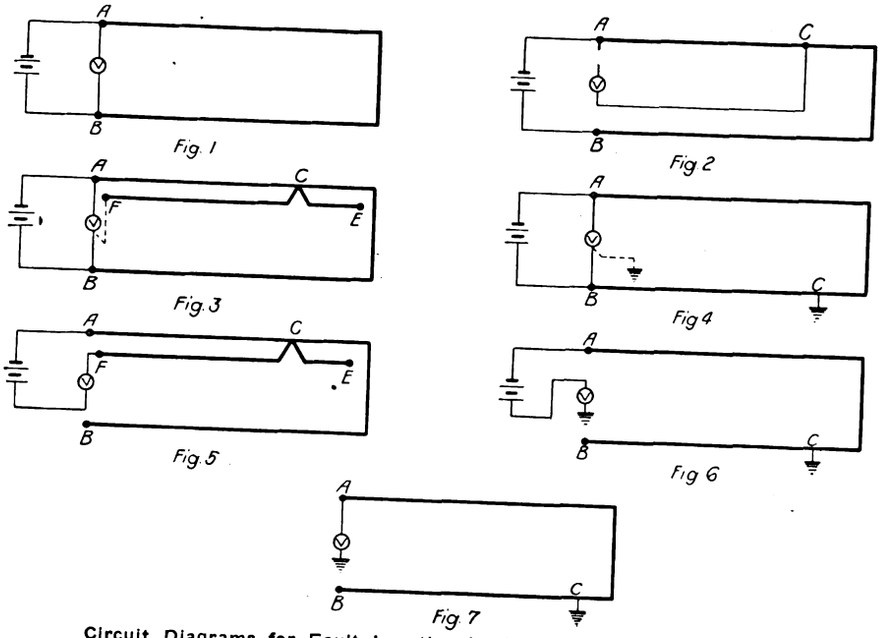
Similarly, if the circuit had been grounded, Fig. 4, at any point C, the drop D over the total circuit could be measured as before and the drop from A to the fault could be determined by connecting the voltmeter between A and ground, as shown by the dotted line. The distance from A to the fault could then be calculated from formula (3) as in the case of a cross.

Application of the Method.—It is is to be noted that since the drop in both cases is proportional to the current flow as well as to the resistance of the conductor, the results will be inaccurate if the current flow is not the same when drop d is taken as when drop D is measured. A constant source of supply is therefore essential. This feature is of particular importance when primary batteries are used as the source of current because, as will be pointed out below, fairly large currents are sometimes necessary and when currents of more than a few amperes are drawn from ordinary cells the potential, and consequently the current flow, decreases quite rapidly. To meet this condition the battery leads should be connected to the circuit under test only long enough to read the voltmeter in each case, disconnecting the battery while the change in voltmeter connections is being made. This can be conveniently done by means of a small switch.

Where the circuit is of sufficient resistance to prevent excessive current flow, it may be connected directly to ordinary lighting mains, but in most cases where such a source of supply is to be employed it will be necessary to insert a suitable resistance between the mains and the circuit under test to keep the current within reasonable limits. If a resistance is used, all voltmeter connections should be made so that the resistance is not included in the portion of the circuit over which the drop is taken; in other words, the inserted resistance must not be embraced by the voltmeter leads.

It is to be noted that for a given error in reading the voltmeter, the error in the result will be larger the smaller the deflection. It is important, therefore, if an accurate location is to be made, that the deflections d and D be reasonably large proportions of the full scale of the instrument. If the circuit is of considerable resistance, satisfactory deflections can usually be secured with a small current and an ordinary 150-volt instrument, but if the resistance of the circuit is small, as in the case of a transmission line, a low-resistance voltmeter and a current flow of several amperes will be necessary to obtain deflections large enough to avoid serious inaccuracy in the location. The current flow should not, of course, be sufficiently great to heat the conductor, as its resistance would be changed thereby.

With any source of supply it is well to repeat the readings d and D several times, rejecting any which are not in practical agreement with the others for the same voltmeter connections. This will tend to eliminate error in reading the instrument and indicate whether there is any variation in the current flow. Where primary batteries or small storage batteries are used, the readings should be made as quickly as possible and the battery circuit opened promptly in order to avoid draining the battery



Circuit Diagrams for Fault Location by Drop-of-Potential Method.

Digitized by Google

and consequent diminution of the current flow as pointed out above.

Even low-range voltmeters are of considerable resistance, so that extending the voltmeter terminal to the fault by means of the conductor with which the circuit is crossed, in case of a fault of that nature, or through the earth, in case the conductor under test is grounded, does not introduce appreciable error on account of the extension of the voltmeter lead.

If, however, the fault itself is of a resistance amounting to more than a negligible percentage of the voltmeter resistance, reading d will be in error by approximately the same percentage, unless a correction is made. The presence of excessive resistance at the fault can be ascertained by connecting the voltmeter as shown in Fig. 5, in the case of a short or cross, or as in Fig. 6, in the case of a ground. In either case the voltmeter reading will be practically equal to the voltage of the supply, if the resistance of the fault is negligible. If any appreciable difference is noted, an approximate correction can be made by increasing the reading d of the test by the percentage which the check reading is of the supply voltage. For example, if the voltage of the supply is 110 and the deflection when the voltmeter is connected as in Fig. 5 or Fig. 6 is 104.5, then the difference, considering 110 volts as 100 per cent, is 5 per cent. Therefore the deflection d given by the test should be increased by 5 per cent in calculating the location of the fault.

When the fault is a ground, it is important that the earth connection at the testing point be of low resistance, since undue resistance at that point would be as serious as a high resistance at the fault. A low-resistance ground can ordinarily be secured by connecting to gas or water pipes. In the absence of such means or a good existing ground, an iron rod driven four or five feet in permanently moist ground will usually be satisfactory.

The presence of earth potential between the ground at the fault and that at the testing point will also cause inaccurate results in measurements of that kind, unless proper corrections are made. The existence of such potential may be ascertained by connecting the voltmeter as shown in Fig. 7. If earth potentials are present, a deflection will be noted on the instrument and allowance can be made therefor by adding the deflection to the test deflection d, in case the earth potential is in the opposite direction to that of the test current, or by substracting the earth potential if they are in the same direction. It is also to be noted that when testing for the location of a ground, the current supply should not be grounded, as otherwise the current will not flow through all parts of the circuit under test in equal amounts, which is, of course, essential to the accuracy of the test.

In the foregoing, it has been assumed that the faulty conductor can be looped back to the testing point by a good conductor of the same gauge and material. This cannot always be done in practice, but if any conductor can be secured which can be connected to the faulty conductor at the distant end or at any point beyond the fault, and which is also available at the testing point, a location can usually be made, if the lengths of the faulty conductor and the return conductor, from the testing point to the point at which they are connected together, are known. It is not necessary that the lengths be the same, but it is essential that their resistances be known, and that each of the conductors be of uniform resistance throughout the length used in the test. The gauge of each conductor will usually be known, or if not, can readily be ascertained and the resistance calculated from standard wire tables.

The modification of the method which must be made, if the faulty conductor and the return are not of the same gauge and material, consists essentially in reducing D, the drop over the whole circuit, to an amount S representing the drop over the faulty conductor alone. If the resistance of the faulty conductor be represented by R_1 and that of the return conductor by R_2 then

$$S=R_1D/(R_1+R_2) \qquad (4)$$

This amounts to saying that the drop S over the faulty conductor alone is that proportion of the total drop D, which the resistance of the faulty conductor is of the total resistance. It is to be noted, however, that the drop S cannot be used in formula (3) since L in that formula represents the total length of both conductors. It is necessary therefore to change L to P, the length of the faulty conductor alone. The formula then becomes:

$$X=dP/S \qquad (5)$$

Examples.—The following examples will show the application of the drop-of-potential method.

(*a*) Two wires of a three-phase transmission line 12.6 miles long are crossed at some point between the generating station A and the distant end of the line B. For convenience let the wires be numbered *1*, *2* and *3*, and suppose the cross to be between wires *1* and *2*. Suppose further, that the test for the location of the cross is to be made at A and that a 220-volt direct-current supply is available. Transformers or other apparatus should, of course, be disconnected from the line at both A and B in order to leave the wires clear for test. Ordinarily this will merely involve opening switches or main-line fuses.

The question of whether or not the resistance of the cross is negligible should be determined first, by connecting one terminal of a voltmeter which will read 220 volts, to one side of the 220-volt supply, and the other terminal to wire *1*. Wire *2* should then be connected to the other side of the 220-volt supply and the deflection noted. The pressure at the terminals of the 220-volt supply should also be checked and the two readings compared. Assume that the voltmeter deflection is substantially the same in both cases, thus indicating that the cross itself is of practically no resistance.

Now let either of the crossed wires, say wire *2*, be connected at B to wire *3*. This connection should be firmly made so as to avoid introducing foreign resistance at that point and should be of sufficient conductivity to carry the testing current without heating. Arrangements should be made at A to connect the 220-volt supply to the same wires, i. e., *2* and *3*, through a resistance great enough to avoid excessive current flow. The voltmeter test connections at A may be made either directly to the line wires where they enter the station or to the line terminals of main-line switches or fuses, but in any event must be made on the line side of the resistance.

Connect the voltmeter first between wires *2* and *3*, close the circuit to the 220-volt supply and note the deflection. This deflection will be D since it includes the drop over the entire circuit. Assume it to be 10.75 volts.

Connect the voltmeter between wires *1* and *2* and note the deflection d. Suppose this deflection to be 4.20 volts. Since the line is 12.6 miles long, the circuit is double that or 25.2 miles.

These values may then be substituted in formula (3), thus

$$X=4.20\times25.2/10.75=9.85.$$

Therefore the fault is 9.85 miles from the generating station.

If conditions had permitted, a convenient alternative to the use of a resistance to limit the current flow in this case would have consisted in reducing the field excitation of the generator supplying the testing current, until a potential was obtained which could be applied directly to the circuit without causing excessive current flow.

(*b*) Assume that when the voltmeter was connected in series with the crossed wires to determine whether or not the resistance of the cross was negligible, the deflection had been 212.4 volts and that when the 220-volt supply was checked, it was found to be 220.8 volts. These readings differ by 8.4 volts, indicating that there is resistance at the cross itself which should be taken into account to avoid inaccuracy.

Let 220.8=100 per cent.,

Then 8.4=3.8 per cent.

It will be necessary therefore to increase deflection d by 3.8 per cent.

d=4.20 volts,

3.8 per cent of 4.20=0.16 volt.

Then $d'=d+0.16=4.36$ volts.

Digitized by Google

Inserting this value in formula (3) gives

$$X=4.36\times25.2/10.75=10.2.$$

Therefore under these conditions the fault would be 10.2 miles from the generating station.

(*c*) Suppose that wire *1* in example (*a*) had been grounded. In that case the connection at *B* would have been made between wire *1* and either wire *2* or *3*, say wire *2*, and a test would not only have to be made to determine whether there was any appreciable resistance at the fault but also to find if there was any difference of potential between the fault and *A*. The question of potential should be settled first, since if potential were present, it would give false indications in the test to determine the presence or absence of resistance at the fault, as well as in the location itself, unless proper allowance were made in each case.

The presence of earth current could easily be detected by connecting a voltmeter between wire *1* and the station ground. If a rapidly fluctuating potential were found, a representative value should be calculated by taking a series of readings, say every five seconds for a minute and determining the average. If the potential fluctuated slowly, some mean recurring value should be selected and the connections arranged so that the voltmeter could be left in circuit between wire *1* and ground until the chosen potential recurred and then shifted quickly to the proper connection for the desired reading. If the potential were found to be constant, the procedure would, of course, be much simplified, but in practice a constant difference of potential between two grounds is seldom encountered. Suppose, in the case in question, that a difference of potential is found which varies slowly between a minimum of 0.65 volt and a maximum of 2.85 volts and that a value of 2.0 volts is of frequent occurrence, the ground at the fault being at all times negative to the station ground. Since the fault has been assumed to be negative to the station ground, the positive terminal of the voltmeter would be connected to ground and the negative terminal to wire *1* to read the earth potential. Therefore, if the negative side of the 220-volt supply were grounded and the positive voltmeter terminal shifted quickly from ground to the positive side when an earth potential of 2.0 volts was noted, the deflection would be equal to the actual voltage of the supply plus 2.0 volts, if no appreciable resistance were present at the fault. If resistance were present at the fault, the deflection would be less than that value by an amount depending upon the amount of resistance. Suppose, in this case, that the actual voltage of the supply was, as before, 220.8 and that the deflection obtained in the manner just described, was 208.4. Since this value was obtained with an earth potential of 2.0 volts assisting the 220-volt supply, the deflection is 2.0 higher than if no earth potential had been present. Consequently, the true value by which to modifv *d* would be 206.4.

The drop *D* over the entire circuit should then be taken by connecting the voltmeter between wires *1* and *2* and passing the proper testing current through the same wires. In taking the drop *d* it will be necessary to observe the same precaution as in determining the correction to be made for the presence of resistance at the fault. namely, to select a particular value of the earth potential and take readings only at times when that value is observed. Since 2.0 volts was chosen in the former test, that value might be selected for the present test, though any other recurring value would do as well. Since the positive voltmeter terminal is connected to ground to observe the earth potential, a change in the voltmeter connections can be avoided by connecting the positive side of the 220-volt supply to wire *2*.

With the negative side not connected to wire *1*, no testing current flows through the circuit and the voltmeter reads only the earth potential, but when connection is made the voltmeter reads the drop *d* from the fault to *A* plus the earth potential at that moment. Therefore, by making connection between the negative side and wire *1* only when the earth potential is 2.0 volts, that value can be subtracted from the total deflection to find the drop which would exist if no earth potential were present.

Assume the deflection *D* to be 15.4 volts and the deflection *d* to be 8.95 volts. As indicated, the latter deflection is too large by 2.0 volts so that the true deflection *d* would be 6.95 volts, which could be used directly in formula (3) were it not for the presence of resistance at the fault, as shown by the preliminary test. The actual voltage of the supply in the preliminary test was 220.8 and the corrected deflection was 206.4 volts, giving a difference of 14.4 volts. As before, let

$$220.8=100 \text{ per cent,}$$

$$\text{then } 14.4=6.52 \text{ per cent.}$$

It will, therefore, be necessary to increase deflection *d* by that percentage, giving a corrected deflection *d'* of 7.40 volts. The values may now be substituted in formula (3) thus

$$X=7.40\times25.2/15.4=12.1.$$

Accordingly, the ground on wire *1* is 12.1 miles from the generating station.

(*d*) A No. 6 B. & S. single-phase signaling circuit carried on a 33,000-volt transmission line is crossed out at some point between the generating station *A* and a substation *B*, 16.4 miles distant. A "good" wire for the location of the fault cannot be taken from the transmission line on account of interference with service but a No. 12 N. B. S. gauge telephone circuit carried on the same pole line is available. In order that the wires may be clear for test the terminal apparatus at *A* and *B* should be removed from the signaling circuit and from the telephone circuit and one of the wires of the signaling circuit connected at the substation to one of the wires of the telephone circuit. The remaining wire of the signaling circuit will therefore be used as an extension of the voltmeter lead to the cross. For convenience, call this wire *1*, the other wire of the signaling circuit wire *2*, and the telephone wire which will be used to loop the circuit back to the testing point *A* wire *3*. The connection at the substation will therefore be made between wires *2* and *3*.

Assume that a preliminary test shows that the resistance of the fault is negligible and that the location test gives a drop *D* over the entire circuit of 24.6 volts and a drop *d* from *A* to the fault of 3.45 volts. Since the return wire *3* is not of the same gauge as that of the faulty wire, it will be necessary to determine what portion of the total drop *D* is given by the drop over the faulty conductor alone. The resistance of the faulty conductor is that of 16.4 miles of No. 6 B. & S. gauge copper, which at the temperature at the time of test, 60 degrees Fahrenheit, is 33.6 ohms ($=R_1$). The resistance of the telephone wire taken from resistance tables for the same temperature is 81.5 ohms ($=R_2$). The drop over the faulty conductor alone is by formula (4)

$$S=33.6\times24.6/(33.6+81.5)=7.18 \text{ volts.}$$

Substituting this value and the length of the faulty conductor in formula (5) gives

$$X=3.45\times16.4/7.18=7.88 \text{ miles.}$$

Accordingly the fault is 7.88 miles, or for practical purposes 7.9 miles from the generating station.

Electric Utility Companies in Japan.

According to the monthly report just published by the Electricity Bureau in the Communications Department at Tokyo, Japan, electric enterprises in that country at the end of May numbered 615, the combined capital amounting to $303,410,786 United States currency. In comparison with the end of 1914 there is an increase of 14 in the number of enterprises and $541,475 in their combined capital.

Power-supply companies make up the largest number of these, being 524 in all with a combined capital of $154,793,112, while electric street-railway companies number only 44, though their combined capital is $25,520,010. Others number 47 with a combined capital of $123,147,463. The total power-generating capacity of all of these electric companies is estimated at 727,783 kilowatts, being an increase of 7,551 kilowatts over that at the end of last year. During May four new electric lighting companies were organized.

Digitized by Google

Regulation of Public Utilities.

On the evening of November 22 a dinner meeting was held at the Hotel Sherman, Chicago, by the Chicago Section of the American Institute of Electrical Engineers, and the Electrical Section of the Western Society of Engineers. In opening the meeting directly after the dinner, Chairman W. J. Norton, of the Chicago Section, and the speaker of the day, Leonard A. Busby, spoke feelingly of the late H. M. Wheeler, who was chairman of the Electrical Section of the Western Society of Engineers.

The main feature on the evening's program was the presentation of a paper by Leonard A. Busby, president of the Chicago Surface Lines, the title of the paper being "Regulation of Public Utilities." Mr. Busby opened the paper by referring to the need of free discussion and educational publicity, in order to familiarize ourselves with regulation problems. He then took up the question of utility regulation, dealing particularly with the electric railway systems of large cities. He spoke of the great importance of street-railway service to everyone in the community, and showed how the traction question is not so much one of rates, since the five-cent fare is still practically universal, but one almost entirely of service. The rapid growth of large cities makes the service problems very aggravating, particularly during the rush hours. In Chicago, for instance, about 250,000 people are carried out of its central business district during the evening hours. The street-railway system of Chicago employs 9,000 motormen and conductors, and handles about 3,000,000 passengers a day, which easily accounts for more or less frequent complaints. No other utility comes in such close and frequent contact with its customers.

Mr. Busby then took up what he called the multiple-unit regulation of utilities and particularly of the Chicago traction lines. First, there is the City Council and its very active Local Transportation Committee; the individual aldermen and various local improvement associations all wish to have an emphatic voice in the control of the service. By the Chicago ordinances there was created the Board of Supervising Engineers, which during the last eight years has very ably supervised the expenditure of $90,000,000 additions to the capital account. Finally there is the recently created Illinois Public Utilities Commission. These various regulatory bodies cause considerable conflict in regulation and a recent order of the State Commission has brought the matter to a head on account of being in direct conflict of the ordinance requirements.

The American public is insisting more and more on higher standards of service, although the rate of fare has not been materially changed in the last fifty or so years. It is now possible to ride in Chicago 30.5 miles for five cents, as compared with a five-cent ride of 1.1 miles in 1859. The type of car, its heating, ventilation and arrangement for comfort of passengers and the speed of service have all been greatly increased without increase in the compensation. Mr. Busby said the electric railways of the country represent an investment of about $5,000,000,000. He cited figures from the censuses of 1902, 1907 and 1912 showing that the amount of new capital going into electric railway systems is diminishing, which is due to the uncertainty of the return and the increasing burdens of regulation. At the present time 26 states have commissions whose power extends over electric railways. Although the functions of these commissions are variously defined, on the whole their object is to regulate chiefly the rates and service. The latter regulation should provide three predominant features: (1) Continuity of service. (2) Extension of service. (3) Improvement of the service. The two latter requirements necessitate the investment of more and more new capital, which requires that the utility have unimpaired credit.

Mr. Busby then took up the basis of sound regulation and enumerated the five chief elements involved therein. These are as follows: (1) Regulation presumes just, reasonable and adequate service requirements based upon just and reasonable compensation. (2) Regulation must not be so directed as to destroy the incentive to economy and efficiency. (3) A reasonable standard of service having been prescribed, the method and detail of providing that service should be left to the utility. (4) Unnecessary interference with operation is bad, and tends to increase the cost of service and to increase the cost to the public of maintaining the regulation. (5) The right to regulate these utilities is neither municipal nor state ownership. These points were elaborated in considerable detail by Mr. Busby. In conclusion he called attention to the change of attitude of the state government to utilities. Whereas in the early days the legislature was urged to encourage internal improvements, nowadays the excessive zeal of utility commissions and of various regulatory measures, if unchecked, would put practically every public utility concern out of business. Fortunately the courts are still fair-minded.

The paper was discussed briefly by Bion J. Arnold, who referred to the fact that many utility companies in recent years, especially street railways, have accepted settlement ordinances, the Chicago traction ordinances of 1907 being the first and practically models of this type. Speaking of the rates of return that are guaranteed to these utilities, he showed that the Chicago traction companies receive at least five per cent on their investment, and the surplus above this is divided between the city and companies. In Cleveland the street-railway company is definitely limited to a return of six per cent. In Kansas City the recent ordinance fixes the return at six per cent and utilizes any surplus over this for retiring intangible valuations. Mr. Arnold said he believed that the best interests of all would be concerned by going one step further; namely, after guaranteeing a fixed return on an agreed valuation and retiring the intangibles, further surplus should be used for improving the service.

Radio Station for Society Islands Near Completion.

The radio station now being built by the French Government on Tahiti Island, Society Islands, will be ready to receive and transmit commercial messages before the close of 1915, the United States Bureau of Navigation announces. The temporary station now in course of erection will be followed by a much more powerful plant. The plans of the temporary station contemplate a 10-kilowatt installation of the type used by the French Government, with a wave length of 600 meters. The two towers will be 100 meters in height. The station will be expected to reach Awanui, New Zealand; Suva, Fiji, and the Samoan Islands.

Immediately upon the completion of the temporary station work will begin on the permanent station. This permanent 300-kilowatt station will be operated by a 500-horsepower gasoline engine, and will use a wave length of 2,500 meters. There will be eight towers, each 100 meters high, erected in parallel rows of four towers. The space between the towers will be 250 meters, and 200 meters between parallels. There will be two anennas, one of 600 meters wave length, the other of 2,500 meters.

With the permanent station it is expected that communication will be established with stations in Cochin-China; South America; Honolulu, Hawaii; San Francisco, Cal.; Sydney, Australia; and even in Martinique and Guadeloupe, West Indies. All material used in the construction of these stations is supplied by the French Government and is shipped from France.

Digitized by Google

Benjamin Banquet.

Fifty-two executives and salesmen of the Benjamin Electric Manufacturing Company attended a banquet given by the company's manufacturing department to the members of the sales and advertising departments of the Central Division, at the Hotel La Salle, Chicago, Monday evening, November 22.

E. A. Drake, factory manager, acted as toastmaster. In calling the meeting to order he referred to the fact that in order to co-ordinate the various departments of a growing organization after the manner required by scientific management, it became increasingly necessary that each should know something of the problems of the other. Harmony and co-operation were essential to successful business building. These could be promoted by a sympathetic study of the difficulties as well as successes in various lines of endeavor. With this thought as the keynote of the meeting the two principal speakers of the evening were introduced.

The first was R. B. Benjamin, president of the company. He held his audience in rapt attention with a preliminary historical sketch of the company's development. After enumerating a number of handicaps which beset the path of the inventor he exhibited samples and models showing various steps in the evolution of an attractive new line of wiring devices which are now under consideration. He was followed by W. D. Steele, vice-president and general manager of the company, who discussed at some length the various factors which enter into the cost of an article after the items of material and factory labor had been disposed of. In a concise and clean-cut manner he followed the various operations incident to the manufacture and sale of goods, showing in detail their relative importance, and pointing out how in the aggregate, relatively insignificant items of expense might appreciably increase the cost of an article to the ultimate consumer.

Both addresses by the officers of the company were well received. They were followed by five minute rapid-fire talks on the following subjects:

"Quality of Material and Service in Salesmanship."

"The Place of Advertising in Business."

"Engineering - Department Problems."

"The Figuring of Costs."

"The Advantage of Bonus Rates in Production."

"The Metal Market."

"The New Field for the Factory Signal Horn."

"The Packing and Labeling of Goods."

"The Handling of Orders."

"Educational and Welfare Work Among Employees."

Among those who contributed to the discussion were A. E. Lubeck and G. B. Weber, salesmen; Andrew N. Fox, advertising manager; H. Pollard, superintendent of manufacture; L. W. Kester, manager of Cost Department; O. F. Westphal, inspector; C. B. Harlow, engineer of Auto Device Division; H. A. Varnell, purchasing agent; J. Estes, foreman of Traffic Department; Paul Phillips, chief engineer; H. A. Frahm, foreman of Plating Department; J. M. Watson, foreman of Assembly Department; George Thyer, manufacturing order clerk; Fred Stranberg, order clerk; C. H. Harrington and C. Vroman, stockkeepers.

Results of Electric-Furnace Operation in an Alaska Mine.

The gold precipitate from the zinc-dust presses in the cyanide plant of the Alaska-Treadwell Gold Mining Company, at Treadwell, Alaska, is treated, in the refinery adjoining, by the Tavener, or lead-smelting method. About 3 or 4 tons of this precipitate is produced monthly, having a gold assay value of $40,000 to $60,000 per ton.

It was formerly the practice to treat the by-products from this process, consisting of 2 tons of slag, 300 pounds of matte, 500 pounds of refinery refuse, flue dust, etc., in a 24-inch water-jacketed blast furnace. This practice was discontinued in the summer of 1914 by reason of the difficulty of keeping the lead-well open when treating a high-grade lead product; of preventing the loss of gold in the flue dust; and of avoiding injury to the general health of the refinery operators; a plain single-phase electric furnace was substituted for the blast furnace.

The furnace was constructed from an old steel acid drum by cutting off the top and introducing a cable, made from strands of bare copper wire, through the bottom and spreading the strands out fan-shaped on the inside of the drum.

Powdered graphite, obtained by grinding up old crucibles, mixed with 10 per cent cement, was tamped wet into the bottom of the drum, around and completely covering the copper wires. The graphite was carried up to the bottom of the furnace, or lead-well, and acted as the lower electrode. The sides were built up of ordinary fire brick forming a melting chamber 14 inches in diameter by 20 inches high.

The upper electrodes, of graphite or carbon, are three inches in diameter and 40 inches long, arranged with joints enabling new electrodes to be connected without shutting down or wasting stubs. A screw feed was arranged for raising and lowering the upper electrode.

The cover for the furnace had three openings, one for feeding the charge, one for the escape of gases, and one in the center for the introduction of the electrode. It was later found more practical to enlarge this center opening to 6 inches in diameter, to allow of a central feeding of the charge around the electrode. A 4-inch pipe connected to a ventilating fan carries off the escaping gases. The furnace is operated on the lighting circuit through a 50-kilowatt transformer, at 60 cycles, 110 volts.

In starting, the furnace is operated as an arc furnace, until it has become thoroughly hot, when the charge, consisting of slag, brick dust, etc., is added, the electrodes being raised as the load in amperes increases, until the entire chamber is filled with the charge and the upper electrode extends into the melt almost a foot. As the charge continues to melt the electrode is moved down or up, keeping the amperage reading as nearly constant as possible. The raising or lowering of the upper electrode decreases or increases the power consumption and thereby affects the amount of heat generated.

At this stage the furnace is no longer operating as a simple arc furnace, but has automatically transformed itself into a resistance type of furnace, the semi-fluid or molten charge acting as the resistant, the current passing from one electrode through the center of the charge to the other.

After the charge is in quiet fusion, which takes on an average 2 hours and 10 minutes, the power is turned off and the charge allowed to settle.

In operation, the molten lead and slag are tapped, as in the blast furnace. If the lead freezes it is melted by diverting current from the upper electrode and letting it pass through the lead, the tapping rod playing as an arc on the side of the furnace or into the lead tap. The operators use colored or amber glasses to protect their eyes from the glare of the electric arc.

Total running time, 128 hours 40 minutes.
Average weight of charge added, 160.5.
Average fusion time of charge, 2 hours 25 minutes.
Total number of charges, 53.
Graphite electrodes used, one per 24 hours.
Total energy for 128 hours 40 minutes, kilowatt-hours, 4,440.
Energy used per hour, 34.50.
Energy used per pound of material fed, kilowatt-hours, 0.52.
Energy used per ton of material fed, kilowatt-hours, 1,044.
Acheson graphite used per hour, feet, 0.15.
Material melted per hour, pounds, 67.7.
Material melted for 24 hours, pounds, 1,625.

Both graphite and carbon electrodes are used, the former costing $2.95 each, and the latter $1.20. Power cost is less than one cent per kilowatt-hour.

The labor required for the operation of the furnace, including the work of charging and tapping, is one-half one man's time.

Digitized by Google

BOOK REVIEWS.

"Dielectric Phenomena in High-Voltage Engineering." By F. W. Peek, Jr. New York: McGraw-Hill Book Company, Incorporated. Cloth, 264 pages (6x9 inches), 190 illustrations. Supplied by the Electrical Review Publishing Company, Inc. for $3.00.

"Though old the truth and oft exprest,
'Tis his at last who says it best."

This is the poet's way of stating the principle that controls in the preparation of most textbooks. This, however, is not wholly true with reference to books on technical subjects, especially those that give the results of investigations and research. The book before me belongs to this latter class. Although much work has been done in studying the properties of dielectrics, perhaps most of the investigations have been made with comparatively low voltages. The facilities of the General Electric Research Laboratories permit the investigations of the effects of high voltages which very few, if any, other institutions can equal.

After a general mathematical analysis of the dielectric field and dielectric circuit, Mr. Peek gives the results of his extensive research in high-voltage problems. He not only gives the results of his investigation, but analyzes these results and where possible derives general laws. The subject is treated under the following heads: Visual Corona, Spark-over, Corona Losses, Corona and Spark-over in Oil and Liquid Insulations; Solid Insulations, Electron Theory; Practical Corona Calculations for Transmission Lines; and Practical Considerations in the Design of Apparatus where Solid, Liquid, and Gaseous Insulations Enter in Combinations. A practical bearing is given the treatment of each subject and many photographs of visual corona and oscillograms of the corona current are given. One of the interesting and important features of the book is the extensive consideration given to the manner of making engineering investigations and of reducing the data, the measurement of high voltages, the effects of impulse and high-frequency voltages, and the outline of modern theory. The book will undoubtedly prove useful to engineers and also to students of high-voltage phenomena.

C. M. Jansky.

"Telephone Appraisal Practice." By J. C. Slippy. Pittsburgh: J. C. Slippy. Cloth, 98 pages (6 x 8¼ inches). Supplied by Electrical Review Publishing Company, Inc., for $4.00.

This volume applies the principles of public-utility appraisals to telephone plants exclusively, and is unique in this respect. It comprises six chapters. The first explains the objects and scope of the work and methods used. The second deals with inventory and gives a number of useful forms. The third considers costs and gives a large number of average unit costs. This is probably the most valuable portion of the book. The fourth chapter deals with depreciation and also gives data taken from actual experience. In the fifth chapter a list of state utility commissions, with their powers, is given, and the requirements of different commissions discussed. The last chapter consists of a single page of bibliographical references. The book should be of service both to managers of telephone companies and to engineers dealing with this class of work.

"Elementary Electricity and Magnetism." By W. S. Franklin and Barry MacNutt. New York: The Macmillan Company. Cloth, 174 pages (4¾x7½ inches). illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $1.25.

"Advanced Theory of Electricity and Magnetism." By William S. Franklin and Barry MacNutt. New York: The Macmillan Company. Cloth, 300 pages (5½x8½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc., for $2.00.

The authors of these two volumes have, by their previous publications, led folks to expect something original in their treatment of courses of study. The intention is here expressed to "keep the student's mind jammed up tight against physical things." This seems to the reviewer to have been better accomplished in the elementary text than in the advanced course, which is largely of a mathematical nature. The general treatment in both volumes is good, and the idea of connecting the study of physics as far as possible with practical things is excellent.

The elementary book has but five chapters, and leads from the more familiar things to the more complex. The sub-title informs us that it is a textbook for colleges and technical schools. This is borne out by the use of algebraic expressions and chemical formulas, but the simplicity and brevity of the subject matter seems more suited to high-school or even grammer-school classes. There are some things taught which will have to be unlearned later, such as the statement that Ohm's law is not true for circuits containing motors or storage batteries. Indeed the derivation of this law is such as to completely mask its significance. The text is amplified by problems, a desirable feature.

The advanced course contains ten chapters dealing with magnetism, electromagnetism, electrostatics, electric waves and electrons. The last subject is treated in a descriptive rather than mathematical way, but the earlier chapters involve the use of calculus and are mainly mathematical. The scope is "advanced" in comparison with the elementary volume, and is well adapted for a college course. Problems illustrate the work of each chapter.

"Arithmetic of Alternating Currents." By Ellis H. Crapper. London: Whittaker & Company. Cloth, 208 pages (4¾ x 7¼ inches), 45 line diagrams. Supplied by Electrical Review Publishing Company, Inc., for $0.75.

Each chapter of this excellent little book contains an explanation of the principle involved and a solution of one or more problems, thus illustrating the method to be employed. A set of exercises is then given, answers to which may be found in the back of the book. In this way the student is enabled to check his work. There are ten chapters in all, dealing with Periodic Quantities, Generation, Inductance, Capacity, Parallel Circuits, Polyphase Power, Transformers, Motors, etc.

"Calcul des Lignes Aériennes au Point de Vue Mécanique par des Abaques." By André Blondel. Paris: La Lumière Electrique. Paper, 63 pages (8½ x 10¾ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $1.25.

The author has from time to time worked out curves for the computation of transmission lines. These are reproduced here with explanations and derivations of the formulas used, and comparisons are made. The last curve applies to aluminum. The effects of temperature and of stretching are considered. Applications of the method to actual cases are taken up, and various conditions considered. The third chapter deals with the supports. Appendices give the French regulations and a bibliography.

"The Year-Book of Wireless Telegraphy and Telephony, 1915." New York: The Marconi Publishing Corporation. Cloth, 800 pages (5¼ x 8¼ inches) with illustrations and map. Supplied by the Electrical Review Publishing Company, Inc. for $1.00.

This is the third issue of the Year-book, and in size it is almost the same as the previous edition. Among other things it includes a record of the year's developments; laws and regulations; a list of wireless stations with call letters (this occupies over 250 pages); useful formulas, data and tables; patents granted during the year; lists of operating companies and wireless societies; codes; bibliography; and a number of special articles dealing with radio subjects. A wireless map of the world, 32 by 20 inches in size, is bound in the back of the book. It shows the location of wireless stations and also the principal steamship routes. This book will be indispensable to those having frequent need for information along the lines noted. There is a great deal of incidental matter of interest, such as portraits and biographies of well known men, dictionary of terms, and calendars. There is a full index. The paper used is thinner than that in the previous volume, so that a less bulky book is the result.

Digitized by Google

New Electrical and Mechanical Appliances

Electric Heater to Prevent Gasoline Automobiles from Freezing in Cold Garages.

The approach of cold weather is again bringing troubles to the owners of gasoline automobiles. Aside from the difficulty of starting a chilled engine there is the great danger of having the radiator freeze up, which means heavy expense as well as trouble. To overcome this latter difficulty it has come to be a practice by many to use so-called anti-freezing mixtures, which are not always reliable, or to drain the radiator on leaving the car in an unheated garage, which requires refilling, generally with warm water, before starting up; all this is very inconvenient, however. To put in any stove, gas or steam radiator to heat the garage is expensive. Moreover, the engine and machinery contained within the hood of the car is all that really needs to be kept warm.

Electric Heater for Gasoline Cars.

This problem has been very happily solved by means of a very simple and compact electric heater recently placed on the market by the Hughes Electric Heating Company, 211 West Schiller Street, Chicago, Ill. As shown in the accompanying cut, this heater is shaped like and is about the size of a common dry cell. It contains a durable heating element that takes but 100 watts on any 110-volt lighting circuit, to which it is attached by means of a rugged 10-foot cord and plug. The shell and end caps thoroughly protect the element and are neatly finished. The shell is perforated to allow circulation of the heated air from within. The outfit weighs less than one pound.

To use this heater, the plug is merely inserted into any lighting outlet in the garage (and every garage should have at least one such outlet), place the heater within the hood of the car, and then turn on the current. It keeps the vitals of the car at a uniform, safe temperature which permits starting up without delay and exertion. The cost of the heating current is but one cent or less per hour where the maximum rate is 10 cents per kilowatt-hour. This simple device should prove a great boon to the motorist who has not yet been converted to the merits of the electric vehicle.

New Swiveling Attachment Plug.

In the last few years there has been an extraordinary increase in the use of electrical appliances adapted for

Fig. 1.—Plug Separated to Show Post Construction.

ready connection to lighting circuits by means of flexible cord and attachment plugs. Every possible means for reducing the cost of production of such appliances with their connecting cords and plugs should be encouraged, as it results in a reduction in price and consequent increased sale.

To aid this tendency the Best Electric Company, Fifty-first and Harrison Streets, Pittsburgh, Pa., has placed on the market a new attachment plug which it is said can be wired in less than half the time that is required to wire an ordinary plug. The secret of this advantage lies in the interior construction of the plug which, as shown opened in Fig. 1, can be seen to have very convenient binding posts. The wire is merely inserted through the cap and the ends bent over the binding posts and fastened by the terminal screws. There is no need of making a knot in the cord, since the posts are so constructed as to act as a very effective strain-relief device, which also serves to prevent the wires slipping. The wires are cut to even lengths, thus reducing waste and facilitating the wiring job.

The screw shell of the plug is of the swiveling type, which permits easy connection of the plug without twisting the cord. The body of the plug and its cap are made of an asbestos composition which is heatproof, does

Fig. 2.—"X-Ray" View to Show Plug Interior.

not burn, melt or warp and is not affected by oil or water.

Protection from Submarines.

An Italian electrical engineer, Emile Guarini, has announced the invention of apparatus which will enable a vessel to deflect the course of a torpedo which has been aimed at it, and also to make the torpedo explode before coming in contact with the vessel. The means used is said to be electrical, but the nature of the apparatus has not been announced. It is said that even though the use of this device may be known to those firing a torpedo, it will be impossible to prevent its application.

Digitized by Google

Light-Weight Street-Railway Motor.

The encroachment of the "jitney" in the street-railway field has led to the study of the broad problem of transportation, and the conclusion reached is that a light-weight car weighing from 8,000 to 12,000 pounds completely equipped, without load, with possibly one-man operation, would be a requirement at an early date.

A car of this weight would have a seating capacity of 24 to 30 passengers, depending upon the arrangement and design, and would meet the requirements of most operating companies during the light-load periods, and in most cities of 100,000 population or less, will undoubtedly meet all requirements.

The economies of a light-weight car are numerous, since it involves power consumption per average passenger hauled, track maintenance, brake-shoe and wheel wear, and above all, platform expense, as one-man operation is possible where local conditions permit. The larger number of cars which can be purchased for the same amount of money permits more frequent service for a given investment, and in turn faster schedules are possible, due to less stops made with frequent headway. The public, as a rule, appreciates rapid and frequent service, which if properly advertised would unquestionably be more attractive than the jitney.

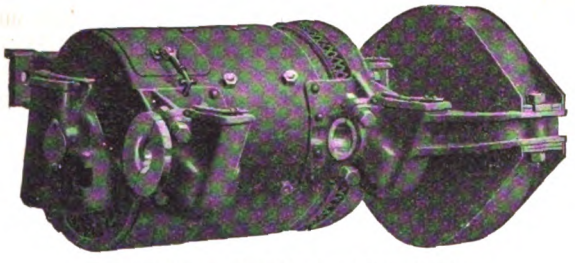
The Westinghouse Electric & Manufacturing Company, realizing the necessity for a motor to fill the requirements of light-weight car operation, made a thorough investigation of the requirements which would have to be met under the varying conditions, and developed an entirely new motor of light-weight yet rugged construction to properly perform such service. The result is the new No. 505 railway motor, popularly designated as the "Wee" (Westinghouse Electric Efficiency) motor.

This motor has a rating of 17.5 horsepower at 600 volts, and weighs, complete with gears, gear case and axle bearings, 800 pounds. It is said to be the lightest weight motor for railway service ever placed on the market. The design includes all of those features which have proven successful in larger sized motors that have been on the market for some years, only such changes being made as are necessary to adapt it to the service requirements.

The Corpus Christi (Tex.) Street Railway Company was the pioneer in working out this problem, and ascertaining the availability of the Wee motor, purchased eight double equipments for immediate delivery. The company operates a city line three miles long, and the cars, weighing 14,000 pounds, are to make eight stops per mile, with a maximum speed of 30 miles per hour.

The Albuquerque Traction Company, Albuquerque, N. M., also purchased seven double equipments of this motor, for city service. The cars, weighing 11,800 pounds and seating 28 people, will have a schedule speed of nine miles per hour with eight stops per mile, over a line three miles in length.

The Rio Grande Railway Company, Brownsville, Tex., has adopted two single equipments of No. 505 motors. The existing road is operated by mules and one of the Wee motors will satisfactorily perform the service requirements.



"Wee" Light-Weight Street-Car Motor.

Lee Electric Radiators.

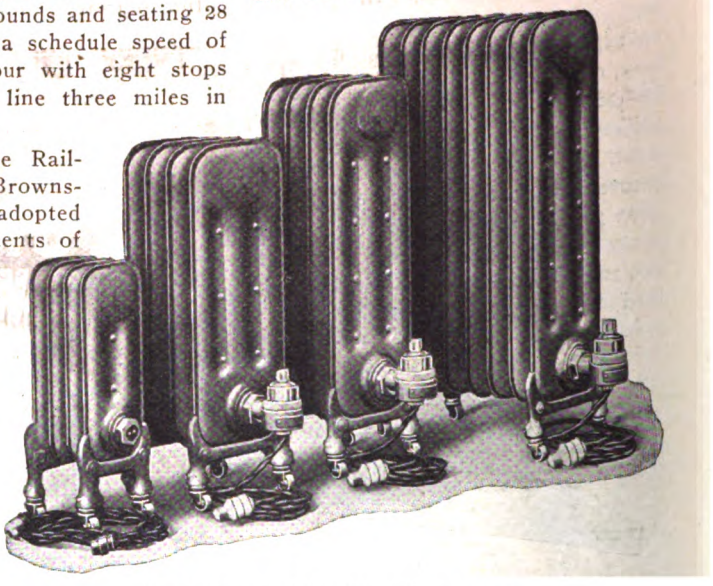
The marked advantages of electric heating, due to its safety, convenience, absence of air contamination, and ability to apply it wherever needed, are bringing about its steadily increasing use, particularly in places where it is possible to secure comparatively low rates, whether they be primary, secondary or tertiary. Such rates, say five cents or less per kilowatt-hour, make the cost of operation moderate.

In the case of rooms where no heating equipment is provided, such as so-called sun parlors, ticket and cashiers' booths, etc., the installation of portable electric radiators proves not only very effective but quite economical, both in first and operating costs. In many cases rooms that are exposed to strong winter winds are found to be inadequately heated and the provision of additional heat is most conveniently and cheaply done by placing in such a room a portable electric radiator that may be readily connected to existing lighting or wall outlets.

To meet the growing demand for equipment of this character, the Lee Electric Radiator Company, 335 Wells Street, Chicago, Ill., has developed a line of portable radiators, comprising complete self-contained units rated at 200, 500, 750 and 1,000 watts. These appliances have been designed to provide steady and easily controlled heat by means of a portable radiator that may be readily placed where the heat is needed; they are also so built as to give a durable equipment that involves minimum maintenance costs.

The principle involved in the construction is that of an open resistance coil submerged in a circulating, non-corroding, non-freezing, insulating liquid; this is a commercial fluid that does not materially increase the cost of the appliance. The entire unit is hermetically sealed; therefore there is no evaporation of the liquid. The electric coil is contained in the bottom longitudinal passage of the radiator, and by use of the liquid as a circulating medium steadiness and uniformity of heat is produced on the entire heating surface of the radiator, which resembles a steam or hot-water radiator, but has no valves or vents. The fundamental principle of circulation is carried out to perfection; the radiator operates efficiently and quietly without the pounding and hissing of steam radiators. It also holds its heat well after the current is turned low or off.

These units are easily installed. They require no connection to any piping system. They may be quickly attached to any lighting socket or wall receptacle and can be easily regulated by means of a three-heat switch. The casters with which they are equipped



Several Sizes of Lee Electric Radiators.

Digitized by Google

make them easily transportable from one location to another, the 500-watt size weighing approximately 40 pounds complete. The 500-watt or most popular size can be operated at full heat for only two cents per hour in localities where the cost of current is four cents per kilowatt-hour and proportionately for other rates. As soon as the radiator has reached full heat, the current can usually be reduced to an amount sufficient to maintain this heat, thus producing further economy.

Chase Changeable Signs.

There are many places where the ability to change an electric sign from time to time is very advantageous. For instance, theaters must announce their changes of bill frequently, department stores and other merchandising establishments very often have special sales and in many other cases the possibility of changing the sign gives renewed interest and value to it on account of the attention it continues to command.

In line with this idea the Chase Electric Company, 105 South Dearborn Street, Chicago, Ill., has developed a system designed primarily to permit the ready change of electric signs. However, it is well adapted also for miscellaneous purposes where it is desired to connect various appliances to convenient outlets quickly and interchangeably. The system consists of what are called wireless continuous sliding contact strips; these are molded of Bakelite insulating compound and include two phosphor-bronze continuous strips that form the terminals of the circuit. The arrangement is well shown in Fig. 1. The upper portion of this diagram is a front view of these strips and at the upper right corner is a simple end view thereof. A rear view of this set of strips is shown in the lower portion of the diagram, and in the lower right corner is shown a typical contact hook which answers the purpose of an attachment plug. This may be connected to the back of the letter in the case of changeable signs, or to an extension cord where portable appliances are to be connected to the continnous contact strips. The contact hook needs merely to be obliquely inserted from the upper front portion of the strip and in the case of a sign letter this thereby hangs it in place.

From this it is readily seen that to change a sign is a matter of but a few moments. The advantage of this arrangement in the case of signs is not only that it very decidedly facilitates the change of the sign, but it eliminates the need for having on hand a multiplicity of signs. All that is necessary is to keep on hand a few sets of the various letters of the alphabet, the number depending upon the relative frequency of use of the various letters and also upon the total number of letters to be displayed in the sign. A typical installation of one of these changeable signs is shown in Fig. 2, which is the main entrance to the La Salle Opera House on Madison Street, near La Salle Street, Chicago.

Fig. 1.—Continuous Contact Strip for Changeable Signs, Etc.

Fig. 2.—Changeable Sign in Front of Theater.

This entire system is built up of unit parts. For instance, the continuous contact strips are made in unit lengths of two and four feet. By joining two of these it is evident that a six-foot sign can be obtained; likewise, by further assembly a sign of any length is obtainable; a four-foot sign base made of two two-foot units is shown in Fig. 3. To get greater width in the sign it is likewise possible to add unit width sections to obtain any desired width or height of sign. The company sells durable letters of various forms equipped with the contact-hook device shown in the lower right corner of Fig. 1.

Wallace Lamp-Shade Patent Held Valid.

The United States District Court, Southern District of New York, has held after a hearing that United States patent No. 1,117,131 dated November 10, 1914, which is the patent covering the lamp shades upon the portable electric lamps of the Wallace Novelty Company, Incorporated, is a valid patent and that it has been infringed by the Leindorf Electric Light Company, of New York City, which has been selling a lamp with a shade of this description.

The court has granted a permanent injunction forbidding the Leindorf Electric Light Company or its agents from manufacturing, using or selling lamp shades of this character and has ordered that an accounting for profits and damages be made to the Wallace Novelty Company, Incorporated.

Fig. 3.—Four-Foot Strip Made Up of Two Units.

Digitized by Google

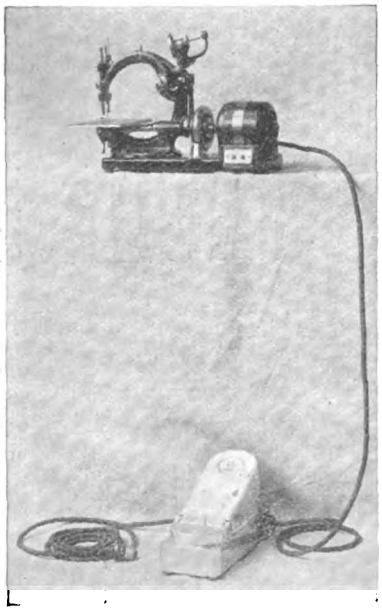
Electric Drive for Wilcox & Gibbs Sewing Machine.

A new type of motor for the Wilcox & Gibbs domestic sewing machines was shown in operation at the recent New York Electrical Show in the Westinghouse Electric & Manufacturing Company's booth. The motor is smaller than those previously used and is coupled directly to the machine shaft without use of belts, brakes or friction drive.

The speed of the motor and hence of the needle is under perfect control by the operator from a special foot pedal supplied with the motor. In this pedal there is a specially constructed resistance which has virtually an unlimited number of steps similar in principle to a slide-wire resistance. This gives perfect speed control from zero up to 1,800 stitches per minute. However, as this maximum speed is higher than practicable, an adjustable stop is provided so that the operator may easily adjust the maximum speed to suit her own requirements. Any speed from the maximum to the slight movement giving a single stitch, may be obtained. The acceleration is always smooth regardless of what speed is desired; there is no jerking and therefore no breaking of threads.

No brake is necessary, because the motor very quickly comes to rest, since the large flywheel required with foot power is not included in the drive. The motor is of the compensated universal type permitting it to be used on any 110-volt circuit whether it be direct current, 25, 60 or 133-cycle alternating current.

A very good idea of the compactness of the motor may be gained from the illustration, as the small size of the Wilcox & Gibbs sewing machine is well known.



Compact Electrically Driven Wilcox & Gibbs Sewing Machine.

Electrically Operated Motion Signs on Horse-Drawn Trucks.

A very unique method of advertising has been developed by the American Sugar Refining Company, of New York City, utilizing the large number of trucks that its Brooklyn plant operates.

The fifth of these trucks is now equipped and it is planned to have about 25 more within about two months.

There are three types of signs. No. 1, shown in Fig. 1, advertises Crystal Domino granulated sugar. This sign has a revolving disk which illustrates the sugar flowing from the standard carton to a large bowl.

Fig. 1.—Appearance of Motion Sign on Truck.

Another sign shows the well known "Little Miss Crystal Domino" emptying a carton of Crystal Domino sugar tablets into a sugar bowl. Around this sign is a revolving disk with spiral colored stripes which give a rainbow effect.

The third sign advertises both granulated and tablet Crystal Domino sugar. The picture of the carton of the tablet sugar appears. Then this picture disappears and the granulated sugar carton appears in its place.

The mechanism of the signs is driven by a six-volt ball-bearing motor, made by the Robbins & Myers Company, Springfield, O. The motor runs at 1,000 revolutions per minute and takes 10 amperes. A 120-ampere-hour lead storage battery supplies the current. Fig. 2 shows the method of mounting the motor on the back of the sign. The battery is supported at the rear of the truck under the body.

The batteries are charged each night, twelve batteries being charged in series across 115-volt mains. Six sets of twelve charging receptacles are provided permitting 72 storage batteries to be charged at a time.

Four men are employed to maintain the batteries and signs, two on day and one at night. Considering the distribution obtained, this method of advertising has proven very inexpensive.

Safeguarding Fire Hazards in Buildings.

It is far from the purpose of anyone in sympathy with the safety movement to advocate the continued use of fire traps, whether for business, public or private purposes, but common sense would suggest that if certain danger spots were effectively protected so that even if fire started around them, it could not easily spread, the hazard would practically disappear so that the old buildings might quite well be continued in use.

Asbestos lumber has a great protective value even against actual flames, while as an insulation for protecting woodwork from the effects of heat, as found in boiler rooms and similar places, it offers almost perfect protection.

A boiler room ceiled and lined with Transite asbestos lumber is fire resistant to a high degree. The asbestos lining does not readily transmit heat, as does metal, and consequently the asbestos-protected woodwork does not acquire the tinder-like dryness of improperly insulated material, while in case of actual fire, the flames cannot readily pass the asbestos lining, nor does the woodwork readily char.

Where partitions are pierced for the passage of flues or pipes, an insulation panel is easily inserted, while a sheet of asbestos wood placed behind a radiator effectively protects the wall.

For electric switchboards, switch-

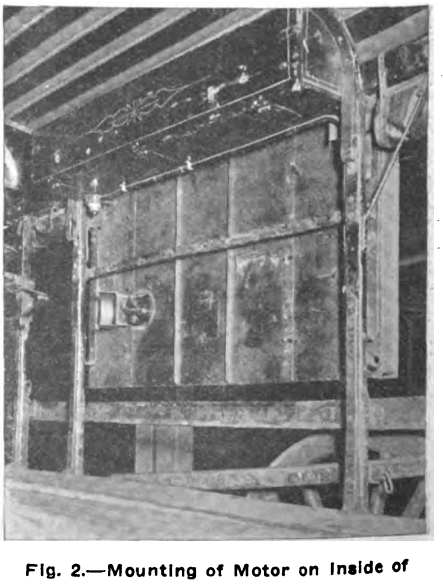


Fig. 2.—Mounting of Motor on Inside of Truck Sign.

Digitized by Google

boxes, partitions and other central-station installations working at high tension, it is advisable to use ebony asbestos wood which is entering largely into the equipment of central power stations all over the country.

By the judicious use of these two materials, in such places as indicated, many old buildings may be made safe without waiting for the order of the fire commissioner. It is far better and usually far cheaper to be prepared, than to wait until the commissioner issues his order.

The owner of a building in which every reasonable precaution has been taken against both the occurrence and spread of any possible fire is in a far stronger moral position than the man who has done nothing. In the one case he will be admitted to have done his best, with the result that his efforts are likely to be approved, while in the other the building may be condemned without any option.

Transite and ebony asbestos woods referred to herein are the products of the H. W. Johns-Manville Company, New York City.

Electric Signal Horns for Factories.

The accompanying illustrations shows two new factory signal horns placed on the market by the Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill. One represents the vibrator type, the other a direct-current motor-driven type. On the high-voltage direct-current vibrator horn a special condenser bridged across the magnet-coil winding is used. This precludes any arcing at the vibrator contacts inasmuch as the condenser absorbs the charge or kick-back from the coil caused by the breaking of the electric circuit. The alternating-current horn has only one moving element; there are no contacts or vibrator springs. It is furnished for any commercial voltage from 110 volts down, and for any frequency which may be specified.

Vibrator-Type Factory Horn.

The direct-current motor-driven horn may be used either for automobile or factory service. In the former case standard winding is for connection to a six-volt storage battery; in the latter case it can be furnished for voltages from 6 to 60 or higher, not to exceed 110. It is equipped with a skeleton-type ventilating motor. The armature is adjustable, taking up any possible wear on the ratchet wheel or diaphragm button. This is one of the most powerful medium-size horns on the market.

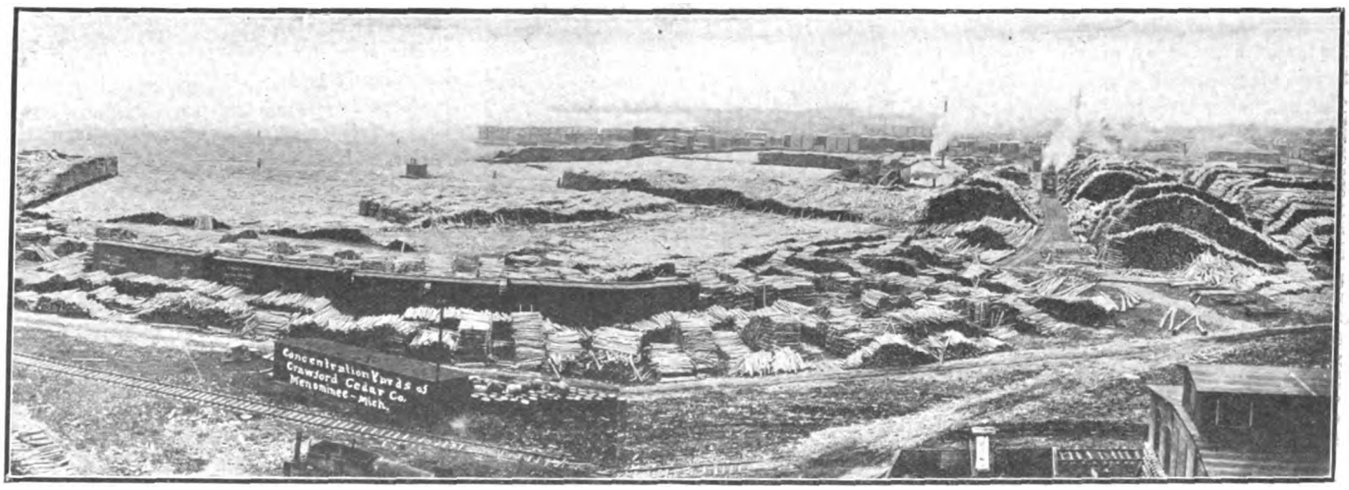
These horns may be used not only in combination with interior fire-alarm systems, but may also be operated as interior calling systems. They are approved by the National Board of Underwriters. Blue prints showing typical installations have been prepared for those interested in these devices for interior service.

Concentration Yard of Crawford Cedar Company.

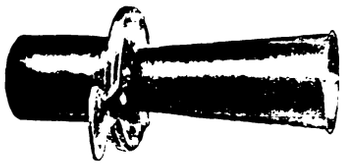
In the construction of pole lines it is very frequently necessary to secure poles and other material on short notice in order to make urgent extensions or replace damage caused by storms. This imposes the requirement on the producer of pole-line materials of maintaining large and well sorted stocks at points provided with good shipping facilities.

In the accompanying illustration is shown the concentration yard of the Crawford Cedar Company at Menominee, Mich. This firm is one of the best known producers of cedar poles, ties, posts, piling. etc. The view shown includes about two-thirds of the yard, which contains piled up about 125,000 cedar poles 18 feet in length and about 1,000,000 posts ranging from 7 to 16 feet in length; there is also an accumulation of about 125,000 cedar and hemlock ties. In the background of the picture can be seen a large volume of material being removed from a raft in the waters of Green Bay. This material is being taken out, sorted and distributed into the respective piles by machinery for facilitating these operations. Included in this are two traveling derricks, an elevator scow hoist and endless chain tramways that are back of the mill.

Aside from the large concentration yard which the company maintains at Menominee, it also carries considerable stock at various operating points and landings along the lines of the Chicago & Northwestern, Chicago, Milwaukee & St. Paul, Wisconsin & Michigan, the "Soo" Line and the South Shore railroads.



Main Concentration Yard of Crawford Cedar Company.



Benjamin Motor-Driven Horn.

Noteworthy Electric Furnace Installations.

During the past two weeks the Snyder Electric Furnace Company, Chicago, Ill., has started up three basic furnaces at the plants of the Gerlinger Steel Casting Company, Milwaukee, Wis., Halcomb Steel Company, Syracuse, N. Y., and Dayton Steel Foundry Company, Dayton, Ohio. The Gerlinger furnace is the same type and size as those which were started up during September in the plants of the Niagara Electric Steel Corporation, North Tonawanda, N. Y., and S. Fair & Son, Inc., Saginaw, Mich. It has a 24-hour capacity of six tons. The Halcomb furnace has a 24-hour capacity of

Digitized by Google

30 tons, and the Dayton furnace a capacity of 10 tons.

Metal from the second blast of the Gerlinger furnace showed a tensile strength of 72,000 pounds, unannealed and 120,000 pounds annealed with an elongation of 20 per cent in two inches. The carbon content was 0.45 per cent. The Holcomb furnace poured good tool-steel ingots on the very first heat and is operating satisfactorily as designed and guaranteed.

Electric Sterilization of Milk.

The Electro-Pasteurized Milk Products Company is a new Columbus, O., enterprise. The Ohio state dairy inspector states that to his knowledge there is no other plant in the country where milk is sterilized by electricity. While conducting a plant for the sale of product in the usual way, the company has the larger object of demonstrating the process and apparatus which it has originated.

The milk flows by gravity through a series of porcelain cups. In the bottom of each cup is located an electrode which is connected with the main wire carrying an alternating current of 2,200 volts. The electrodes in two adjacent cups are connected to the opposite poles of the generator supplying the current, and as the milk flows out of the first cup into the one below it the electric circuit is thus closed, the milk serving as a conductor of the current from one electrode to the other, and so on through the series of cups, which gives pure milk with all bacteria eliminated.

Tests made by the city bacteriologist of Columbus, who is also a member of the Ohio State University faculty, have led him to announce the product of this plant to be absolutely sterile. Another local authority reports that a sample of milk examined by him three hours after it came from the cow disclosed 144,500 bacteria per cubic centimeter, and that a second examination made after the sample had passed through the electric process in question showed that there had been a removal of 144,494 bacteria, or over 99.99 per cent.

Whereas pasteurizing by heating requires half an hour and leaves the milk with a more or less disagreeable taste, the electric process does the work in about twnty seconds and enhances the natural flavor of the milk, it is claimed, without introducing any unnatural taste.

Greatest stress, however, is laid on the greater purity of the milk. The boiling process, it is stated, while destroying the active bacteria which are in the milk at the time, does not kill the spores which afterward develop into active bacteria. The electric purifying process not only kills the active bacteria, but from the continued application of the current as the milk flows from one cup to another develops these spores into active bacteria and seals their fate through the electric route.

The company is now treating about 300 gallons of milk a day, for which it is finding a ready sale. The output is soon to be increased, and the plant made into a model demonstrating place for dairymen and others who may become interested.

A New Sketching Sign.

A highly novel and interesting form of sign has recently made its appearance in London, where it is on show at several of the chief railway stations, according to *The Illuminating Engineer*.

The design is projected on to a large white sheet about 12 or 15 feet square,

Electric Sketching Sign.

which is erected high above the heads of people on the platform and can be seen from all parts of the station. The interesting thing about the sign is that each motto and drawing is sketched out before the eyes of the onlookers in the course of a few minutes. For example, in the illustration shown, the moving pen has finished sketching the figure and has nearly finished tracing the words "Flor de Dindigul." A picture is only shown for a few minutes and during each night a large variety of advertisements can be shown, a small weekly charge for each being made. The illustration gives an excellent idea of the vivid appearance of the sign, as contrasted with the dimly lighted station area.

The sign is worked as follows. The operator sits in a small inclosure a short distance away from the screen. Any desired picture is traced out on a brass plate by a small metal pencil, which is attached to two wires guiding an inking pen operating on a transparent sheet of gelatine paper. When the point of the pencil is applied to the brass plate an electric circuit is completed and the inking pen is thus brought in contact with the transparent paper. Then owing to the mechanical connection between the pen and the pencil any motion of the latter is reproduced exactly by the former. The drawing is thus traced out in ink on the transparent paper, which is situated in an arc light projector and is thereby thrown on the screen, forming an image of jet black lines on a brilliant white background.

The operator, while sketching out the drawing, keeps his eyes on the screen, and the public sees the whole design being sketched out by the pen, starting with a blank white sheet and ending with the finished drawing. After the sketch is completed a short time is allowed for it to be seen by the public, and then a new portion of the endless roll of transparent paper is substituted and the process begins over again.

The sign invariably attracts notice. It has already been tried for recruiting purposes at Liverpool and proved almost too successful—attracting a crowd which within a few minutes completely blocked the roadway!

A New Peat-Distillation Process.

A new process for the distillation of peat has recently been patented in Great Britain and other countries by which coke, fuel, oil, toluol, ammonia, paraffin wax, and acetone are obtained in sufficient quantities and of such high grade as to prove of great value. The process has been in practical operation now some six months and seems to promise to revolutionize the peat industry and to furnish sources of fuel oil to the British Navy which possibly make it independent of foreign oils.

The peat is first broken up in a macerator, compressed into briquets, dried to reduce the mosture content to 25 per cent and then fed by means of a worm-screw conveyor through a triple-chamber retort in which the successive chambers have increasing temperatures. The gases distilled off are condensed and the condensate separated.

With peat costing about 8 shillings ($1.95) per ton delivered in the hopper, dry, it is believed that by this process a profit of not less than 15 or 20 shillings ($3.65 or $4.87) per ton will be obtained; and this does not include any allowance for the toluol and acetone, which may prove to be more valuable than all the other products together.

Electric Taxicabs.

Electric taxicabs to the number of 700 will soon be operating in New York City.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CONDUIT BOXES—Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill.

Laundry outlet boxes with hinged and locked covers, catalog Nos. 1550-2 inclusive, 1560-2 inclusive, 1570-2 inclusive.

Also above types with steel or porcelain covers or with porcelain bushings.

Listed September 21, 1915.

CONDUIT OUTLET BUSHINGS AND FITTINGS. — National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Couplings for connecting flexible conduit, catalog Nos. 2188, 2189.

Listed September 8, 1915.

LAMP CLUSTERS.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Adjustable socket clusters, 660 watts, 250 volts.

Keyless, catalog Nos. 867, 868, 869.

Pull or lever-key, catalog Nos. 855, 857, 877, 878, 879.

Listed October 27, 1915.

LIGHTNING RODS.—Boston Lightning Rod Company, 294 Washington Street, Boston, Mass.

Listed October 29, 1915.

PICTURE MACHINES AND APPLIANCES. — Non-Rewinding Film Reel Company, 713 Utica Street, Toledo, O.

Non-rewinding film reel and magazine. A special upper magazine and reel for motion-picture machines; so designed that by unwinding film from center of reel it can be repeatedly exhibited without rewinding it. A variety of supporting brackets are provided to make device attachable to any standard projecting machine.

Listed October 22, 1915.

RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" heater control combinations.

10 amperes, 125 volts, catalog Nos. 514-15.

Listed October 21, 1915.

RECEPTACLES, For Attachment Plugs.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Flush receptacles for use with standard Edison screw-shell attachment plugs.

C-H, 660 watts, 250 volts, catalog No. 7642.

Face plates, catalog Nos. 7643-4.

Listed October 15, 1915.

RECEPTACLES, For Attachment Plugs.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Surface type, 10 amperes, 250 volts, three-pole, catalog Nos. 6045, 6046, 6146; 20 amperes, 250 volts, three-pole, catalog No. 6055.

Flush type, 10 amperes, 250 volts, three-pole, catalog Nos. 6049, 6050, 6148.

Listed September 27, 1915.

RECEPTACLES, Standard. — The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

Arrow E, porcelain-shell receptacles.

Key, 250 watts, 250 volts.

Wall, cleat and concealed, catalog Nos. 4007-B, 4009-B.

Conduit box, catalog Nos. 4045-B, 4048-B.

Molding, metal or wood, catalog Nos. 4011-B, 4070-B, 4073-B.

Keyless, 660 watts, 250 volts. Sign or conduit box, catalog No. 102704.

Listed September 15, 1915.

RECEPTACLES, Standard.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Benjamin, porcelain shell.

Keyless, 660 watts, 600 volts. Catalog Nos. 341, 342, 358.

Listed September 24, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal shell, closed or slotted bases.

Keyless, 660 watts, 250 volts, catalog Nos. BX-13, BW-13.

Listed October 2, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal shell, closed or slotted bases.

Key, 250 watts, 250 volts, catalog Nos. BW-10, BX-10, BW-11, BX-11.

Key, 660 watts, 250 volts, catalog Nos. BW-12, BX-12.

Pull, 250 watts, 250 volts, catalog Nos. BW-15, BX-15.

Twin pull, 660 watts and 250 watts, 250 volts, catalog Nos. BW-17, BX-17.

Turn, 250 watts, 250 volts, catalog Nos. BW-14, BX-14.

Also all of above types with shadeholders attached; key types with composition or insulated metal key.

Listed October 11, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. Keyless, porcelain shell. Conduit box, 660 watts, 250 volts, catalog No. 4108.

Listed October 11, 1915.

RECEPTACLES, Standard.—Weber Electric Company, Schenectady, N. Y.

Brass shell.

Key, 250 watts, 250 volts, catalog Nos. UK130 (1435), UK132 (1441), UK133 (1444), UK134 (1447).

Keyless, 660 watts, 250 volts, catalog Nos. 50717, 50718, UL130 (1436), UL132 (1442), UL133 (1445), UL134 (1448).

Pull, 250 watts, 250 volts, catalog Nos. UP130 (1437), UP132 (1443), UP133 (1446), UP134 (1449).

Also above types with shadeholders attached.

Key types with composition or insulated metal key.

Listed October 11, 1915.

RHEOSTATS. — The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H" self-starter, bulletin No. 9765.

Listed September 25, 1915.

RHEOSTATS.—Monitor Controller Company, 111 South Gay Street, Baltimore, Md.

Automatic starting devices for direct-current motors.

Types Nos. 100-103 inclusive, 210-11, 215-16, 300-303 inclusive, 315-318 inclusive, 320-323 inclusive, 340-343 inclusive, 400, 405, 500, 501-02, 510-12 inclusive, 520-22 inclusive, 530-32 inclusive, 540-543 inclusive, 550-52 inclusive, 560-563 inclusive, 710.

Listed October 22, 1915.

SHADEHOLDERS. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Uno shadeholders. These shadeholders are designed to thread over spiral socket shells as supplied on Bryant or Perkins sockets or receptacles. Catalog Nos. 533, 534.

Listed September 15, 1915.

SIGNAL APPLIANCES.—Schwarze Electric Company, Adrian, Mich.

Schwarze electric bells for alarm and signalling systems. Single-gong, magneto, catalog No. 7.

Listed September 15, 1915.

SWITCHES, Push-Button Flush.—John I. Paulding, New Bedford Mass.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 972.

Double-pole, 10 amperes, 250 volts, catalog No. 973.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 974.

Four-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 2971.

Listed October 25, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

HOLYOKE, MASS.—The Board of Aldermen has voted in favor of a $100,000 bond issue, for the enlargement and improvement of the gas and electric light plants operated by the municipality. W.

ELBA, N. Y.—The Public Service Commission has authorized the Genesee Light and Power Company, of Batavia, to issue bonds to the amount of $10,000 for furnishing a new street-lighting system in Elba.

GOWANDA, N. Y.—The Gowanda Light and Power Corporation has been incorporated with a capital of $100,000. The directors are G. M. Gest, George A. Larkin and Edmund Wisnewski.

NORTH CENTRAL STATES.

DECATUR, ILL.—On his bid of $3,397.80, J. P. McGarry was awarded the contract for installing ornamental lights on North Water Street. Z.

KANKAKEE, ILL.—Tungsten lamps will replace the arc lights now in use for street-lighting at Kankakee, if plans being discussed by the city councilmen and officials of the Kankakee Public Service Company are carried out. It is proposed to put in the new lamps and have one at every street intersection. Z.

FOX LAKE, WIS.—A resolution has been passed granting a right to the Fox Lake Light and Power Company to erect and operate an electric lighting system in village. Address R. O. Williams, president.

MENOMINEE, WIS.—The Lannon Light and Power Company has been incorporated with a capital of $15,000, by W. C. Leitzke, A. H. Christman, and others.

ROCHESTER, MINN. — Specifications have been issued by the Charles L. Pillsbury Company, engineers, 805-811 Metropolitan Life Building, Minneapolis, Minn., for power plant equipment for a new municipal electric power plant. A new $45,000 power-plant building is now being erected and new machinery together with a part of the equipment from the old power plant is to be installed. The new plant will have a capacity of 1,725 kilowatts in generators and 1,040 boiler-horsepower. Bids will be received by the Public Utility Board at Rochester, W. F. Lenz, Secretary, until 10 a. m., December 8, 1915, for equipment installed as follows: Two 260-horsepower water-tube boilers, mechanical stokers for four boilers; ecomonizers and induced draft fan equipment; chimney; steel breeching and flues; overhead coal bunkers; coal crusher and conveying equipment; 750-kilowatt turbogenerator and condenser; switchboard; condenser for two engines; crane for engine room; electric elevator; industrial rail and ash car. Proposals can be made on any division or on any part or parts of the entire equipment.

SOUTH CENTRAL STATES.

RUSH SPRINGS, OKLA.—An electric light plant will be installed by the council. Address mayor.

ATLANTA, TEX. — The Atlanta Electric and Ice Company is preparing to build a new electric light plant here. D.

DALLAS, TEX.—The City Commissioners have passed an ordinance reviving in favor of E. P. Turner and associates a franchise for interurban trackage in Dallas granted to J. Mercer Carter in 1906. The Dallas Northwestern Company and Dallas Southwestern Traction Company, projecting interurbans to Denton and Glen Rose, hold the franchise. It provides that work must be begun on the lines within six months after passage of the ordinance and that twenty miles of line must be completed within 15 months.

HOUSTON, TEX. — The complete properties of the Brunner Water and Light Company have been sold by the receiver, A. J. Binz, to W. H. Ostenburg for $14,900. The property consists of an electric light plant and a waterworks plant, both of which are situated in Brunner.

M'KINNEY, TEX.—The citizens of the town will vote on the question of the sale of the municipal electric plant here to the Texas Power and Light Company. There are at present two competing plants in the town, neither of which is paying.

NORTH PLEASANTON, TEX.—The North Pleasanton Ice and Electric Company will build an electric-light plant here to cost about $25,000. L. B. Myers is interested. D.

PLAINVIEW, TEX. — The Texas Utilities Company, which has just been organized with principal office here, and having a capital stock of $250,000, has taken over the electric light and power plants at Plainview and Lubbock. It plans to invest about $1,000,000 in enlarging the plants and constructing transmission lines through a big scope of territory around the towns for the purpose of furnishing power to farmers for operating irrigation pumping plants and other industrial enterprises. The incorporators are E. M. Kurtz, H. W. Beck, H. Wurdack, of St. Louis, Mo. Mr. Wurdack is president of the company. D.

WESTERN STATES.

HAILEY, IDAHO.—Ferris Brothers, of Wisconsin, who own several electric power plants in the west, have purchased the local plant from the Hailey Electric Company, and are also negotiating for the Rockwell-White power plant at Bellview. When this deal is complete, the two plants will be merged, and will be managed by John T. Hart, who has had charge of the Hailey plant for the past two years. The capacity of the two plants will be enlarged, and mining properties in the vicinity of Hailey will be furnished with power. O.

RATHDRUM, IDAHO.—The plant of the Rathdrum Electric Company, formerly owned by A. O. Skinner, which includes the lighting, heating and power systems at Post Falls, has been sold to Ralph Y. Poole, of Ouary, Colo., and according to reports extensions and improvements will be made by the new owner. O.

TACOMA, WASH. — The Puget Sound Traction, Light and Power Company, operating the Tacoma Railway and Power Company, with head offices in Seattle, has been granted a franchise by the Pierce County Commissioners to erect poles and wires for electric transmission from Sumner to surrounding territory, and to Orting and a short distance beyond, covering practically all of the Puyallup Valley.

POULSBO, WASH.—The County Commissioners have granted the Poulsbo Light & Power Company a franchise to construct an electric power plant and to erect and maintain transmission lines in all portions of Kitsap County.

INDEPENDENCE, ORE. — A. L. Martin, local manager of the Oregon Power Company, reports his company will extend its transmission lines to Buena Vista, south of Independence, for the purpose of getting electric service to Buena Vista, and farming districts in between. O.

LA PINE, ORE.—Thoms Brothers, of Nebraska, affiliated with other eastern capital, recently purchased the power plant and properties of the Pringle Falls Water and Power Company, of La Pine. This company also maintains offices in Portland. It is understood the purchasers paid $300,000 for the property. The new company plans to supply power for the irrigation of the entire La Pine basin, and Eden-Coulee, Silver Lake, and Fort Rock Valleys. It is reported the first step in the development will be the furnishing of power and light to the town of La Pine. Work on the power plant is practically completed, and electrical equipment for the generation of current will be purchased and installed at an early date. O.

PRAIRIE CITY, ORE.—Announcement has been made by the Prairie Power Company that work will be commenced at once on the extension of its

SALEM, ORE.—The North Coast Power Company, of Vancouver, Wash., has filed articles of incorporation to do business in the state of Oregon, taking over the properties of the Washington & Oregon Utilities Company. The capital stock is $1,750,000.

Digitized by Google

NEW INCORPORATIONS.

LIBERTY, ILL.—The Liberty Electric Company has been organized with a capital of $2,500, by Steven G. Lawless, M. E. Graff and W. E. Merce.

CHAFFEE, N. Y. — The Chaffee Electric Corporation has been established with a capital of $5,000, by A. J. O'Dell, R. B. Fisher and J. G. Aleen.

NEW YORK, N. Y.—Superb Electrical Manufacturing Corporation. Capital, $2,000. Incorporators: Joshua Bernstein, Jacob Lichtenstein and David Price.

BROOKLYN, N. Y.—G. and G. Electrical Company, Incorporated. Capital, $1,000. Incorporators: Benjamin Gadofsky, Hyman Cohen and Morris Whinston.

ROCHESTER, N. Y. — Electric Panel Board Company, Incorporated. Capital, $5,000. Incorporators: John B. Tucker, William J. Pierce and Chester Y. Macdonald.

WAYNESBORO, VA.—Price Electric Devices Corporation. Electrical supply business; capital, $150,000. Incorporators: W. G. Ellerson, president; E. L. Eakle, secretary.

NEW YORK, N. Y.—Western Electric Company, Incorporated; electrical appliances, equipment, etc. Capital, $750,000. Incorporators: George J. Pratt, Thomas J. Perkins and John H. Peck.

CHICAGO, ILL. — The Absolute Contact Company has been incorporated to manufacture and deal in motorless electrical sign flashers and electrical devices. The company's capital stock is $50,000. John D. Clancy, L. M. Clancy and M. C. Ryan are the incorporators. Z.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,259. ELECTRIC METERS AND TRANSFORMERS.—A firm in Spain informs an American consular officer that it desires to be placed in touch with manufacturers of electric meters, transformers, bells, electric-light carbons, lamps, and all kinds of electric specialties. Correspondence may be in English.

NEW PUBLICATIONS.

NITROGEN IN COAL.—The Bureau of Mines has issued Technical Paper 64 entitled "Determination of Nitrogen in Coal," by A. C. Fieldner and C. A. Taylor. This compares different methods and indicates the sources of error.

HARDENED STEEL.—An article by Charles F. Brush entitled "Spontaneous Generation of Heat in Recently Hardened Steel" has been reprinted from the *Proceedings of the American Philosophical Society*. It shows that such heat generation is accompanied by changes in volume.

SMELTING IRON ORES.—The Canadian Department of Mines has issued a report by Alfred Stansfield entitled "Electrothermic Smelting of Iron Ores in Sweden." This describes the furnaces used, the nature of the ore and product, number of men employed, cost, etc., and gives an estimate of the cost of similar work in Canada.

TERRESTRIAL MAGNETISM.—The United States Coast and Geodetic Survey has issued publications Nos. 25 and 33 by Daniel L. Hazard. The first of these gives the results of magnetic observations made in 1914 on both land and sea. The second gives the distribution of magnetic declination in the Unitel States for January 1, 1915, with a chart and tables showing the secular change.

FINANCIAL NOTES.

The Consumers Power Company of Michigan, the principal generating subsidiary of Commonwealth Power, Railway and Light Company, has filed in Michigan a mortgage securing an authorized bond issue of $35,000,000 with the Harris Trust & Savings Bank, Chicago, as trustee. The new mortgage and the bonds under it are secured by liens on the entire property of the company and takes the place of the present collateral mortgage. The filing of the new mortgage is one of the final details in the plans of the company by which Consumers Power holds all its properties in fee, instead of through ownership of underlying stocks and bonds.

Dividends.

	Term	Rate	Payable
Con. Gas, Elec. Lt. & Pw., Balt., com.	Q	1.75%	Jan. 3
General Elec.	Q	2 %	Jan. 15
No. Ohio Trac.	Q	1.25%	Dec. 15
Rochester Ry. & Lt., pf.	Q	1.25%	Dec. 1
Shawnigan Water & Pw.	Q	1.75%	Jan. 10
Standard Gas & Elec., pf.	Q	1 %	Dec. 15

Reports of Earnings.

VIRGINIA RAILWAY & POWER.

	1915	1914
October gross	$ 473,073	$ 446,704
Net earnings	254,711	234,390
Total income	264,013	241,352
Surplus after charges	120,709	107,620
Balance after depreciation	112,376	99,286
Four months' gross	1,816,634	1,761,703
Net earnings	946,247	914,813
Total income	980,918	942,692
Surplus after charges	407,939	399,002
Balance after depreciation	374,606	365,669

DAYTON POWER & LIGHT.

	1915	1914
October gross	$ 99,239	$ 82,225
Net	50,347	37,814
Surplus	31,695	20,412
10 months' gross	855,391	756,588
Net	408,887	338,305
Surplus	227,592	166,199
12 months' gross	1,042,123	924,905
Net	497,594	416,430
Surplus	280,757	209,980

CONSOLIDATED COMPANY, BALTIMORE.

Consolidated Gas, Electric Light & Power Company, of Baltimore, the $11,472,334 common stock of which was recently listed on the New York Stock Exchange is a good example of the possibilities of development in gas and electric light and power corporations. The growth of the company from 1910 to 1915 inclusive was as follows:

	Year Ending June 30, '15	Year Ending June 30, '10	P. C. Inc.
Income from electricity	$3,301,199	$1,753,167	88
Income from gas	$3,374,915	$2,926,332	15
Electric customers	38,419	14,995	156
Electric sales in kilowatt-hours	126,933,209	37,790,200	236
Gas customers	121,866	96,416	26
Gas sales in cubic feet	4,199,790,500	2,934,872,100	43
Gas ranges in use	102,874	59,628	73
Water heaters in use	25,712	13,220	94

Income accounts for the last four fiscal years ending June 30, compare as follows:

	1915	1914	1913	1912
Total gross income	$6,789,401	$6,400,896	$6,114,973	$5,465,287
Expenses and taxes	3,576,583	3,333,821	2,963,180	2,642,887
Net	3,212,818	3,067,074	3,151,792	2,822,399
Interest on funded debt, etc.	1,640,361	1,567,689	1,476,767	1,417,267
Surplus for dividends and reserves	1,572,457	1,499,385	1,675,025	1,405,131

Electric maximum rate reduced 1.5 cents per kilowatt-hour July 1, 1913. Electric power contracts closed since 1911 amount to 68,517 horsepower of which 37,312 horsepower represents steam power supplanted by electric power. Industrial gas sales also have increased largely.

CITIES SERVICE COMPANY.

	1915	1914
October gross	$ 411,505	$ 300,212
Net after expenses	397,182	289,821
Surplus after charges	356,348	248,988
Balance after preferred dividends	225,515	112,155
12 months' gross	4,232,915	3,940,940
Net after expenses	4,069,412	3,837,884
Surplus after charges	3,579,412	3,441,217
Balance after preferred dividends	*2,003,416	1,799,224

*Equivalent to 13.61 per cent on common stock as compared with 11.45 per cent for the preceding 12 months.

Combined earnings of the subsidiary companies for the 12 months ended September 30, 1915, were $21,275,616.

REPUBLIC RAILWAY & LIGHT.

	1915	1914
October gross	$ 276,356	$ 251,893
Net after taxes	109,944	87,877
Total income	110,050	88,199
Surplus after charges	51,135	31,056
Balance after preferred dividends	25,178	5,099
Ten months' gross	2,514,277	2,500,002
Net after taxes	972,351	949,256
Total income	973,641	951,234
Surplus after charges	396,595	386,729
Balance after preferred dividends	137,025	127,159

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 22	Nov. 15
American Tel. & Tel. (New York)	128½	127⅞
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	240½	238
Electric Storage Battery common (Philadelphia)	67	67
Electric Storage Battery preferred (Philadelphia)	67	67
General Electric (New York)	174⅞	177½
Kings County Electric (New York)	125	120
Massachusetts Electric common (Boston)	7	7
Massachusetts Electric preferred (Boston)	39	41
National Carbon common (Chicago)	116	155
National Carbon preferred (Chicago)	120	119¾
New England Telephone (Boston)	132	132
Philadelphia Electric (Philadelphia)	27¾	27⅜
Postal Telegraph and Cables common (New York)	80	82
Postal Telegraph and Cables preferred (New York)	65	65½
Western Union (New York)	87¾	87⅜
Westinghouse common (New York)	67½	69⅞
Westinghouse preferred (New York)	—	—

Digitized by Google

PERSONAL MENTION.

MR. J. L. S. SCUDDING, acting superintendent of the Fort Madison Electric Company, Fort Madison, Iowa, has resigned to take charge of the meter department of the Mississippi River Power Company, Keokuk, Iowa.

MR. C. E. PATTON, president of the Curwensville Light & Power Company, Curwensville, Pa., has been appointed Secretary of Agriculture of the State of Pennsylvania.

DR. MILLER REESE HUTCHISON, chief engineer for Mr. Thomas A. Edison, has been appointed by Secretary of the Navy Josephus Daniels to a position on the Naval Advisory Board, which is headed by Mr. Edison. Dr. Hutchison is himself an inventor and in naval matters is particularly well informed on the matter of submarine mines and their control. He was engaged in this branch of harbor and coast defense during the Spanish-American War.

MR. J. D. MOONEY has been appointed sales manager of the Commercial Department of the Hyatt Roller Bearing Company. In the past Mr. Mooney has been in charge of belting sales for the B. F. Goodrich Company, Akron, Ohio.

MR. CHARLES R. UNDERHILL, chief electrical engineer of the Acme Wire Company, New Haven, Conn., has completed his second lecture course through the Middle West this season, having lectured on "Electromagnets" at Purdue University, November 9; University of Illinois, November 10 and November 11; Ohio State University, November 12; Engineers' Club, Dayton, November 15; Case School of Applied Science, November 16; University of Cincinnati, November 18, and Engineers' Club, Cincinnati, November 18.

OBITUARY.

MR. EUGENE HARTMANN, founder and director of the Hartmann & Braun Actien-Gesellschaft, died at Munich, Germany, on October 18. The decreased was a past-president of the Verband Deutscher Elektrotechniker.

DATES AHEAD.

American Society of Mechanical Engineers. Annual meeting, New York City, December 7-10. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

National Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, December 8-10. Secretary, F. B. MacKinnon, Washington, D. C.

American Association of Engineers. First annual convention, Hotel La Salle, Chicago, Ill., December 10-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

American Association for the Advancement of Science. Annual meeting, Columbus, O., December 27-31. Secretary, L. O. Howard, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

With the Electrical Manufacturers

Lee Electric Radiator Company, 335 Wells Street, Chicago, Ill., manufacturer of a line of electric circulatory radiators, has opened an office at 1019 Post Street, Seattle, Wash., to enable it to handle more expeditiously its western business.

The Standard Electric Tool Company, Cincinnati, O., has issued Bulletin G, which brings the latest information of its high-power portable ball-bearing electric grinders. These are made in various types, all of which are fully illustrated and described.

Belden Manufacturing Company, Western Avenue and Twenty-Third Street, Chicago, Ill., has issued a new discount sheet (No. 165) applying to its catalog No. 6. This gives discounts and various base prices for its wires and cables.

Century Electric Company, Nineteenth, Pine and Olive Streets, St. Louis, Mo., has issued an attractive circular entitled "The Little Tots." This deals with Century fractional-horsepower single-phase motors. It points out their merits, particularly the high starting torque combined with low starting current, and shows a number of typical applications of these motors.

Stow Manufacturing Company, Binghamton, N. Y., has issued bulletin No. 33, which describes the Stow flexible grinder, which is built especially for use in the steel industry and allied trades. The motor shaft combination is mounted on a truck, making it possible to transport it readily to any part of the shop. A very large number of these sets are in successful use in the leading steel mills.

The Barber Electrical Manufacturing Company, North Attleboro, Mass., has been organized to manufacture switchboards, switches and cutouts. The company organized with H. C. Barber, president; William W. Plattner, secretary; Charles E. Riley, treasurer. The directors will include Frank Mason, Charles E. Riley, Orin W. Clifford, H. C. Barber, Alton H. Riley, Louis E. Freeman and Ernest T. Upham.

The N. W. Dunton Company, 150 Niagara Street, Providence, R. I., advises that the 32-page book on "Soldering Kinks," which was mentioned in these columns in our November 13 issue, is supplied for 25 cents. This book contains 69 valuable suggestions on soldering, many of which relate to electrical products. The company also issues posters that may be tacked up over the work bench; these contain 22 soldering kinks. Copies of the latest poster can be obtained by sending two cents to cover cost of mailing.

Reynolds Electric Company, 422 South Talman Avenue, Chicago, Ill., has issued bulletin No. 33, dealing with some types of Reco flashers. The types described and illustrated particularly are the simple off-and-on type in various sizes; the script type used in script-letter signs, fancy borders, arrow and rocket effects; a special low-priced simple flasher for small signs; the Reco motor made in sizes from one-twentieth to one-sixth horsepower for driving flashers and other small machines; and Reco color hoods for obtaining natural colors with ordinary incandescent lamps.

Industrial Controller Company, Milwaukee, Wis., has issued handbook No. 4 on I-C controlling devices. This book contains 184 pages and is devoted to direct-current motor starters and speed regulators, alternating-current motor starters and speed regulators, direct-current automatic starters, and speed regulators, accessories to the foregoing, battery-charging resistance units and field rheostats. Nine pages give National Electrical Code wiring and motor data and eight pages are devoted to the telegraphic code and indexes. The book is well illustrated and gives complete descriptions and data on each control device listed.

Hyatt Roller Bearing Company, Newark, N. J., announces that on account of the rapid increase in its business it is adding three new large buildings to its factory. These structures when completed will give the company a total of over 600,000 square feet of floor space devoted exclusively to the manufacture of roller bearings, making this the largest plant of its kind in the world. One of these buildings is designed for heat-treating processes and is 90 by 110 feet in area and six stories high. The other two buildings are each 200 by 50 feet in dimensions and eight stories high. These will be used for the press work, assembly of roller-bearing parts and shipment. A very complete and elaborate system of ventilation is being provided for the heat-treating building.

The Shaw Insulator Company, 207 Market Stret, Newark, N. J., has completed a plant for the molding of composition into insulating parts for all electrical purposes. The company announces that the most modern machinery has been installed. H. M. Shaw, president of the company, states that the men in charge of the plant have been in the insulation business for the past 25 years. The insulation is manufactured from carefully selected materials tested in laboratory and actual service, and is claimed to be free from "excessive contraction, moisture absorption, varied dielectric strength, carbonization, mechanical imperfections, surface leakage, is impervious to acids and will exceed standard requirements for heat. Has luster finish and a toughness and elasticity to with-

Digitized by Google

stand electrical and temperature changes without cracking or breaking. Age and service increases its efficiency."

Harrison Safety Boiler Works, Philadelphia, Pa., has issued a 68-page book devoted to the use and design of Cochrane meters. It is entitled "Finding and Stopping Waste in Modern Boiler Rooms." The value of feed-water and condensate meters as aids in the management of power plants is taken up in detail, covering among other factors grade of fuel, grates, methods of firing, air leaks, control of draft, condition of gas passages, scale and soot on boiler tubes, radiation, etc. With a feed-water meter installed, it becomes possible to measure the effect of changes in connection with these several factors. The means of obtaining the desired result having been ascertained, the manager or engineer is in position to insist upon good results continuously, since the facilities for continuous quantitative measurements and records are afforded by these meters. In the subsequent sections of the book, the Cochrane metering heater (combined open feed-water heater and hot-water meter), with its several modifications, is described in detail, as also the Cochrane flow recorder for use in connection with V-notch weirs. In the last pages of the book a new type of meter, working on the volumetric principle, by means of which it is possible to obtain an accuracy of within one-third of one per cent, is described.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued a number of new bulletins, of which two have considerable interest to engineers of power development and transmission companies. Bulletin No. 1097 deals with power transformers which the company makes in three types. These are oil-filled self-cooled; oil-filled water-cooled; and air-blast; each of these is made in single-phase or three-phase form. The method of construction is described in considerable detail, with numerous illustrations of parts and of typical installations, both indoors and outdoors. These transformers are built for voltages up to 150,000. Bulletin No. 1636 is a 56-page publication on hydraulic machinery. A number of illustrations are shown of hydroelectric plants for which Allis-Chalmers hydraulic equipment and in several cases also the generators were furnished. The various types of hydraulic turbines, particularly the Francis and impulse types, are described and liberally illustrated. These machines are made for practically any head and for vertical or horizontal shafts. The company is in position to build all kinds of hydraulic and electrical generating equipment to best suit the particular conditions, for which an engineering department is maintained to make a complete study of each development contracted for. Governors and other auxiliaries are also described.

Record of Electrical Patents

Issued by the United States Patent Office, November 16, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,160,125. Dictograph Intercommunicating Telephone System. W. P. Andrick, assignor to General Acoustic Co., Jamaica, N. Y. Has master station and substations.

1,160,129. System of Automatic Block Signaling for Railways. G. H. Benjamin, New York, N. Y. Comprises co-operating car and track coils.

1,160,133. Means For Circulating Electrolyte. W. L. Bliss, assignor to U. S. Light & Heat Corporation, Niagara Falls, N. Y. Is simultaneously circulated in several cells of storage battery.

1,160,142. Combined Frog and Switch for Overhead Trolleys. H. Crist, Scalp Level, Pa. Knife switch on frog structure.

1,160,169. Method of, and Apparatus for, Heating Fluid Material. C. Hering, Philadelphia, Pa. Solidification of molten material controlled by passing current.

1,160,177. X-Ray Tube. E. W. Kelly, assignor to Snook-Roentgen Mfg. Co., Philadelphia, Pa. Cooling medium through electrode.

1,160,181. Machine Telephone Switching System. F. R. McBerty and D. Koenig, assignors to Western Electric Co., New York, N. Y. Sending mechanism and relay control.

1,160,187. Plug-Receptacle Box for Electric Circuits. W. F. Meschenmoser, New Dorp, N. Y. For mounting behind wall plate.

1,160,188. Signal-Transmitter. C. Miller, assignor to Edwards & Co., New York, N. Y. Call-box mechanism.

1,160,243. Wigwag Flagman. J. A. Bell, C. R. Twitchell and D. M. Palmer, assignors to Railway Specialties Co., Los Angeles, Cal. Crossing signal oscillated by electromagnets.

1,160,244. Treating Materials in Electric Furnaces. E. S. Berglund, Trollhättan, Sweden. Easily fusible slag introduced at intervals.

1,160,261. Method of Electric Welding and Apparatus for Use Therein. W. B. Cleveland, assignor to Electric Railway Improvement Co., Cleveland, O. Work clamped between electrically heated blocks.

1,160,268. Gramophone. R. W. de la Rue, Newmarket, England. Sound arm opens motor circuit to stop.

1,160,289. Electrical System of Distribution. J. W. Jepson, assignor to Gould Coupler Co., Depew, N. Y. Voltage regulation in battery system having variable-speed generator.

1,160,294. Selective Signaling System. O. M. Leich, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Has polarized harmonic ringer.

1,160,315. Elevator Signaling Apparatus. E. R. Newell, assignor to Elevator Supply & Repair Co., Chicago, Ill. Time when signal can be given controlled by passenger's button and gate mechanism.

1,160,327. Homogenizing and Heating Device for Gaseous Fuel. E. P. Ross, Freeport, N. Y. Gasket has heating resistor wire.

1,160,344. Electrical System of Distribution. W. A. Turbayne, assignor to Gould Coupler Co. Includes multi-voltage generator.

1,160,345. Convertible Direct or Indirect Lighting Fixture. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. Reflector normally above may be adjusted to form bowl below lamp.

1,160,346. Clock Mechanism. H. E. Warren, Ashland, Mass. Pendulum magnetically connected with time train.

1,160,356. Apparatus for Determining the Speed of Rotation of Impulse-Transmitters. A. H. Adams, assignor to Western Electric Co. For automatic telephone exchanges.

1,160,357. Electrical Transformer. R. F. Agnew, assignor to Agnew Electric Welding Co., Detroit, Mich. Structure of secondary.

1,160,371. System for Operating Burners by Means of Liquid Fuel. C. A. Brown, Hinsdale, Ill. Electrical heating and feeding of fuel.

1,160,386. Fuse Carrier. J. J. Crouse, Waterbury, Conn. Insures good contact of fuse with terminal clips.

1,160,388. Ignition Apparatus for Internal-Combustion Engines. L. C. Daucher, Suresnes, France. Regulatable gaps in parallel with spark plugs.

1,160,400. Electrolytic Process of Detinning. H. Goldschmidt, assignor to Goldschmidt Detinning Co., New York, N. Y. Tin scrap placed in alkaline bath to which electrolyte and electrolysis is applied.

1,160,401. Electrolytic Detinning System. H. Goldschmidt, assignor to Goldschmidt Detinning Co. Apparatus for above.

1,160,416. Selective Controller for Vehicle-Call Systems. J. H. Kliegl, New York, N. Y. "Talking" number sign.

1,160,422. Electric Fire-Engine System. C. Loeffler, Philadelphia, Pa. Contact controlled by valve of water plug.

1,160,428. Art of Metal Working. G. E. Markley, Cleveland, O. Manner of uniting rotor bars to end rings.

1,160,431. Process for Producing Aluminum From Clay, Kaolin, and Other Aluminum Silicates. G. Mellen, assignor of one-half to United Aluminum Ingot Co., New York, N. Y. Cyclic process comprising electrolysis and reusing exhausted sodium-fluorid-containing electrolyte.

1,160,435. Electric-Lamp-Retaining Device. H. J. Morey, assignor to Pass & Seymour, Inc., Solvay, N. Y. Spring wire engaging socket and lamp base prevents vibration of latter.

1,160,447. Machine Telephone-Switching System. L. Polinkowsky, assignor to Western Electric Co. Circuits and contacts of automatic selecting switch.

1,160,461. Display or Advertising Clock. W. Swank, Altoona, Pa. Comprises electrically controlled time balls and seconds lamps.

1,160,466. Electric Automobile-Clock. W. H. Thompson, assignor to Electric Clock Co., Memphis, Tenn. Spring-driven gearing and electric contacts.

1,160,469. Machine for Producing Electrical Coils. C. R. Underhill, assignor to Acme Wire Co., New Haven, Conn. Wire and insulation strip wound into coils.

1,160,472. Device for Regulating the Speed of Motor Cars. J. G. Wallmann, Oakland, Cal. Manual and automatic electromagnetic control of passage of air from manifold to brake cylinder.

1,160,488. Electrical Resistance. C. O. Bastian, London, England. Unit for use at high temperatures.

1,160,485. Apparatus for Extracting Precious Metals. V. I. Zachert, San Francisco, and P. A. Brangier, Agnew, Cal., assignors of one-third to V. G. Bonaly. Continuous electrical amalgamator.

1,160,491. Battery. P. Brown, Springfield, Mass. Vent provided for secondary cell without danger of leakage when cell is tipped.

1,160,496. Burglar and Signal Device. A Casper, Vallejo, Cal. Doorknobs control electromagnetically operated "In" and "Out" plates.

1,160,514. Method of Regulating Boiler-Pressure. P. O. Keilholtz, Baltimore, Md. Hunting prevented in electric regulation of fuel and air supply in mechanical-draft system.

1,160,518. Pocket Flashlight. A. S. Byhne, Bridgeport, Conn. Pistol-shaped; controlled by trigger.

1,160,524. Oxygen Generator. W. F. Muehl, Syracuse, N. Y. Electrically heated chemical receptacle in gas tank.

1,160,531. Attachment Plug. H. P. Rounds, Detroit, Mich. Has eccentric collar for locking in socket.

1,160,543. High-Voltage Strain Insulator. L. Steinberger, Brooklyn, N. Y. Chain-type insulator.

1,160,544. Insulating Support for High-Tension Conductors. L. Steinberger. Combination of rod-type and chain-type insulators.

1,160,545. Mouthpiece. L. Steinberger. For telephone transmitter.

1,160,547. Disk Strain Insulator. L. Steinberger. Combination of ribs on disk.

1,160,547. Electrical Connection for Electric Relays. C. Stille, Zehlendorf-West, near Berlin, Germany. Microphone relay device.

1,160,556. Tension Apparatus. G. S. Williamson, New York, N. Y., and C. E. Mandelick, Ridgefield Park, N. J. Braking generator on web-tension mechanism.

1,160,567. Method of, and Means for, Calibrating Electric Meters. O. T. Blathy, Budapest, Austria-Hungary. Field of electrodynamic brake is varied.

1,160,570. Prepay Box for Use in Telephone Systems. O. Brisbois, assignor to

Digitized by Google

J. H. Ware, Chicago, Ill. Entry of coin prevented except under proper conditions.

1,160,585. Fuel-Supplying Means. T. A. Edison, Jr., Burlington, N. J. Comprises electric heater for mixture.

1,160,608 and 1,160,609. Electrical System of Distribution. A. S. Hubbard, assignor to Gould Storage Battery Co. First patent: regulation of charge and discharge of floated battery; second patent: substation regulation.

1,160,610. Alternating-Current Apparatus. A. S. Hubbard, assignor to Gould Storage Battery Co. Current rectified by arrangement of series transformers and asymmetric cells.

1,160,615. Aiming Device. H. Jacob, assignor to firm of Optische Anstalt C. P. Goerz Aktiengesellschaft, Friedenau, near Berlin, Germany. Arrangement of lamp filament in Galilean double telescope.

1,160,619. Electric Attachment Device. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Flush receptacle and plug.

1,160,620. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Multiple-contact snap switch.

1,160,660. Mining Machine. J. Secrist, Nuttallburg, W. Va. Driving gear between motor and cutter and cable drums.

1,160,661. Incandescent Lamp. F. Skaupy, assignor to General Electric Co., Schenectady, N. Y. Amorphous carbon containing halogen in tungsten lamp to prevent obscuring deposits on bulb.

1,160,671. Apparatus for Printing Cinematograph Films. J. E. Thornton, Rochester, N. Y. Utilizes mercury-vapor lamps.

1,160,673. Series-Parallel Control System. J. F. Tritle, assignor to General Electric Co. For number of pairs of motors.

1,160,674. System of Control for Electric Motors. J. F. Tritle, assignor to General Electric Co. Contactor control for four motors.

1,160,678. Electric Control for Elevators. A. Ward, Greystone, R. I. Elevator door controls pilot motor for controller.

1,160,679. Flow Meter. J. Wilkinson, assignor to General Electric Co. Electrically operated indicating pendulum controlled by flow pressure.

1,160,684. Electric Percolator. H. P. Ball, assignor to General Electric Co. Arrangement of electric heater, fountain, etc.

1,160,702. Insulator. G. Faccioli, assignor to General Electric Co. Oil filled; for mounting in tank wall.

1,160,705. Method of, and Means for, Operating Synchronous Dynamo-Electric Machines. W. J. Foster, assignor to General Electric Co. Starting of synchronous motors.

1,160,714. Electrically Controlled System for Moving-Picture Theaters. J. H. Hirschberg, Oakland, Cal. Traveling contact arm to control lights and apparatus.

1,160,716. Electrical Apparatus. A. Hundt, assignor to General Electric Co. Grounded safety device.

1,160,717. Alternating-Current Dynamo-Electric Machine. L. J. Hunt, assignor to General Electric Co. Windings and poles arranged for speed control.

1,160,718. Headlight. L. O. Ingalls, assignor to General Electric Co. Has adjustable lens.

1,160,736. Bracket and Fixture. W. Lumley, assignor to General Electric Co. Lamp-supporting arm for street use.

1,160,745. Filament Support. M. M. Merritt, assignor to General Electric Co. Filament supports extend along prolonged stem traversed by leading-in wires.

1,160,749. System of Electrical Distribution. G. S. Neeley, assignor to General Electric Co. Generator field windings regulated in battery system.

1,160,750. System of Distribution. H. F. Perkins, assignor to General Electric Co. Circuit supplied by vapor rectifier and direct-current generator.

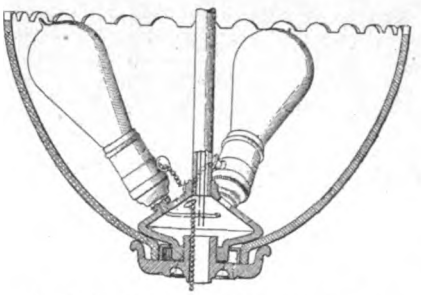
1,160,764. Lamp House for Picture-Projection Apparatus. A. D. Robinson, New York, N. Y., and A. P. Boller, Jr., East Orange, N. J. Special provision for dissipating heat.

1,160,766. Signaling Device. R. R. Root, Cleveland, O. Electromagnetically operated horn.

1,160,770. Electrically Driven Fan. A. Schaeffer, Frankfort-on-the-Main, Germany. Arrangement of face blades and motor in air douche.

1,160,771. Apparatus for Driving Electrical Machines. A. Schalkau, assignor to Siemens-Schuckert Werke, G. M. B. H., Berlin, Germany. Readings of indicator in motor circuit varied with motor load capacity.

1,160,776. Linotype Machine or the Like. J. B. Shufeldt, Jr., New York, N. Y., assignor of one-half to J. B. Allen. Electrical means to operate one of two matrix escapements.



No. 1,160,859.—Semi-Indirect Fixture.

1,160,795. Fire-Alarm System. F. X. Veranich, West Allis, Wis., assignor of one-half to F. Brandstätter. Thermostatically controlled mechanism.

1,160,811. Method of Producing Nitrogen Compounds. C. E. Acker, Ossining, N. Y., assignor to The Nitrogen Co. Includes electrolytic process.

1,160,822. Method of Reducing Metals. J. W. Beckman, Berkeley, Cal. Oxides reduced by melting in electric furnace and treating with reducing vapor mixed with air.

1,160,829. Tool for Detaching Obstructions from Electric Wire Conduits. M. Blumenthal, Brooklyn, N. Y. Toothed cutter for cleaning out cable conduits.

1,160,837. Carbureter. T. J. Burnham, Jackson, Miss. Electric heater in carbureting chamber.

1,160,842. System of Electrical Distribution. F. Castiglioni, Wilmette, Ill. Electrolysis of underground structure prevented by interconnection of traction systems.

1,160,844. Arcing-Ground Suppressor. A. Chernyshoff, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Transformer primary shunts arc and secondary impedance is automatically varied.

1,160,847. Electrolysis of Alkali Chlorides or Alkali-Earth Chlorides. A. Clemm, Mannheim, Germany. Structure and arrangement of cell.

1,160,857. Electric Locomotive and Cable-Reeling Mechanism. F. C. Coseo, assignor to Jeffrey Mfg. Co., Columbus, O. Gearing automatically driving feeder-cable reel in either direction according to direction of movement of car.

1,160,859. Electric Lighting Fixture. J. H. Dale, New York, N. Y. Semi-indirect lighting fixture adapted for pull sockets. (See cut).

1,160,860. Electric Lighting Fixture. J. H. Dale. Convertible for direct or indirect lighting.

1,160,876. Sender-Board Apparatus. E. R. Gill, Yonkers, N. Y., assignor to Hall Switch & Signal Co. Board adapted for detachable mounting and connections of sending devices.

1,160,879. Chain Guide for Pull Switches. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Right-angled tube extends laterally from socket. (See cut).

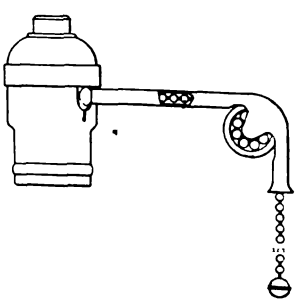
1,160,896. Fog-Signal for Trolley Lines. W. F. Hoeltke, Rochester, N. Y. Magnetic bell alarm connected with trolley for preventing rear-end collisions.

1,160,899 and 1,160,900. Mechanically Actuated Diaphragm Horn. M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Operated by motor-driven adjustable cam; mechanism in dustproof case.

1,160,901. Horn or Signaling Device. M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co. Modification of above.

1,160,902. Diaphragm Horn. D. A. McConnell, assignor to Lovell-McConnell Mfg. Co. Compact structure of motor and cam vibrator.

1,160,907. Dry Battery. I. Koretzky, assignor to L. J. Morrison, New York, N. Y. Has depolarizer of recovered manganese.



No. 1,160,879.—Pull-Switch Chain Guide.

1,161,911. Spark Plug. T. Latch, Galeton, Colo. Arrangement and shape of electrodes.

1,160,913. Street or Station Indicator. B. Ledermann, New York, N. Y. Swinging signs electromagnetically, selectively displayed from a bank of signs.

1,160,921. Electric Switch. J. F. McElroy, assignor to Consolidated Car-Heating Co., Albany, N. Y. Two-way oscillating switch with centering and locking spring.

1,160,950. Convertible Reflector for Lamps. M. J. Oestreich and H. N. Oestreich, Philadelphia, Pa. Has adjustable reflector shield.

1,160,951. Automatic Trunking System. O. V. Olson, assignor to Automatic Electric Co., Chicago, Ill. Line-switch-governing master switch is locked against motion while at rest.

1,160,959. Controlling Apparatus for Electric Railway Cars. A. Sundh, assignor to Otis Elevator Co., Yonkers, N. Y. Pneumo-electric system.

1,160,960. Surgeproof Transformer. C. H. Thordarson, Chicago, Ill. Secondary protected by arrangement of impedance and resistance.

1,160,993. Railway Signaling System and Apparatus. C. J. Coleman, assignor to Hall Signal Co. Block system depends on diversion of current from bonds between the two rails by passing car.

1,160,994. Pay-Station Telephone System. J. Erickson, assignor to First Trust & Savings Bank, Chicago, Ill. In automatic system, talking condition removed on calling and restored when coin is deposited.

1,160,995. Magneto-Electric Machine. J. B. Frawley, assignor to Pittsfield Si. Coil Co., Pittsfield, Mass. Inductor alternator type of magnet comprising timer casing; for ignition.

1,160,999. Galvanic Cell. M. L. Kaplan, Brooklyn, N. Y. Process of making miniature cell of Leclanché type.

1,161,005. Motor. W. H. Muzzy, New York, N. Y. Gasoline, lubricant and ignition spark simultaneously turned on to automobile engine.

1,161,010. Electrical Device. M. Setter, assignor to First Trust & Savings Bank, Chicago, Ill. Combined telephone drop and jack.

1,161,013. Thermal Valve. H. Stewart, assignor to Stewart-Kelly Automatic Drain Valve Co., Walla Walla, Wash. Thermally controlled operating magnet in drip valve structure.

Reissue No. 14,010. Selective Signaling System. E. R. Gill, assignor to Hall Switch & Signal Co. Combined telegraph and telephone lines.

Reissue No. 14,012. Method of, and Apparatus for, Selective Wireless Telegraphy. F. G. Sargent, Westford, Mass. Dial contactors synchronously adjusted at all the stations.

Patents Expired.

The following United States electrical patents expired on November 22, 1915:

614,453. Method of Manufacturing Electric Cables. S. Z. de Ferranti, Hollinwood, England.

614,462. Commutator. J. R. Grindrod, Lynn, Mass.

614,472. Potential Switch. J. D. Ihlder, Yonkers, N. Y.

614,474. Transformer Stamping. D. C. Jackson and W. B. Jackson, Madison, Wis.

614,484. Hanger for Electric Lamps. J. E. Mayo, Belvidere, Ill.

614,494. Fire and Burglar Alarm. J. L. Norris, Washington, D. C.

614,528. Electric-Lighting Gas Burner. J. M. Anck, Philadelphia, Pa.

614,539. Secondary Battery. N. H. Edgerton, Philadelphia, Pa.

614,571. Transformer System and Apparatus. A. Müller, Hagen, Germany.

614,572. Method of and Apparatus for Treating Ores. J. G. McNulty, New York, N. Y.

614,575. Conduit and Electric-Current Conductor for Surface Railways. A. Petzenbürger, Gross Lichterfelde, Germany.

614,597. Means for Conveying Cables, Wires or the Like Through Underground Conduits. J. Wrigley, Elmira, N. Y.

614,608. Dynamo Electric Machine or Electromotor. E. Cantano, Pavie, Italy.

614,633. Electrolytic Apparatus. F. A. Thum, Newark, N. J.

614,677. Switchboard Apparatus, Signal and Circuit. T. C. Wales, Jr., Boston, and F. L. Rhodes, Winchester, Mass.

614,686. Magnetic Cutout. L. Andrews, Hastings, England.

614,759. Galvanic Battery. C. T. Richmond, Cleveland, O.

614,794. Circuit-Breaker. W. I. Crawford, St. Louis, Mo.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 23. CHICAGO, SATURDAY, DECEMBER 4, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET

CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.

J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
- Standardization of Portable Cords....1001
- Bonus Systems for Electricity Employees....1002
- Addresses to Commercial Bodies....1002
- Women as Electrical Workers....1003

DEPARTMENTS:
- Commercial Practice 1008
- Electrical Construction 1012
- Dollar Wiring Kinks....1017
- Public Service Commissions....1018
- New Electrical and Mechanical Appliances....1032
- Latest Approved Fittings....1038
- Current Electrical News....1039
- Record of Electrical Patents....1043
- Electric Vehicle Section....1045

LEADING ARTICLES:
- Electricity In Ice Harvesting....1005
- Handling Stores According to the Cash-Control Idea.—By Wilfred G. Astle....1012
- Testing for Grounds and Insulation Resistance.—By L. H. Henderson 1020
- Electric Service for a City High School.—By C. L. Vestal..1024
- Notes on Telephone Plant Organization.—By F. Day....1028
- Electric Vehicles In Municipal Service....1045
- Electric Vehicles Prove Good Hill Climbers in Department-Store Delivery Service.—By A. Jackson Marshall 1048

BOOK REVIEWS....1027

MISCELLANEOUS:
- New Regulations Governing Export Procedure....1004
- Joint Independent Telephone Convention in Chicago....1004
- Annual Dinner of Massachusetts Electric and Gas Association 1004
- State of Utah Uses Electric Power In Road Building....1008
- New Street Lighting for Salt Lake Business District....1009
- An Electric Range Campaign at Scranton....1009
- Campaign Results In 110 Washing Machine Sales in One Month 1010
- Effective Plan for Interesting Children In Electricity....1010
- The Future of Electrical Advertising....1010
- New Electric Sign Attracts Attention in Cincinnati....1011
- A Common Fallacy.—By G. W. Hill....1015
- Excess Indicator for Fire Alarm.—By George A. Schneider..1016
- Foreign Trade Promotion Through Strong Organization....1018
- Some California Types of Street-Lighting Standards....1018
- Stream Measurements in the North Atlantic Coast Drainage Basins 1021
- Honoring John J. Carty....1023
- Chicago Vehicle Men Discuss Ways to Boost Sales....1024

STANDARDIZATION OF PORTABLE CORDS.

The early standardization of sockets and lamp bases in this country was a great boon to the industry. The advantage of a similar standardization of plugs and receptacles has been very generally recognized and steps have been taken toward the attainment of this end. The consummation of an agreement between the manufacturers which will result in the uniformity of these items of their product will appreciably advance the industry as a whole by making current-consuming devices more popular. The Committee on Wiring of the National Electric Light Association has given considerable attention to the matter and has made its recommendations. The final step rests with the manufacturers, and any one or more failing to co-operate in this matter is likely to feel his unpopularity in a diminished demand for his goods.

At the meeting of the Committee on Wiring, which was reported in the last issue, the question of uniformity in the contact devices at the other end of the connecting cord was also discussed. While uniformity at this point may not be quite as important as in the previous case, it is nevertheless an appropriate subject for standardization, and especially so at the same time as the plugs and receptacles. It involves the provision by manufacturers of devices having similar conducting terminals, or at least terminals which will fit a common form of terminal on the end of the connecting cord. Such a condition may at first seem difficult of realization, and it may involve the partial redesign of certain appliances, but the resultant advantages would far outweigh all the difficulties. It seems ridiculous that it should be necessary to have a separate connecting cord for every device which may be used in the household, and yet this is almost literally true, especially with devices of different manufacture. It is seldom that all such devices would be in use at one time, and in many homes not more than one would ever be used at one time, and it is both an unnecessary inconvenience and an unnecessary expense to have to change cords when turning from the use of one appliance to utilize another. This applies especially to appliances consuming not more than 600 watts. For heating or cooking apparatus of larger size there is less need of interchangeability and for some reasons such interchangeability might be undesirable.

Our contemporary, *The Electrical Times*, of London, has recently devoted a portion of two issues (Oc-

Copyright, 1915, by Electrical Review Publishing Company, Inc.

Digitized by Google

tober 14 and 21) to a discussion of this question. The terminals of various forms of heating and cooking apparatus are illustrated and their weaknesses considered. It is stated that to be satisfactory a connector should be made of some non-hygroscopic material which is strong mechanically, of high resistance, capable of withstanding high temperatures, and neither brittle nor soft. Certainly all of these qualities are desirable. Porcelain answers these requirements only when incased in metal, but the modern molded insulating materials made from condensation products should prove satisfactory. Wood, ebonite, fiber, marble and many other common insulating materials are unsuited to this purpose.

The conducting terminals of the cord should, of course, be countersunk, so that if disconnected while alive it would not be easy to either get a shock or cause a short-circuit. Convenience of handling should receive consideration, and many minor details need to receive attention if a thoroughly and permanently satisfactory terminal is to be evolved.

Since devices of this character have become objects of considerable international trade, it would be well if such standardization should be made international, rather than merely national. At least co-operation in Great Britain and this country might be secured, and that would indeed be something accomplished.

BONUS SYSTEMS FOR ELECTRICITY EMPLOYEES.

The bonus principle has been successfully applied in connection with a number of public electricity undertakings in England. Engineers and managers who have adopted it have considered the results to amply justify the application in many cases; of course, as in everything else, there have been exceptions. Within quite recent times bonus allowances have been made to street-car drivers for economical use of power, and to boiler-house stokers for economy in consumption of fuel; managers, canvassers and other members of commercial staffs have received percentage bonuses on either the new lamp and power connections made, or on the increase in the annual sale of electricity.

War-time has, however, given rise to special conditions, and many undertakings have made special war-bonus allowances to employees, based not upon either economies effected or additional business secured, but adopted entirely because wage additions have been pretty generally made in many departments of activity in order to meet the increased cost of living consequent upon war conditions. Such allowances as these, however, do not come in the same category as those granted under schemes which have for their object either the development of the electricity load or the more economical and therefore more efficient operation of a system.

The borough electrical engineer of Maidstone, England, has recommended his authority to introduce at once a co-partnership or bonus scheme which will embrace the whole of the staff, and which will not be operated with any idea or intention of "giving the staff anything." His investigation of practice along such lines in other towns in England is that the engineers of undertakings which have adopted it unanimously advocate it as a good investment, and among electricity managers generally the idea is rapidly growing in favor. Mr. Hoadley, the engineer referred to, says that in view of the altered relations between capital and labor which now exist, and which will exist to a greater degree for some time, he recommends such a co-partnership scheme for Maidstone as a means of promoting the unity of purpose between the committee responsible for the higher control and policy, and the staff who have to carry out that policy, in order to obtain the highest efficiency in the working of departments.

ADDRESSES TO COMMERCIAL BODIES.

Central-station managers and their chief assistants are in increasing demand in many localities as speakers at luncheons of business men's organizations, and the good which this sort of activity does the electrical industry cannot easily be exaggerated. The respect which the general public has for the electrical opinions of a responsible executive or department head in a modern central station is often but little realized inside the local company, but here is real material for development—a basis on which to build a pretty respectable sort of structure.

A good many times when the central-station man accepts an invitation to speak before the local Rotary Club at some noonday celebration, or perhaps finds himself on the program without any personal consultation, the task looks most burdensome. He wonders what he can say that will be of interest and at the same time help the electrical art along its shining way. Here a real danger presents itself. The speaker-to-be may take the easier course and decide to give a general talk about the convenience, safety and all-around attractiveness of electrical service, throwing in some choice bits of history and painting the wonders of the electrical age until he loses himself in a glow of oratory and sits down perspiring but happy in the thought that his enthusiastic remarks have advanced the electrical cause a long way and that increased receipts are as certain as the next sunrise.

Now it cannot be denied that a great many interesting things can be said after luncheon about the wonderful development of the electrical art, and every time electric service is mentioned some good results. But listeners at Rotary Club and similar gatherings are apt to be much more impressed by specific instances of what electricity is doing right in their own community than by too many generalities, and if the talk can be turned to constructive account all the better. Thus, in straightforward terms the speaker may tell his audience something about the development in connected mo-

Digitized by Google

tor load in the past two or three years resulting from the rate schedule not long since adopted, or he may cite a few actual costs in the use of electric cooking appliances, pointing out wherein these won the day over coal ranges and gas; or, again, he may suggest ways in which the electric company and the merchants can cooperate to secure a brilliantly illuminated town, transforming it into a live little city which everyone likes to visit.

If one of the big manufacturers has recently electrified his plant, let the diners be given a newsy account of what has been accomplished, and how the community gains by progressive service. In most cities of the enterprising type there is always some new school, hospital, shop, library or other structure newly completed or planned in which the very latest "wrinkles" in electric service are to be seen. Often in some little, remote town the first installation of some notable equipment representing an advance in design of interest to the engineering world can be drawn upon for popular description. By giving one's hearers a chance to share in the things that are doing and taking them into one's confidence a bit relative to things pretty well planned, the good results of an informal address can be much broadened, and friends of real value made and retained for the central station.

WOMEN AS ELECTRICAL WORKERS.

It is common knowledge that one of the consequences of the war in Europe is a large increase of female labor in electrical and other engineering factories. As the combatant nations call more and more upon their able-bodied men to relinquish the arts of construction in favor of those of destruction, this tendency becomes very marked. This movement was, however, making progress in the years preceding the war. So far as England is concerned, the statistics show that, whereas in 1901 out of a total of electrical workers numbering 49,518, 2,490 were women, the proportion of women had grown to 9,275 out of a total of 66,186 workers in the year 1911. The work covered included various operations in connection with cable manufacture, lamp-making, apparatus-making, etc. As part of an investigation instituted by a special economic committee of the British Association on the question of outlets for labor after the war, we have available an examination into the future possibilities in this connection. It is found that women are doing today in certain departments work which before the war was done by men, such as small-lathe work, screw-machine work, cable making, and the winding of transformers. The last-named of these occupations is regarded as an extension of work previously done by women, rather than as an entirely new process; for example, where they now wind two coils on a transformer they previously did only one.

The committee which investigated the matter consisted of three ladies. They say that it was the policy of many English firms before August, 1914, to extend the employment of women into new branches. That women have to some extent been replacing men, or at any rate entering new branches, may also be inferred from the fact that, though the electric-lamp branch of the trade has been depressed owing to the war, there has been a total increase in the employment of women in the electrical trade of nearly 18 per cent. Part of this increase is due to a temporary increase of production in branches of the trade in which women were previously employed, but women are to some extent taking the place of men who are away at the front. In most cases readjustment to meet the introduction of women has been simple, or no alterations at all have been necessary, as they have only been put at the lighter machine work. One firm has actually made the machines more mechanical and employs an extra mechanic as supervisor. It is usual when women are introduced into new processes for them to have a separate workshop.

The committee referred to states the main objections to the employment of women for electrical work thus: (1) want of technical skill and general experience; (2) want of physical strength, making it impossible to employ women on the heavier processes; (3) employers strongly object to men and women working side by side in this trade; (4) the men object to the introduction of women. In regard to physical strength, one firm found the women's output slightly less than that of men, owing mainly to exhaustion during the last hour of work. It is clear that as a general rule women's output is considerably less than that of men, since both on time and piece rates their wages are generally 50 per cent below those of men. The main advantages of woman's labor are found to be these: (1) their greater dexterity in certain processes where small fingers are an advantage; a noteworthy example is found in such processes as assembly work in the electric-lamp trade; (2) cheapness of their labor; (3) the larger supply of unskilled workers to draw upon.

It is considered that in those processes which are suitable to women, the possibilities of extending their employment are great. The employers do not anticipate any prospect of dismissing the women when the men return from the war. They in some cases expect not only to take back such men as return fit for such work, but to take on new ones as well, though the future state of trade naturally affects this prognostication. The men's unions, on the other hand, fear that the employment of women will both reduce the standard of wages for the men and lead to male unemployment also, after the war.

We have alluded to only one very small section of a most elaborate investigation which has been spread over many professions and departments of trade. The subject is one which will demand the closest study and attention in coming months, and perhaps years, at the hands of leaders of industry, leaders of labor, and social economists in Europe.

Digitized by Google

New Regulations Governing Export Procedure.

The announcement that new United States regulations relative to export procedure will become effective January 1, 1916, has created such intense interest among manufacturers and shippers that the Bureau of Foreign and Domestic Commerce, Washington, D. C., has found it necessary to reprint the new order with explanatory text. That pamphlet is just off the press and is being supplied free of charge to those interested, upon application to the above-mentioned office. All shipments for export to foreign countries or to Alaska, Hawaii, and Porto Rico will be affected by the new regulations.

Accuracy of statement and completeness of description in export statistics are the primary objects of the new procedure. Heretofore the data received by the Bureau of Foreign and Domestic Commerce have frequently been lacking in these respects, largely by reason of the fact that interior shippers consign to their agents at the seaboard for export, goods unaccompanied by adequate descriptions for use in making export declarations. The new regulations seek to remedy this defect.

The importance of detailed and accurate returns as a basis for the statistical information published by the Bureau of Foreign and Domestic Commerce is apparant when it is realized that the export trade of the country now exceeds $3,000,000,000 annually and is rapidly increasing. With practically all commodities participating in that growth, interest in commercial procedure is widespread and to meet the demand for authoritative instructions regarding the new requirements in export trade, the main features of Treasury Decision No. 35708, containing the regulations on that subject, have been summarized as follows:

1. A simplified form of shippers' export declaration has been prescribed, alike for exports by rail and by vessel. It is so drawn up as to prevent the disclosure of the value of goods to persons outside the customs service. The duplicate to be handed over to the shipper's agent at the seaboard or to the common carrier as proof of compliance with customs requirements will contain no statement of value.

2. The oath to shippers' declarations for export by water may be taken before any person authorized to administer oaths and not as heretofore exclusively before the collector of customs at the port of exportation. This will facilitate the preparation of export declarations by the original shipper instead of by his agent at the seaboard, who is less cognizant of the character and value of the merchandise and the country of final destination. Manufacturers themselves are urged to make out the export declarations wherever practicable, to assist in which work the Bureau of Foreign and Domestic Commerce cheerfully supplies to those interested Schedule B containing the official classification of all merchandise entering export trade.

3. The requirements on the part of common carriers have been somewhat simplified and hereafter copies of the waybills will be accepted from the railroad companies in lieu of car manifests. In vessel manifests a notation that the values are as stated on the shippers' declarations will be accepted in lieu of a detailed statement of the value of each shipment.

4. On an after January 1, 1916, the legal requirement that goods shall not pass out of the jurisdiction of the United States until shippers' declarations are presented in due form will be strictly enforced. Exception will be made only when the carrier gives bond to produce within 15 days export declarations (originals or duplicates) for all shipments.

Compliance with the new regulations will impose no hardships on exporters who have been observing the legal requirements. On the contrary their convenience is served, and the cooperation of shippers generally will aid the Bureau of Foreign and Domestic Commerce in publishing full and accurate information regarding the export trade.

Joint Independent Telephone Convention in Chicago.

An important epoch in independent telephony will be marked by the joint convention to be held in Chicago next week by the National Independent Telephone Association and the Independent Telephone Association of America. The latter organization was formed a few years ago by seceders, who did not approve of the policy of the old National Association. The directors of the National had already planned to hold its annual convention at the Hotel La Salle, Chicago, on December 8 to 10. At a recent meeting of the board of directors the directors of the Independent Telephone Association of America were invited to hold its annual gathering simultaneously and as a joint convention. This offer was accepted, and next week's assembly will, therefore, be notable as an unusually large gathering of independent telephone men and as marking the establishment of harmonious and friendly relations between the two associations, which doubtless will lead to their complete merger.

Exceptionally important problems are to be considered at the joint convention. Among these is telephone regulation, on which addresses will be made by members and engineers of the Interstate Commerce Commission and several state utility commissions. Management of telephone systems will be considered from several viewpoints. Telephone accounting will come in for much attention, also standards of apparatus.

Annual Dinner of Massachusetts Electric and Gas Association.

The twenty-sixth annual dinner of electric lighting interests in Massachusetts, with whom by invitation the gas interests of the state have recently become affiliated in a joint organization, occurred at the Copley-Plaza Hotel, Boston, Mass., November 22. President Charles L. Edgar presided. He referred to the organization of the Massachusetts Electric Lighting Association in 1889 by Frederick A. Gilbert and Everett W. Burdett, the latter having been associated with the organization as clerk and counsel for 26 years. By the inclusion of the gas men, an added representation of manufacturing interests aggregating about $1,000,000 in "balance of manufacturing account" has been secured.

There are in Massachusetts 53 electric companies, 61 gas companies, 19 persons, associations or corporations manufacturing or selling gas or electricity, and 22 combination gas and electric companies. "Balance of manufacturing accounts" of electric companies aggregates about $10,600,000, and of this $7,500,000 is included in the Association. Ninety-one per cent of electric companies, 25.5 per cent of gas companies and 77.5 per cent of combination companies in the state are affiliated with the organization. It is expected that a number of gas companies will soon become members.

Mr. Edgar alluded to the subject of the evening, "Taxation," as a burning issue, on which there is great haziness in the minds of business men. He looked with expectation of valuable results from the data which the Taxation Committee of the National Electric Light Association is preparing on the subject.

The speakers of the evening were Charles A. Andrews, former deputy tax commissioner of Massachusetts, and John J. Martin, president of the Boston Real Estate Exchange.

Special Lighting for State House.

The next Legislature of Massachusetts will be asked to authorize external illumination of the State House at Boston, either by means of flood lighting from concealed searchlights or a row of incandescent lamps outlining the entire structure, just below the cornice.

The Allegheny County (Pa.) Grand Jury has recently granted to the Borough of Turtle Creek permission to change its name to Westinghouse, in honor of the late George Westinghouse. Wilmerding and East Pittsburgh had also asked the same thing, but the jury refused their requests. Judge Brown suggested to the counsel of the several petitioners that it might be possible to incorporate the three boroughs into a third-class city.

Digitized by Google

Industrial Power Series—Article No. 146

ELECTRICITY IN ICE HARVESTING.

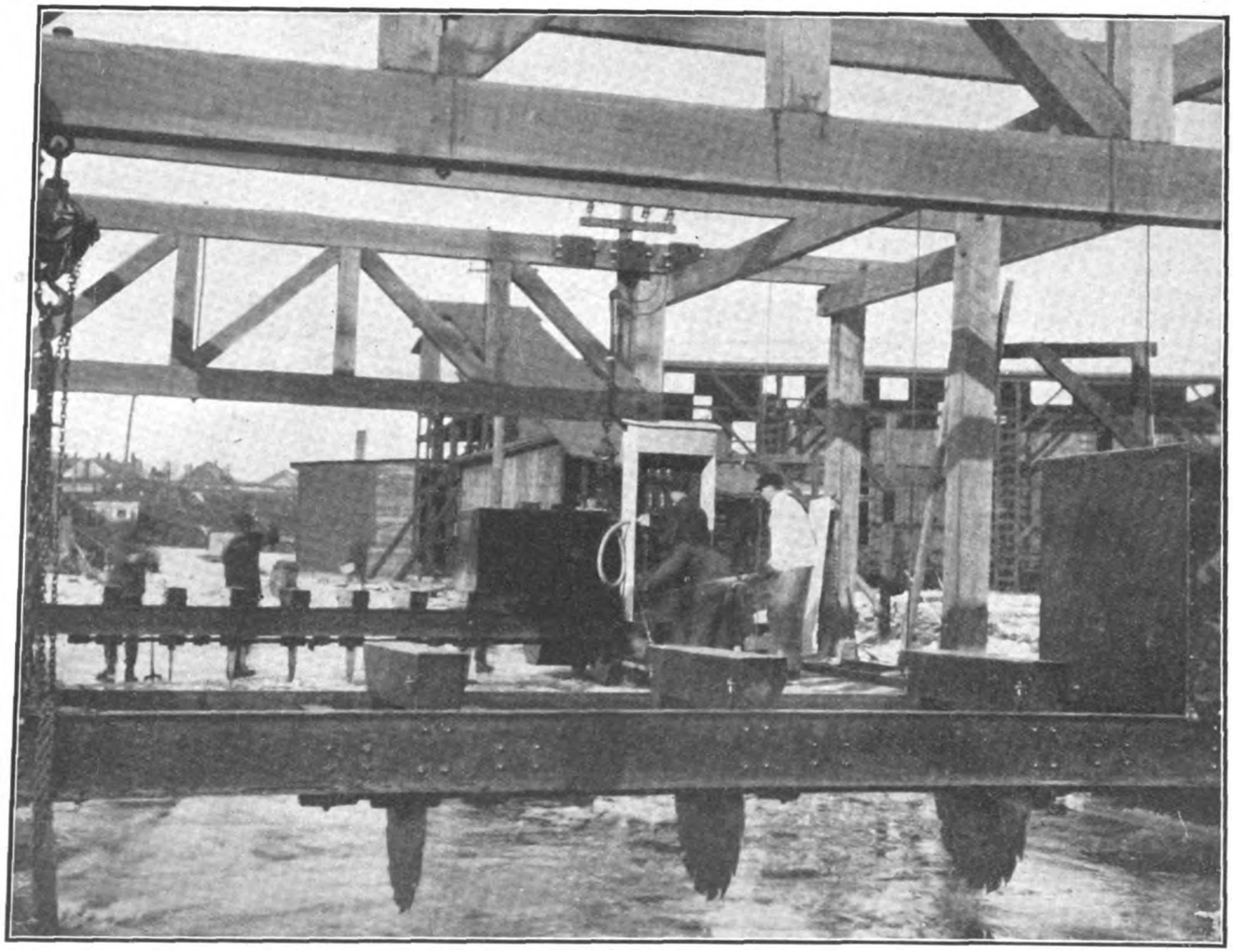
As the ice-harvesting season is approaching, attention is naturally being given ice-handling equipment by ice companies. The accompanying article describes an installation in a New England plant where electricity is used exclusively, and where, as a result, labor cost alone has been reduced $125 per day. Because of the short period of operation, the cost of a private generating plant is prohibitive. Central stations can well afford to investigate the opportunities for the sale of power in this field.

The use of electric motors has invaded the business of harvesting natural ice, which would seem to be one of the most primitive and rudimentary industrial operations known to modern life. The simple method of grooving and then plowing the ice field by the use of horses; then barring off the cakes and floating them to the apron and elevator at the ice house, by men ranged along the canal and armed with ice hooks, has been superseded at some of the important city plants of New England, by a method which not only economizes the labor of a large per cent of the working force, but also enables the crop to be harvested in a shorter time than formerly. The latter consideration is especially weighty, in that weather conditions have to be taken advantage of promptly or loss will result, and a possibility of missing the chance of harvesting the full quantity desired is incurred.

Last year the Walker Ice Company, of Worcester, Mass., adopted the improved method of ice-getting, with excellent results in the saving of time and labor. The present season the Waltham Ice Company, Waltham, Mass., is installing the same type of apparatus. The Dorchester Ice Company and R. H. White, of Taunton and Holbrook, Mass., are also operating this mode of ice harvesting the present season.

The machine for cutting ice by electricity is known as the Basin saw, manufactured by the Gifford-Wood Company, Hudson, N. Y.

The modern process of ice harvesting may be described briefly: First, the ice field of the pond or river is laid off by means of a float marker drawn by two horses. This machine divides the surface into sizes ranging from 14 by 16 to about 16 by 18 feet,



Motor-Driven Basin Ice Saws at Waltham Ice Company's Plant.

Digitized by Google

to constitute "basin floats," cutting a groove about two inches deep. These are deepened by the use of one to three ice flows, the depth of cut varying with the thickness of ice. The basin floats are barred off from the field and floated to the saw mill.

The floats are run through the first set of saws, which divide them into one dimension of the cakes desired, the float is given a quarter turn by men with ice hooks, and is sent through the second gang-saw, which gives the cross cut. Some companies cut cakes 22 by 44 inches, other 20 by 40, 28 by 44, 22 by 32 and 20 by 28 inches.

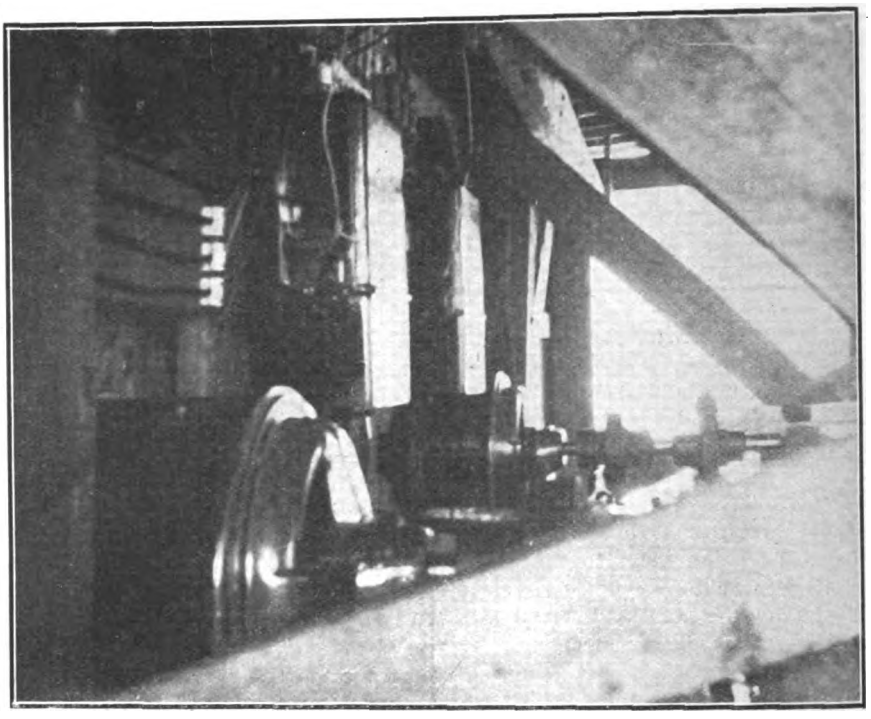
As the floats come from the second gang saw the cakes are barred apart and sent along a channel to the foot of the elevator. Formerly this operation was entirely hand labor, but now picking or driving machines, of which the Bond feeder is the approved mechanism, are installed over the channel, each in a shed to protect the motor and connections from the weather. The feeder consists of a revolving drum with spikes, which engage the surface of the ice cakes and keep them moving forward as fast as the apron of the elevator can take care of them. In modern ice houses electric motors operate the elevating apparatus and the horizontal runs.

The Walker Ice Company's plant at Worcester consists of two gang saws, one carrying eight and the other six 40-inch circular saws, installed across either end of a temporary covered shed about 60 feet long and 30 feet wide. The shaft on each saw is driven by a 35-horsepower induction motor installed on a raised platform on one side of the shed and centrally located between either end of the structure. A belt in either direction connects the gang-saw pulleys with those of a short shaft direct-connected to the motors, respectively, at about 18 feet between shafts.

The saws are set to cut about nine inches deep into the ice, which was about 14 inches thick last season. Both the sheet-steel frames which carry the saws are encased with a wooden hood which protects the saws from risk of accident and prevents the water and ice chips flying.

The Walker Ice Company operates two feeding machines, one of the Bond type and one of earlier home construction. The former is driven by a 7.5-horsepower induction motor, and the latter a 3-horsepower motor of the same type. The greater power requirement of the first mentioned feeder is due to its location at the lower end of the channel, where it forces forward the whole line of ice cakes.

The Walker Ice Company's elevator and gallery runs are now operated by a steam plant, but it is the intention to motorize this apparatus before another season.

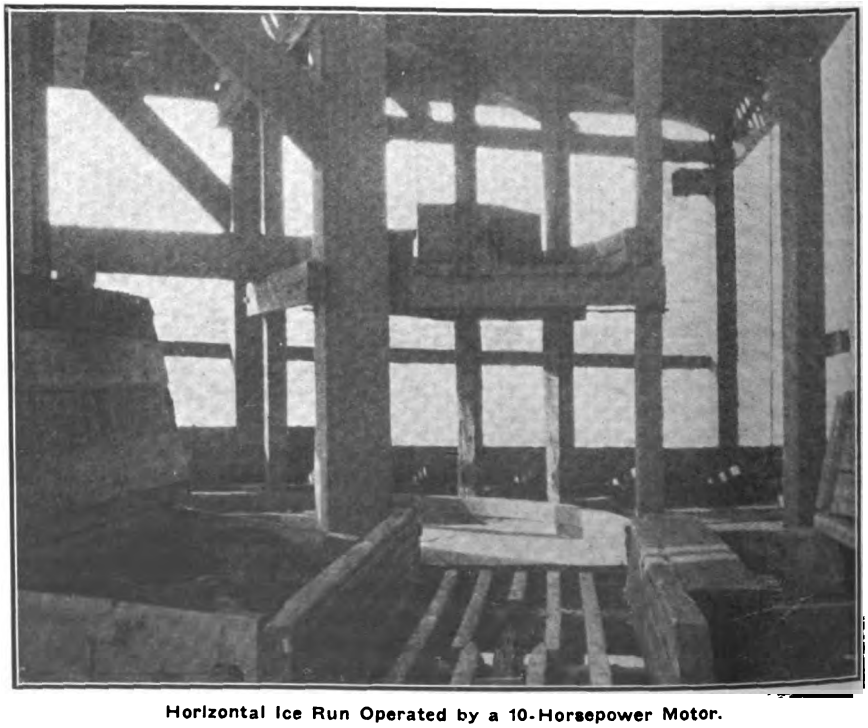


Two 35-Horsepower Motors Driving Gang Saws at Walker Ice Company's Plant.

About 70 hours—7 days of 10 hours—are required to fill the company's house, which has a capacity of about 35,000 tons. The rate of wages paid the laborer is $1.75 a day in ordinary seasons. Last season the force consisted of about 210 men, 65 on the ice-field and basin-channel work, and 145 at the plant and in the houses. This represents a saving of the services of 65 to 70 men over the years before the motor-driven apparatus was installed—an economy of something like $100 to $125 a day for labor, or $700 to $875 for the season. The cost of power used in gathering the crop a year ago was $269.29, 7,278 kilowatt-hours, at the rate of 0.037 cent per kilowatt-hour. The company uses a certain amount of energy the year round, for which it pays 0.053 cent per kilowatt-hour. The consumption in 1914 was 22,559 kilowatt-hours.

Formerly about 25 horses were required for grooving and plowing the ice field into cakes; now only four horses are required. The risk of losing horses by drowning is greatly reduced; in 1912-13 the company lost four horses through the ice.

The four motors installed, aggre-



Horizontal Ice Run Operated by a 10-Horsepower Motor.

Digitized by Google

gating 80.5 horsepower, operate at a considerable overload. The Worcester Electric Light Company provides energy from its 220-volt, three-phase service. Carbon lamps on temporary installation from posts set along the channels, and also in the saw shed, enable work to be carried on after dark, thus shortening the harvesting season.

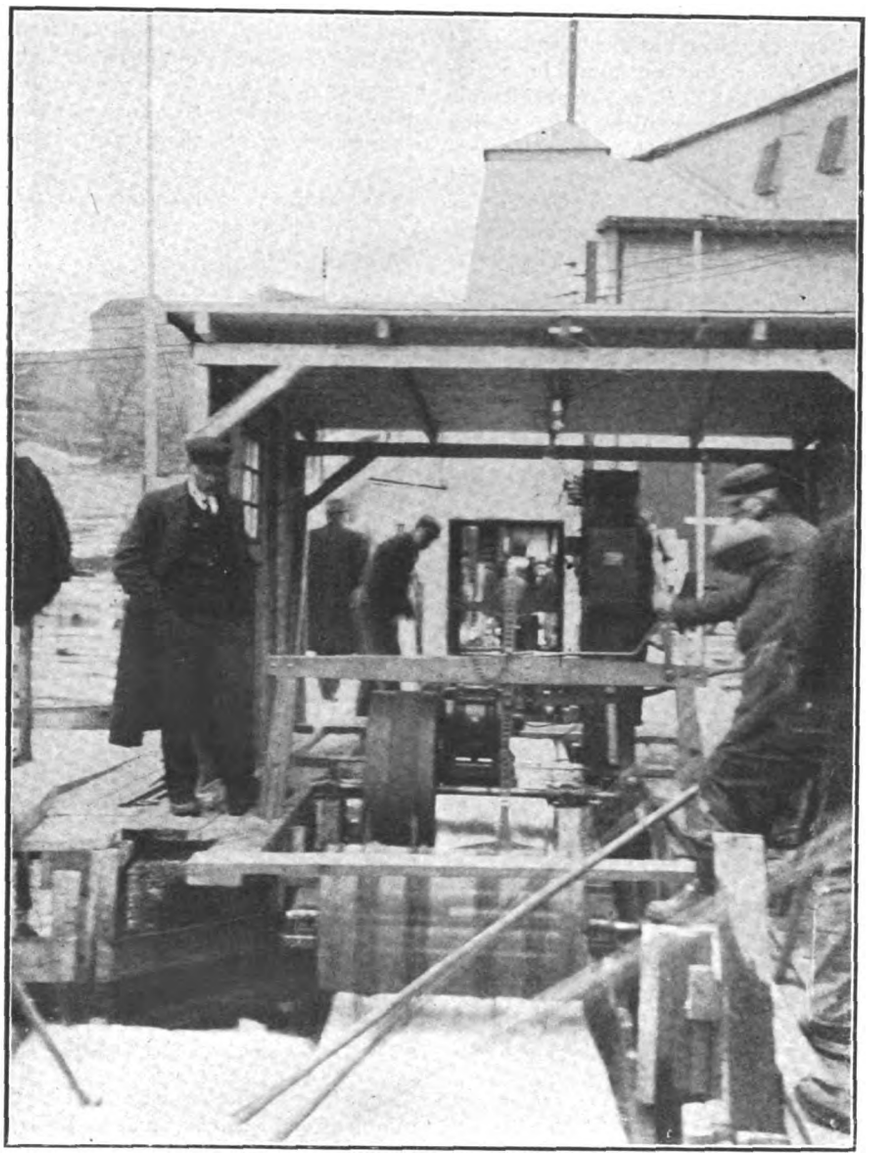
The Waltham Ice Company's houses are located on the bank of the Charles River at Waltham, just below the Waltham Watch Company's great plant, and in the closely-settled part of the city. Formerly ice was obtained from the river close by, but now, owing to the sediment and the cinders from the Boston & Maine Railroad trains near the river, the ice is unsuitable for use; hence the supply has to be taken from a mile to 1.5 miles up the river, where it is free from impurities.

A channel about 25 feet wide is cut from the ice-house landing to the field, and the floats are brought down the river, impelled by a tugboat.

The Waltham Ice Company's harvest is about 50,000 tons annually.

The Basin saw is installed in a 22 by 40 foot structure of southern pine timbers bolted together. The saws are 36 inches in diameter, the first gang in the channel carrying three saws and the second seven saws. The former are 44 inches and the latter 22 inches apart, to form a cake 22 by 44.

The gangs are driven by a 15 and a 35-horsepower induction motor, respectively. The two motors, one on each shaft, are each inclosed in a sheet steel box 3 feet 6 inches wide, 4 feet 4 inches long, and 3 feet 4 inches high, resting on the sheet-metal framework housing the saws. These frames are supported from the cross timbers above by chains which pass through pulleys and enable the apparatus to be raised or lowered to conform with the water levels and the requirements of the depth of cut in the ice. The Waltham company cuts about 8 inches deep, the ice being 12 inches thick.



Motor-Driven Basin Feeder.

From the basin in front of the second series of saws the cakes, barred apart, float along the channel to the apron and elevator, which is operated by a 35-horsepower induction motor located in a tower at the upper end of the elevating hoist, which it operates through gears. The motor also operates by rope drive a water pump to furnish flushing to a receiver for ice chips cut from the surface of the cakes.

The horizontal run, which connects the company's seven storage houses, about 225 feet in aggregate length, is driven through gears by a 10-horsepower induction motor installed in a wooden box near the initial end of the run.

Energy for operating all the motors is supplied by the Edison Electric Illuminating Company of Boston, on 220-volt, three-phase service. The rate is based on demand, and ranges from 10 cents to 5 cents per kilowatt-hour.

Electrical Prosperity Week in Boston.

Flood lighting of Massachusetts' historic State House, a parade of electric vehicles, and special activities on the part of the Boston Edison Company, which kept open house to the public at its 16 stores, were features of the Week at "the Hub."

The State House illumination was by means of 74 500-watt Mazda lamp projectors each equipped with a 16-inch reflector and giving a beam candlepower of about 100,000, or a total of 7,400,000 candlepower from all the units.

Thirty-eight of the projectors were located on the roof of the building at No. 6 Hancock Avenue, southwest of the State House, and 36 units were on the roof of No. 9 Park Street.

Hours of illumination were from dusk to midnight. The central location of the building, at the head of the Common and in full view of the business heart of the city, made for a conspicuous display, which was witnessed by thousands.

Electric cooking and washing apparatus were featured at all the Edison stores, including the appliance department of the main store, 39 Boylston Street. Tea and other electrically prepared refreshments were served to all callers.

The company's new two-cent rate was brought to the front in the demonstration of electric ranges, and it was claimed in connection with the display of washers that two cents' worth ef electricity will do the washing of a family of four to six.

On November 29 the Boston Edison Company mailed to its 80,000 customers a letter signed by General Superintendent W. H. Atkins asking for suggestions as to service, the courtesy and attention of employees, and ways in which the company could do more.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Electric Range in College Dormitory.

An electric range of large capacity has been installed in Tower Court, the new central dormitory at Wellesley College, Wellesley, Mass.

The range is 12 feet long and comprises three ovens with inside working spaces, each 21.5 inches wide, 27 inches deep and 16 inches high; one flat three-section heated top 4 feet 6 inches long by 2 feet deep, three 18 by 24 inch rim griddles and three plug receptacles controlled by three-heat switches for connecting deep-fat frying kettles or other portable heaters.

The construction is of steel, with polished trimmings. Each heating unit has fuses and a separate three-heat control switch, and under each unit is a signal lamp under a ruby glass bull's-eye. The range is of Simplex manufacture.

The total connected load is about 35 kilowatts. This range, together with a Simplex electric baking oven serves 250 persons, steam being used for stock kettles and vegetable steamers. The energy used is from the Wellesley municipal supply which is obtained from the Boston Edison Company.

Taylor and Waco Now Connected by Electric Power Line.

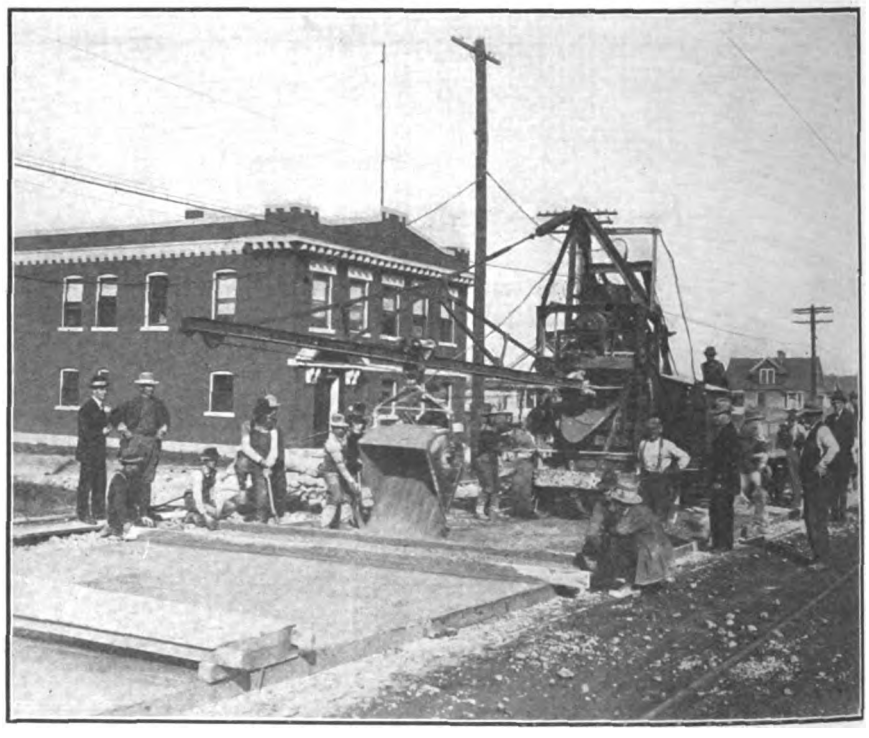
On Wednesday, November 17, electric current from the big power plant of the Texas Power & Light Company in East Waco was sent as far as Taylor for the first time.

The transmission line which has been under construction for the past six months is practically completed and, although continuous service from Waco to Taylor will not be furnished for about ten days, in order to allow time for thoroughly testing out the line, the big job is done and an unlimited supply of power is now available for the sixteen cities south of Waco which will be supplied.

Temple, Belton, McGregor, Rogers, Moody, Heidenheimer, Eddy, Lorena, Bruceville, Troy, Holland, Bartlett, Taylor, Thorndale, Rockdale and Thrall will receive electricity from the Waco plant. Although the power stations at Temple and Taylor will be kept intact for emergency use, it is hardly probable that they will be needed because of the rugged type of construction used on the transmission line.

State of Utah Uses Electric Power in Road Building.

Electricity has not been considered available for use on movable equipment, especially if any considerable distance were covered in a day, owing to the expense of changing service connections. The Utah Power & Light Company has solved this problem by mounting portable substations on wagons for contractor's use. Each substation is equipped with 1,000 feet or more of secondary cable, which can be paid out as needed, thus supplying a range of 2,000 feet without a change in location of the substation. If the contractor has enough electrical equipment to warrant he employs an electrician to look after it who is also competent to make primary connections to the power company's lines.



Motor-Driven Concrete Mixer Used in Road Construction Work. Fed from a Portable Substation.

The State Road Commission of Utah is using an electrically equipped tractor-concrete-mixer in the construction of six miles of concrete roadway between Salt Lake City and Murray. The roadway is 16 feet wide and 6.5 inches thick, and is laid on a rolled gravel sub-base which had previously been put in. A one-half yard mixer equipped with a 15-horsepower three-phase motor is used. Nine hundred and fifty lineal feet of roadway, requiring 305 cubic yards of concrete, are laid in an eight-hour day with a current consumption of 121 kilowatt-hours, or four-tenths of a kilowatt-hour per cubic yard of concrete.

The roadway is kept flooded with water for about three weeks after it is laid, and water for this purpose is pumped from ditches with an electric-motor-driven triplex pump. Three-inch pipe is run out for a distance of 1,500 feet on each side of the pump, and these furnish water for the mixer as well as for flooding.

Baltimore Stock-Selling Plan.

During the past month more than 100 names have been added to the list of stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., through subscriptions to the common shares under the company's easy-payment plan. The company is selling the shares to its customers at the market price and subject to monthly payments of $4.00.

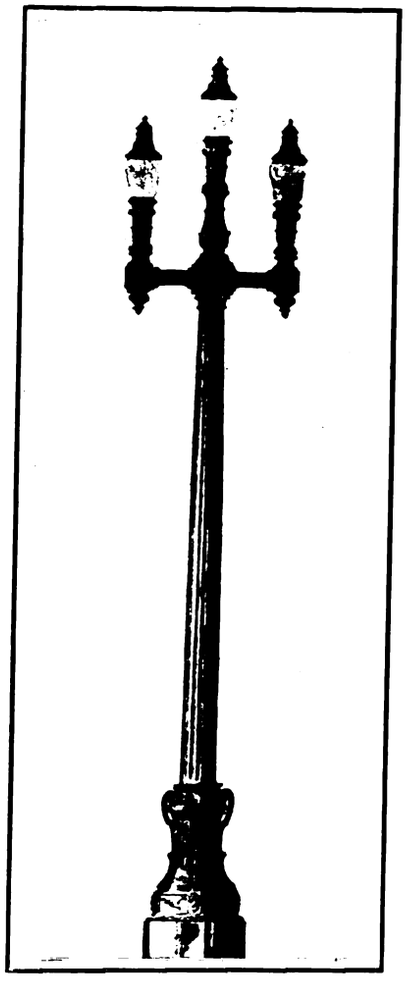
Digitized by Google

New Street Lighting for Salt Lake Business District.

The City Commission of Salt Lake City has formally declared its intention of installing ornamental lighting standards on Main Street, from South Temple Street to Fifth South, a distance of five blocks, or 3,960 feet. The proposed system contemplates the installation of 14 special standards to the block, seven on each side of the street, the distance between posts being approximately 100 feet. Each standard will be equipped with three 6.6-ampere inverted-type luminous arc lamps. The posts are of special design, as shown in the accompanying illustration, and are arranged to fit over the trolley pole, the bottom of the bracket carrying the lamps coming just above the point where the span wire attaches to the pole. It is the intention when this system is completed to require the removal of all other posts and poles from the curb, so that this special lighting system will be the means of substituting for the present trolley pole, unsightly at the best, a highly decorative standard and removing all other obstructions to the view. The height to the lamps will be 27 feet, and as the width of the street is 132 feet between property lines, the squatty narrow effect so usual where the lamps are mounted low will be avoided.

The cost of installation of the system is estimated at about $4.00 per front foot. This will be prorated under the provisions of the law, against the property included in the district, and will be collected as are other special assessments. The cost of maintenance and operation is figured at $1.30 per front foot per year. A portion of this expense will be borne by the city in lieu of the street lighting it is now doing, which will be replaced. The balance will be prorated against the property as is the installation cost.

The system was designed by W. D'A. Ryan, chief illuminating engineer for the Panama-Pacific International Exposition, who was specially commissioned by the property owners.



New Lighting Standard for Salt Lake City.

An Electric Range Campaign at Scranton.

The wide publicity which is being given electric cooking by manufacturers and central stations in many parts of the country is resulting in popularizing the electric range and attracting to it the attention and consideration which it deserves. Mention was made in our last issue of a campaign for this class of business recently inaugurated at St. Louis where 22 ranges were sold the first week.

In Scranton, Pa., a similar activity is under way and while it is too early to present results, the Scranton Electric Company feels that its efforts in this direction will be amply repaid. Supplementing a special campaign by personal solicitation the company is using considerable newspaper space, the accompanying advertisements being typical of the character of copy used. The Globe Stove & Range Company, manufacturers of the range featured in this campaign, assists the central station in every manner possible and furnishes copy for ads, literature, etc.

At the present time similar campaigns in which the Globe company and central station are co-operating are being held at Burlington, Ia., and Marion, Ind.

G
GLOBE
ELECTRIC
SAFE as a piano keyboard—
Baby fingers may twist at the switches of a Globe Electric as safely as they toy with the piano keyboard. There is no flame, no suffocating or explosive gas to flow out and fill the room. Nor are there dangerous matches lying around when you cook with a Globe Electric.
Globe Electrics are safe, cleanly, convenient, handsome and economical. They bake, boil, roast, fry and broil—all that a range of any kind can do. Won't you let us demonstrate them to you? Any day—any hour—at our display rooms.
(ELECTRICAL COMPANY)
G
GLOBE
ELECTRIC
HEATS without fire—
The most efficient heat known—electrical energy—cooks the food in the Globe Electric Range. There is no flame—only heat. So carefully is this heat utilized and guarded in the Globe Electric, that the oven, heated in ten minutes, will maintain its baking temperature for two hours after the current has been turned off. Surely you know of no other such economical conservation of heat. The Globe Electric does all that any range will do and does it better—fry, boil, bake, broil or roast. Let competent demonstrators in our display rooms explain this and many other remarkable features of Globe Electrics to you.
(ELECTRICAL COMPANY)

Two Typical Advertisements Used by Scranton Company in Range Campaign.

Buy Old Flat Irons.

The Texas Power & Light Company during Prosperity Week induced a number of local contractors in the towns where the company operates to take in old flat irons at 25 cents each, as many as two old irons being taken in on the purchase of a new electric iron at the regular price.

Digitized by Google

Campaign Results in 110 Washing Machine Sales in One Month.

The Do-It-Electrically doctrine has struck Philadelphia and as a result during the month of September 110 housewives elected to have their washing done the electrical way, using Western Electric washing machines. These machines were placed in 110 Philadelphia homes as a result of a thorough sales and advertising campaign carried on during the month of September and covering the entire Philadelphia territory.

The campaign was conducted by the Philadelphia Electric Company, with the co-operation of the manufacturer, nothing being omitted to make the campaign a success. The driving wedge of the campaign was an easy-payment plan by which the machines could be purchased and which consisted of an initial payment of ten dollars and the balance in monthly payments of five dollars each; these were added to the monthly electric bills. This wedge was driven home by special folders inclosed in all light bills, by special one, two and three-column newspaper ads, car cards used in all Philadelphia cars, window displays and 30,000 special mailing cards. All advertising matter was printed from plates supplied by the Western Electric Company who also suggested copy and furnished window-display material, etc. The results obtained in proportion to the amount expended for advertising, were highly satisfactory to the Philadelphia Electric Company, who are planning a similar campaign for the spring.

Effective Plan for Interesting the Children in Electricity.

A novel contest is being staged this week in nineteen of the larger cities where the Texas Power & Light Company operates in the hopes of accomplishing several objects.

Only recently the company put into effect an electric cooking rate and one of the objects of this contest was to stimulate interest in electric ranges. One of the Hughes Jr. electric ranges is being given away to the little girl under fourteen years of age who guesses nearest to the number of beans in a lamp bulb which is hung in the show window. The beans are of different sizes and of different colors. The lamp bulb is sealed at the top and screwed into an ordinary socket.

The question "Do you use electric lights in your home?" is asked of all who enter and is one by which it is hoped to obtain some prospects for appliance sales and house-wiring.

On the back of the card issued to contestants are illustrated a number of household appliances. Spaces have been left under these appliances to fill in the proper names. Of course it is not expected that the children will know the names of these appliances and on this account they will in all probability take the cards to their mothers who will naturally become interested in the subject of "bean guessing" and electrical appliances. The newspaper advertising being done at this time is laying particular stress on the desirability of electrical gifts for Christmas presents so it will be seen that careful plans have been laid to take advantage of the interest created by the guess cards.

An illustration of the company emblem is shown on the card with the question "What company in your town does this emblem represent?" While this is an easy question it will nevertheless help to establish the "Service First" idea which is the basis of the company's business.

Electric Company's Show Window During Guessing Contest.

Rules of the contest have been printed on a window poster 11 by 14 and two of these posters have been placed in each show window. Children of employees of the company are not permitted to make guesses. The guess cards are numbered consecutively and in case there are two winning guesses the range will be awarded to the little girl who has made the earlier guess.

All the advertising that is being done appeals to the "playing house" mind of the children. The fact that the little range will cook as well as mother's big range is brought out vividly by having some little biscuits in the baking pan of the range in the show window. The superiority of this toy range from a safety standpoint as compared with the ordinary toy range with which matches are used is also brought out.

THE FUTURE OF ELECTRICAL ADVERTISING.

Need Shown for Specific Data on Results Obtained.

Speaking before the recent meeting of Ohio new-business men, W. A. Wadsworth, manager of the commercial department of the Union Light, Heat & Power Company, Covington, Ky., said:

"Present indications are that the time is not far distant when electrical advertising in some form will be considered generally as an essential to the success of any business. It is so considered by certain classes now. A striking example of this is the motion-picture theater. The statement was made recently by a prominent owner and operator that he had never opened a new house unless it was in direct competition with one or more other houses, and that he had used electrical advertising to successfully create and draw patronage from his competitors, with the result that he had never been obliged to close a house, due to competition, nor had he failed to drive out all competitors who did not follow his example and advertise electrically. The direct reason for this, he says, is that two theaters may be equal in every way and give equally good value, but if one is brilliantly illuminated and employs electricity generally as an advertising medium, while the other neglects this important feature, human nature will determine results.

"A merchant who for years had followed the practice of turning out his window lights when he closed his store was induced to try the experiment of leaving the lights burning until 11 o'clock every night for a month. It was necessary for the central station to loan the lamps and reflectors and donate the current for this period, but they were willing to do this as the merchant was located on a street of heavy night traffic and it was thought his example would be followed by his neighbors. As a result of this experiment the merchant bought the window-lighting equipment and placed his window lighting on a midnight schedule. Further than this, he employed some moving feature, usually electrically operated, in every window trim. He has completely remodeled his interior lighting, replacing gas arcs with nitrogen units, and has offered to use the best exterior electrical advertising suggestion made him that will not call for an expenditure of more than $500.

"Any central station that feels it is not in a position to carry on an extensive campaign for electrical advertising can certainly push window lighting.

"Probably one of the most important

Digitized by Google

reasons, and one for which we are responsible, why electrical advertising has not been making faster strides is the fact that we do not take the trouble to find out what results are obtained from this kind of advertising that is being done successfully and to use this information to encourage more advertising of the same kind among our customers. If the trouble is taken to inquire of our customers who have electric display, ornamental or decorative lighting, or who have properly lighted windows, or use electrical advertising in some other form, what results are being obtained, we would get enough data and ideas to start an active campaign for this kind of business. Incidentally, we would discover the dissatisfied electrical advertisers and have an opportunity to correct the fault that in nearly every case is the cause of their dissatisfaction.

"Electrical advertising is primarily night advertising. Night is an opportune time for advertising. People, during the day, are busy, their minds intent upon various duties. At night, with tasks of the day thrown aside, they are receptive to the influence of anything that catches their eye and pleases them. They read attractive advertising and heed its message.

"It is not, however, necessary to confine electrical advertising to night advertising alone, nor is it necessary to employ signs to successfully advertise electrically. Study carefully the window displays that have employed electricity to make them a success; investigate the moving effects employed not only by national advertisers but by local merchants to successfully carry out some selling campaign. Do this and tabulate the ideas involved and you will have suggestions and material upon which to build a successful electrical advertising campaign. There is no limit to the application of electricity for this purpose.

"If there be any of us who doubt the advisability of promoting electrical advertising, I am certain that the results of the efforts at present being made in connection with Electrical Prosperity Week will not only justify in such minds the wiseness of the campaign, but will result in getting their co-operation, which is one of the necessities for the successful carrying out of any united effort."

The Rutland (Vt.) Railway, Light & Power Company has offered twelve cash prizes to school children for the best essays on "Why Electricity is Our Best Servant."

The Salem (Mass.) Electric Lighting Company celebrated Prosperity Week by giving a coupon, good for $1 in trade before Christmas, with every $5 purchase.

New Electric Sign Attracts Attention in Cincinnati.

One of the most unique electric signs in Cincinnati, both in appearance and construction, is that designed and built for the new Mills Restaurant, and shown in the accompanying illustration. It carries out the trade-mark of the Mills restaurants, an old Dutch mill. The wings of the mill, in this case, are kept slowly revolving by a clever arrangement, with power furnished by a small electric motor.

The sign itself is one of considerable size, the tower of the mill being eight feet in height, exclusive of the base which bears the words "Mills Restaurant," and

Effective Electric Sign in Cincinnati.

is 4 feet wide by 8.5 feet long. The wings of the mills are over 9 feet from tip to tip. The word "Mills" is in two-foot letters, while the word "Restaurant," below it, is in eight-inch raised-wood letters, enameled, and illuminated by a surrounding border of electric lamps. The mill, with its wings, and the remainder of the sign, are outlined and illuminated by 395 16-watt tungsten lamps.

The structure weighs 900 pounds. It is constructed of metal throughout. The color is Dutch blue, with the border and letters in white, and the tiny window, the miniature fence around the base of the mill, and other decorative points also in white. The slowly-revolving wings of the mill, which run night and day, carry out the effect of reality admirably.

To obtain this effect no flasher device, of the ordinary sort, is used, the continuous slow motion required being obtained by a worm-gear drive. Starting with a 0.25-horsepower motor, with a speed of 1,700 revolutions per minute, it was necessary so to transmit the power as to give the wings a relatively slow motion, 7 revolutions per minute. This was done by gearing the motor to a pulley 1.5 inches in diameter, which in turn was geared to a 7-inch pulley on the worm shaft. This shaft is a heavy steel tube and communicates the power to the wings by means of a 2.5-inch worm-gear connected with a 10-inch wheel operating the wings.

The wings are lighted through the hollow shaft, by means of two brushes, insulated to the shaft, from which wires are run and connected to the wings. In this way the wings are kept moving at the desired rate, day and night, and at night are illuminated, with the rest of the sign, without difficulty. Five separate switches control the various parts of the sign, one controlling the motor which operates the wings of the mill, and one each the lights on the wings, the tower, the base, and the two words "Mills" and "Restaurant." A single master switch, of course, can be used to disconect the current from the whole sign, if desired.

A Useful Sales Help.

One of the first questions the average householder asks when a salesman tries to sell an electrical device is, "How much will it cost to operate?" The Twin State Gas & Electric Company of Dover, N. H., has installed in its showroom a device that will answer this question in a way that instantly attracts a customer. The company has had a seven-inch Westinghouse switchboard-type single-phase indicating wattmeter mounted on a small panel above a lamp socket, and both connected to its lines. The wattmeter has a black dial with white figures and pointer to make the readings stand out clearly, and has been calibrated in "Cents per Hour" instead of watts, based, of course, on the rate of 15 cents per kilowatt-hour in this case. Any heating device can be attached to this circuit, and the prospective customer gets an ocular demonstration of the "juice" it takes.

Flat Rates at Burlington.

The Burlington (Vt.) Electric Light Company is offering lighting at flat rates on the following schedule:

4	25-watt lamps,	$1.00 per month, net
5	25-watt lamps,	1.25 per month, net
6	25-watt lamps,	1.50 per month, net
7	25-watt lamps,	1.75 per month, net
8	25-watt lamps,	2.00 per month, net

For 60-watt lamps, which are supplied free, the charge is 60 cents per month per unit above four. For one flatiron, the rate is $6.00 a month. For the above rates a yearly contract is required.

The municipal light department, which is a keen competitor for business in the same field, has offered to meet the lighting company's flat rates, which, it claims, is a good proposition for the company.

Digitized by Google

Electrical Construction

HANDLING STORES ACCORDING TO THE CASH-CONTROL IDEA.

By Wilfred G. Astle.

Shortages in materials and supplies are just as expensive as shortages in cash and it is just as essential that one be guarded and accounted for as the other, because materials are but cash in a less fluid form and it pays to handle them as carefully. A piece of brass or copper in the storeroom costing and worth one dollar should be guarded and given the same degree of attention as a dollar bill in the office, and as C. E. Knoeppell says in "Maximum Production," a workman should have no more right to take this piece of brass or copper from the storeroom without accounting for it than he would have the right to walk into the office and remove a dollar bill from the cash drawer.

If there is no orderly method of looking after material in the storeroom there will always be a danger of serious and sometimes very costly losses. The principal sources of direct loss are wasteful use of materials and supplies, especially the latter; appropriation of material for private purposes, are out-and-out thievery. In a storeroom where workmen have free access to the materials, where standards of consumption are lacking, and when issuance is not thoroughly checked, there is bound to be wasteful use of materials and more especially the supplies; nevertheless, this tendency can be stopped by requiring a strict accounting for all materials and supplies that are issued. In the average instance, what one man appropriates for his own private use in the course of a year does not amount to much; nevertheless, it is just because he takes this view of the matter, without any particular scruples, he continues the practice until he comes to consider that he is only taking what is his right. Thievery, in the average instance amounts to very little, although it all depends upon the character of the stores. Articles of small bulk but high value, such as copper and brass, in the form of wire, which is easily concealed about the person, and which find a ready market as junk, constitute a temptation to which even the highest grade workman will sometimes succumb. Proper storekeeping and accounting methods will, however, put a permanent stop to these troubles.

One of the greatest sources of indirect loss is a lack of standards of consumption and of rigid control over issuance, which means the carrying of a larger stock than is actually necessary. This in turn amounts to a wasteful employment of working capital and interest on the excess investment and also a heavier depreciation on materials, which is a direct charge against profits. By controlling the supply statistically, it is possible to keep the quantity on hand on all items at all times close to the minimum, and to gradually exhaust any materials that a contemplated alteration in the design of the product will make unnecessary; so that when the old style is dropped the dead stock will be practically nothing. Another source of indirect loss is the production delay on account of shortages. This source, although less tangible, nevertheless is one of the largest negative factors in the problem. To eliminate shortages, which is one of the most detrimental in its effect upon production efficiency, is worth all the time, energy and money required to improve the control of stores. Still another source of indirect loss is the lack of centralization, which means the using of valuable space about the factory for storages, which might be more profitably used for production purposes.

The first step that should be taken, to eliminate these sources of direct and indirect losses, is to consolidate all the materials and supplies in one or more centrally located storerooms, to close them off from the rest of the factory, and place a storekeeper in absolute control with instructions that no material is to be given out under any circumstances except by the authority of a written order duly signed by the proper person. The storekeeper should be a man exceptionally well qualified for the position, and must, above all things, be exacting, and have such

PERPETUAL INVENTORY RECORD

Symbol_____ Description_____ Balance on hand should never exceed_____

Unit _____ Location _____ When balance on hand sinks to_____

Price_____ _____ Requirement_____ Put in order for _____

PURCHASE ORDERS					RECEIPTS			DISBURSEMENTS								
PURCHASE ORDER NO.	DATE	VENDOR	PROMISED	QUANTITY	RECEIPT NO.	DATE	QUANTITY	DATE	QUANTITY	BALANCE ON HAND	DATE	QUANTITY	BALANCE ON HAND	DATE	QUANTITY	BALANCE ON HAND

Fig. 1.—Stock Record Suitable for Perpetual Inventory System.

Digitized by Google

complete control over the men in his employ that the slightest infraction of rules will mean the equivalent to a final check. He should also be capable, conscientious, and a man who will appreciate the value of the materials he handleds and be full alive, at all times, to the responsibility of protecting the company's property. He should be familiar with the materials, and know their uses, but it is not necessary that he should be a skilled mechanic.

A suitable system of filing and indexing all stores should be provided. There should also be a definite place for every class of material, and that class should always be kept in that one place. The question of the size and weight of the material, and the frequency with which it will be called for, should be the first consideration in

Form 416

The Toronto Electric Light Company, LIMITED

Goods received by Stores Department

From _____

_____ BAGS _____ BUNDLES _____ REELS

_____ BARRELS _____ COILS _____

_____ BOXES _____ CRATES

WEIGHT _____ CAR NO. _____ WAY BILL _____

191

Order No.

Via _____

Charges _____

QUANTITY	DESCRIPTION	HOW USED: LOT NO	WORK ORDER	ACCOUNT NO.

IMPORTANT

Full details of all Shipments received must be given above, and this form sent to Audit Dept. within 24 hours after receipt of goods.

Received by _____

Correct _____

Fig. 2.—A Form of Receiving Report—Actual Width 8.5 Inches.

storing. The bins and racks should be arranged so that the storekeeper can tell at a glance how his supply is holding out. If, in addition, the arrangement can be made to show automatically when the low limit has been reached on any item, so much the better. The storekeeper should systematically check up his accounting by taking a physical inventory. A good time to do this is when the balance or any article reaches its low limit, and this should always be done; but it is also well to check up a certain number of items every day in regular turn, so that each item will be inventoried at least once a year, but oftener if possible. No merchant would neglect to inventory his cash on hand at the close of each day's business, regardless of how much confidence he placed in his cash register and in those who used it. Therefore, it should be just as necessary for the manufacturer to keep close tab on his balance of materials, for these are, as already stated, only cash in a less fluid form.

A large electrical company in New York City, in caring for its supplies by means of a perpetual inventory system, has made it very simple by dividing the stock into classifications as follows:

Classes 1 to 10—Wiring and underground supplies.

Classes 11 to 25—Arc-lamp parts, incandescent lamps and light hardware.

Classes 26 to 39—Steam fittings heavy hardware, and automobile supplies.

Classes 40 to 45—Station operating supplies and overhead material.

Classes 46 to 49—Reels and carboys.

Classes 50 to 100—Cable.

These different classes are cared for by means of the perpetual inventory as follows:

February 28—Inventory material in classes 1 to 20.

April 30—Inventory material in classes 21, 26, 27, 28, 29.

May 31—Inventory material in classes 22 to 25.

August 31—Inventory material in classes 30, 31, 32, 34, 39, 40.

October 31—Inventory material in classes 41, 44, 45.

December 31—Inventory material in classes 33, 43, 49, 50 to 100.

Therefore, a physical inventory of the storeroom material is carried on constantly in one division or another and is checked against the stock ledger balances. The officials have also made provision for suitable sections, bins and drawers in their several storerooms, all so arranged as to be readily found and easily accessible, and each bin is also tagged with the name of the material stored in it.

They also have what they call a "flying inventory squad." Their storerooms are scattered over the city and the squad goes into each of the district storerooms and checks up the material in the several classes just prior to the inventory date. This is in addition to the regular check which is carried on constantly by the district storekeepers themselves, so that they are in touch with the situation at all times. This company carries approximately 8,000 items in its supply account, and this system of checking has been adopted with a view to making leakages, if not impossible, at least too difficult to be often attempted. This can be done only by means of perpetual inventory with its far-reaching advantages over the old system of making a physical inventory once a year.

These perpetual inventories require perpetual attention. The difficulties in handling them have been largely due to lack of attention on the part of employees. There are some very simple rules that should be noted. (1) No material should be permitted to leave the storeroom without a requisition, signed on behalf of the department where it is to be used. (2) All requisitions must be checked up each night before closing and for that purpose an hour should be established in the afternoon, after which all requisitions of the day should be held over and filled the first thing in the morning. (3) Low-limit marks should be established by which the storekeeper can be protected, and the purchasing agent can be warned of the possible exhaustion of the supply. (4) A large low-limit mark should be placed on each kind of raw material so that the purchasing agent may have sufficient time to get new estimates before ordering a new stock of material. (5) Perpetual inventory records should be treated as cash is treated. Cash is verified often, or should be; so the inventory should have regular periods of verification.

The faithful operation of a perpetual inventory record, although involving considerable clerical work, gives the manufacturer perfect control over his stock issuance, and for this reason alone is worth every penny it costs. Moreover, if the balances on hand are systematically checked with the actual balances, there is no need to close down once or twice every year for the purpose of taking inventory. Instead a clerk can go through the records and

Digitized by Google

in a few hours, or a few days at the most, obtain the desired information. Finally, in case of a fire, the evidence of an up-to-date stock record furnishes an indisputable basis for insurance adjustments on that element in the valuation.

It is evident that all this is good business policy. No manufacturer would think of issuing checks against an unknown bank balance nor if he found his accounts-payable at any time likely to exceed his cash account, would he delay to make provision for an adequate supply when the critical due-date arrived. Therefore, why should he not be just as provident as to the adquency at all times of his stock supply?

A theoretical stock record system may be outlined which would afford a perfect record, but, when put into practice, it might prove unsatisfactory, or it may be too expensive for the protection afforded. A practical test is always advisable before a decision is made upon a stock record system for any business. The installation of such a system calls for the exercise of judgment of the highest order. These records may be kept either in ledger or card form. There are good points in favor of each, but a list of items which ought to be a part of every stock record, are the name of article, description, part number, aisle number, bin number, unit of stock, date of receipt of material, name of concern from whom purchased, cost per unit, amount received, amount drawn from stock, order number on which withdrawal is made. So far as an actual record of the stock received and disbursed is concerned and the balance on hand, the above will suffice, but the real value of a record of this kind lies in the possibility of being able automatically to keep at the proper level, which can be done by the addition of a few more items—normal stock, minimum stock, maximum stock, amount ordered, balance due. The stock record clerk is then responsible for the ordering of stock at the proper time. Fig. 1 shows a form of stock record.

The normal stock should represent the quantity that would be sufficient to supply the demand for a certain period, or number of units to be manufactured, with due regard for the period of time necessary to obtain more stock of the same kind. If this is raw material, and is purchased in some distant city, the average length of time the material would be in transit, as well as the possibilities of prompt delivery to the cars by the concern from whom it is bought, must be fully considered in establishing a normal stock quantity. The minimum simply serves as a low-limit mark and the maximum as a high limit.

All items posted to stock records, both receipts and disbursements, should be taken from forms made out by responsible employees and checked; otherwise they will not reflect the true status of the stock on hand. Another reason why extreme care should be taken with these records, is that, in case of discrepancies between the records and actual stock on hand, they cannot be accurately corrected. Therefore, separate forms should be used for each receipt of stock and for each requisition that comes from the plant. Never post from oral information.

The records should be checked periodically by the results obtained from an actual count; and in case of errors, either by overage or shortage, the record should be made to agree with the actual amount on hand after the cause for the discrepancy has been determined. Unless checks are made and the reason for discrepancies ascertained, the records cannot be relied upon. Much care should be taken to keep the stock records in balance with the stock on hand as is taken by the cashier to keep his cash in balance with his cash book. If you wish to justify yourself for making the necessary expenditure to cover the installation and maintenance of a system to keep track of your material, or if you feel inclined to consider it "red tape," just stop to reflect that material represents money and whether or not you would be satisfied to fill your storeroom with gold dollars and keep no record of their ultimate disposition. You don't do it in your office; why do it in the storeroom? One surely must admit that the cases are parallel.

Material, under no circumstances, should be received through any channel except the receiving department, as any other course surely will lead to endless mistakes and trouble. This department is usually one in name only, as it is customary to have the receiving and shipping done by the shipping department, in all except the larger organizations. In such cases the shipping department simply makes out a receiving report in duplicate, showing the number of boxes, barrels and crates received. The duplicate copy of this report should be retained by the shipping department and filed according to the date the material is received, or alphabetically according to the name of the concern from whom the material was obtained. Such a routine will insure in all cases a correct record of receipt. The original should be sent to the proper storeroom or department, attached to the material. With this arrangement the material is not opened in the shipping department. Their receipt is merely evidenced by the making out by the clerk of a receiving report.

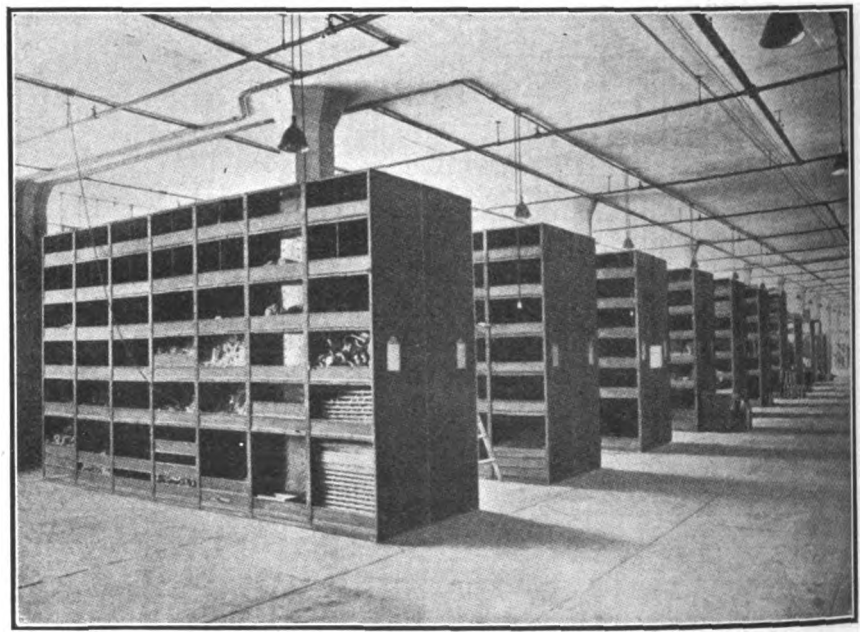


Fig. 3.—Steel Adjustable Shelving in the Plant of Continental Motor Manufacturing Company, Detroit.

This plan as outlined has three excellent features: (1) Inasmuch as all material would necessarily have to be verified, after reaching the storeroom, by counting and checking, the same operation in the receiving department amounts to an exact duplication of work with the incident additional cost of labor involved. (2) The opening of the material in the shipping department would require additional floor space and benches, which is duplicated in the storeroom. (3) Material if opened in the shipping department is more liable to be stolen in transit to the storeroom, or lost.

Nevertheless, there is one particular advantage gained by maintaining a

Digitized by Google

regular receiving department where materials are inspected, counted and weighed, as soon as received. It furnishes an additional check on receipts which, in cases of disputes with outside concerns as to amounts delivered, furnishes the most reliable evidence that reasonably can be obtained. This plan also satisfies the management that materials received are being properly accounted for by two distinct departments. In the last analysis too much cannot be said for the double check, when its cost of maintenance is not out of all proportion to its value.

All material, whether checked and counted in the receiving department or not, eventually has to be handled by the storeroom receiving clerk. In the first place, the storeroom should contain a section devoted exclusively to receiving. All material delivered to the storeroom receiving clerk should be counted, weighed, gauged or measured by him and the date noted on the receiving report, together with a proper description of the material. This verifying should be done, where possible, the same day the material is received, and in no case should it be delayed to such an extent that the non-receipt of the receiving report by the accounting department will cause the loss of discount on bills. Fig. 2 shows a form of receiving report.

In handling material and supplies of all kinds the cash-control idea should always be kept in mind, and the workmen should all be imbued with the same idea. The storerooms should always be locked, so that all stores will be under lock and key and issuance made only on the "O. K." of a responsible foreman, because it is a well known psychological truth that the sense of value is inversely proportioned to the ease of obtainment. By this it is not meant that issuance should be surrounded with safeguards and restrictions so as to put the workmen to inconvenience in securing necessary materials, but on the contrary, this should be facilitated as much as possible and the wasteful use of materials and supplies, especially the supplies, should be discouraged absolutely.

To accomplish these ends, it is very essential that standards of consumption should be adopted, otherwise, it will not be known when restriction becomes a nuisance and a loss. When the management of any business is in such a commanding position that they are able to say with force "this is your allowance—for any excess we must know the reason in every case," the workmen's sense of value assumes its normal; and the proper degree of carefulness in the use of materials and supplies will follow. Then, and then only, does maximum economy in consumption result.

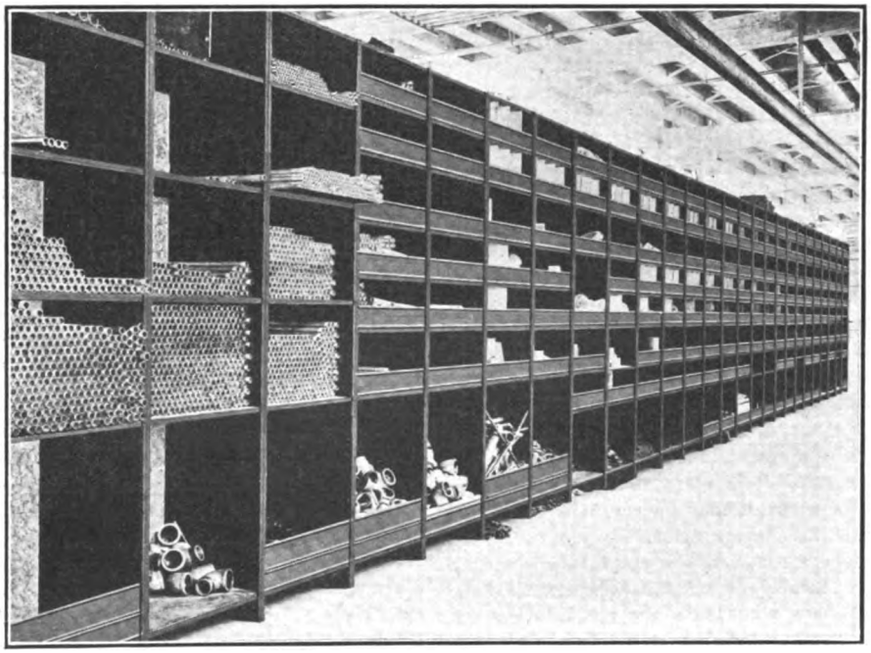


Fig. 4.—Steel Equipment in Storeroom of Davis Milk Machinery Company, Chicago.

Wisconsin Electrical Contractors to Meet.

The thirteenth annual meeting of the Electrical Contractors' Association of Wisconsin is to be held at the Hotel Wisconsin in Milwaukee, on January 17 to 19, inclusive. An interesting program is in preparation. The open session will be held on the afternoon of the second day of meeting, Tuesday, January 18; this will be followed that evening by the annual banquet. The secretary of the association is Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

A Common Fallacy.

For the past number of years the electrical contracting business has appeared attractive to many journeymen as a means of entering into business for themselves, and it has also appeared attractive to others who are not connected with the business in any way. There seems to be a disposition on the part of the general public to assume that there is enormous profits in this business and that the electrical contractor is more or less an extortionist. This opinion is shared by many who are closely identified with the business, namely the journeyman. From outside information, such as is generally gathered by those who are not in immediate touch with the detail of the business, they are led to believe that the difference between the cost of labor and material and the price which is obtained by the contractor is profit. In the course of time a workman gets a fair idea of the cost of material and it is then an easy matter for him to make a close estimate of the cost of the labor, based upon his experience as a workman. Considering these two elements only, it appears to the average workman that the man he is working for is making a tremendous profit on the goods he is selling.

This is a common fallacy, not only among the journeymen electricians, but also among the customers of the contractor. Those who are only permitted to take a casual view of the contracting business practically from the standpoint of an outsider overlook a most important element of all business and especially a business where any labor is required in the sale or installation of material, namely overhead or operating expense. Viewing the electrical contracting business from the angle of the workman or general public, it can readily be understood how such wrong impressions should prevail in the minds of the uninformed. However, when we stop to consider, when we get into the very heart and soul of the business, when we enter into the intricate detail, we find lurking there a parasite which is so easily overlooked by the casual observer and which is in fact so elusive as to deceive those who have the opportunity of being in close touch with the details of the business. This parasite is ever present. It is there eating away the profits everyday, sunshiny days, rainy days, days when business is good, days when business is poor. And it is this unseen and often misunderstood item which is not considered by the journeymen and the customer, and it is quite natural, understanding nothing of this item which represents in most instances the larger proportion of the cost, that the contracting business should appear attractive.

This animal, overhead, is found in every crack and crevice of the business. It is found in the office, in the workshop, it is found in rent, office salary, stationery

Digitized by Google

and supplies, it is found among the tools and other property in the form of depreciation. It is found out on the job in various forms. It sometimes appears in the form of lost time, due to human inefficiency of the superintendent or the men under him. It is among the men in the form of time lost in beginning and quiting work. In the automobile it rides about, in upkeep and depreciation. It travels about with the collector and presents itself in the form of allowances made to customers in the settlement of their accounts. It is ever present with the office force in inefficient methods. It is a daily and hourly companion of the manager. It will be found to be lurking in the books of the concern in bad accounts as well as in accidents in the business which causes unusual and unexpected expense. It will be found in the carelessness of employees is not properly caring for the property of the owner. It is found everywhere and it is this animal, overhead, which often times devours not only the entire profit but the original investment and leads the contractor to bankruptcy.

When I hear a contractor say that he has no overhead, I often wonder how much salary he would ask me to conduct a similar business. You can depend upon it that he would immediately become valuable as a manager and I therefore contend that if he is valuable as a manager in my employ, he then has an overhead and is valuble to his own business. He is unwilling to render service to me as an employer without good compensation, but in business for himself we often find him rendering this same service to his customers without pay.

How many contractors in considering the item of overhead expense give the matter of business insurance any consideration? They carry accident insurance on themselves, fire insurance on their property, automobile insurance on their cars, for the purpose of reimbursement in case of accident. They do not carry accident insurance upon themselves because they believe that if they should sustain an accident, which is liable to occur, that the accident will be less painful or that by carrying accident insurance that they are less liable to sustain an accident. No, they carry accident insurance for the purpose of reimbursing themselves for any unusual or unexpected expense occasioned by an accident which may occur. Accident insurance is carried on oneself to protect the earning power. If it is reasonable to carry accident insurance on yourself, fire insurance on your stock, or automobile insurance on your car, then you should for the same reasons carry insurance on your business, to reimburse you for any unusual or unexpected expense occasioned by an accident in your business. Every business firm should set aside a certain amount each month or year to be considered as accident insurance and this should be considered an item of overhead. Such accident may not occur for months or years but when it does occur you will have an amount which will cover a part if not all of the unusual and unexpected expense and it will not be necessary to take this expense from the profits of your business as it has been added to the cost of labor and material in estimating contracts or it has been added to the cost of material sold over the counter or which enters in to time and material jobs performed by the contractor.

It is my contention that if a person or a firm poses as a contractor and announces himself in business either by the word of mouth, advertising literature, or otherwise they immediately incur an overhead expense. If a person was to enter into business tomorrow as an electrical contractor and let us say for sake of argument that he did not rent a place of business, supposing that it was an individual who was a bachelor and had no residence and to make the point more clear suppose he was living at home with his parents at their expense and suddenly became enthusiastic over the imaginary profits occurring in the contracting business and entered the field as an electrical contractor. The first step this individual would take would be to have some cards printed, which is an item of overhead expense. Just the moment he even decides to enter the business he creates two items of overhead expense. One printing and stationery, the other manager's salary. Just as soon as he obtains his first job he creates an overhead expense in laying out the work and from that time on he meets this animal, overhead, at every turn of the road. Notwithstanding the fact that he may not recognize it in many phases of the business where it may appear, it is there and this has been conclusively proved by the fact that a very large per cent and in fact nearly all of the men entering the business who have not properly considered this business companion, overhead expense, have failed in business.

G. W. Hill.

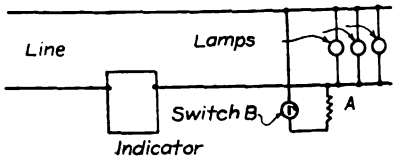
Excess Indicator for Fire Alarm.

A novel application of an excess current indicator was called to the writer's attention some few days ago. In a large manufacturing plant, the operators were frequently unable to hear the fire-alarm gongs on account of the noise of the machinery, and consequently would not always respond promptly during fire drills, which were given at regular intervals as required by law.

To overcome this difficulty and provide a thoroughly reliable signal the red lamps kept continually burning, to mark the various exits of the buildings, were wired up on separate circuits controlled by an excess indicator. The mechanism of this device consists of a magnet and a special double-break switch mounted upon a cast-iron base which also forms the back of a casing much similar in design to that of the ordinary watt-hour meter. This magnet and switch are connected in series with one side of the circuit, as shown in the accompanying diagram. When a load in excess of that for which the indicator has been set is put on the line, the operation of the mechanism causes all of the lights controlled by the indicator to flicker. This action continues until the excess load is removed.

In this particular installation the extra load required is provided by the resistance *A* controlled by the switch *B*. In case of fire, or for fire drill, this switch is closed, throwing the resistance directly across the line, causing the indicator to operate. The flickering is instantly evident over the entire building and gives a positive warning which was not possible with the fire gongs.

In using this system care should be taken to select a resistance which will not overheat if left in the circuit for any length of time. Further, the resistance should be substantially mounted.



Connections for Excess Indicator Used as Fire Alarm.

Probably the best method is to use a resistance unit with Edison screw base which will fit any standard receptacle. Lamps could be used instead of the resistance, but the latter is more reliable and not easily broken. Only a small resistance unit is required, as the indicators will respond to an excess demand of 10 watts on a 100-watt load or an overload of 10 per cent on higher loads. The indicators can be supplied in capacities up to 10 amperes for either 110 or 220-volt direct or alternating-current circuits.

This scheme gives a comparatively inexpensive and effective signal arrangement and one which is not likely to get out of order. It will probably be more largely used as it becomes better known. It is also well to note that this system could easily be interconnected with any fire-alarm system by using a suitable circuit-closing relay instead of the hand-operated switch at *B*. The indicator for this particular installation was of the type manufactured by the Pittsburgh Electric Specialties Company.

George A. Schneider.

Electricity has been a big factor in cheapening water supplies for towns and cities, and its employment is rapidly growing.

Digitized by Google

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

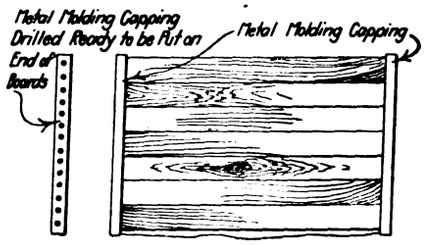
Fixture Tool.

A great help for a wireman who has to hang new fixtures is to solder a brass ferrule on a solid die to act as a guide, and he needs no stock. This makes a handy tool to run over the gas pipes on ceilings before hanging fixtures; it also is useful on the bench or in the tool bag for ordinary use.

Ben R. Browne.

Meter Board.

In making meter boards I always use the scrap pieces of metal molding capping on the ends of several boards



Meter Board.

whose lengths are cut to the width I want it to be. Take the capping and drill it so two nails will catch each board, then put it on the end and nail. Then I have a good solid meter board. Four screws will hold the board in place, size 24x30. The larger the board the more screws can be used to hold it in place.

O. S. Livergood.

Keeping Decorations Clean.

When on a recent job, I had occasion to bore holes, many times in the corners of the rooms. As my hands were, naturally, dirty, and I should probably get the wall and decorations dirty if I touched them, I used my handkerchief. By passing the end under my right thumb, and holding it there by the pressure of my hand on the head of my brace the handkerchief went across the knuckles and back of my hand. The other end of the handkerchief covered the hand working the brace, by going across the back and being held in place by the thumb and little finger. It is rather a bother, but it works, and I did not get any decorations smudged up.

Harold Allen.

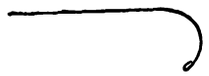
Snake End.

I find it desirable to bend the end of my snake as described below, and in that form it will go through any run of flexible conduit. About two inches from the end I give the snake a longitudinal quarter turn. At the extreme end it is bent into the form of an eye or a ball. I have used this form of snake with great success.

William P. Ullrich.

Curl End of Snake.

When fishing wire in conduit, the steel snake which is inserted first, always hits the inside of the box at the



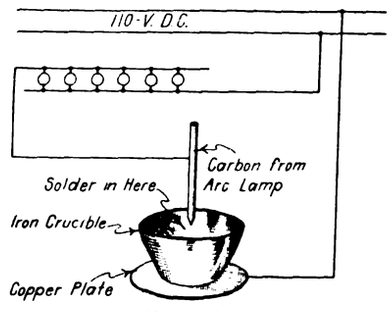
End of Snake.

other end, and must be pulled out by the helper. By curling the end of the snake as shown in the illustration, the snake can be pushed through and out of the box, so that if there is only one ladder at hand, the helper can reach the snake from the floor.

J. H. Lamoureux.

Melting Solder.

The accompanying illustration shows an arrangement I have used for melting solder in small quantities in a crucible, where it is all ready for dipping joints or the ends of stranded wire. An arc-lamp electrode is connected in series with a bank of lamps on a 110-volt direct-current circuit and brought in contact with the solder, which has been placed in an iron crucible connected to the other side of the circuit. After striking the arc the electrode is held a short distance away from the solder and the heat which is generated will



Melting Solder.

melt it very quickly. I find this more rapid and more satisfactory than using a torch.

William T. Estlick.

Holder for Soldering Paste.

By filling an old D. & W. fuse case with soldering paste, it can be carried in the tool bag very conveniently. When in use reverse ends with the case and screw it into top part and it will stand on end any place to suit the convenience of the user.

H. W. Hatch.

Twisting Wires.

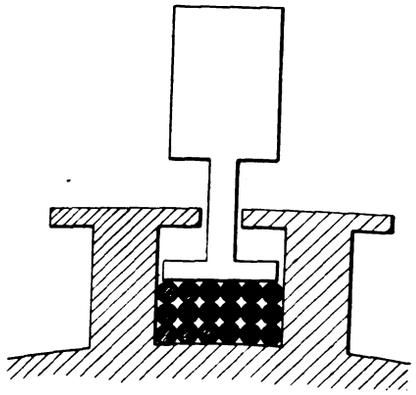
For twisting single wires together take electric, hand, breast or brace drill and chuck one end of each single wire in same. Fasten the other loose ends firmly to a nail or other object to keep them from turning. Turn drill until wires are twisted as required. Insulated wires should not be twisted too much, as the insulating covering will crack.

Each single wire should be several feet longer than the twisted length required.

Frank C. Petersen.

A Coil Drift.

When winding coils into partly closed slots of armatures or stators the wires tend to build up and fill the slot before the required number of turns have been wound on. To force the wires to the bottom of the slot under such conditions a fiber drift was made as shown in the sketch. The web of the tool



Coil Drift.

should be made as short and thick as possible to give the maximum strength. The slot insulation is not shown.

A. Hearvey.

Center of Ceiling.

To find the center of a ceiling not over twenty feet square I use the following method. A bit extension is clamped near the center of an extension rule. I set the step ladder approximately in the middle of the room and holding the bit extension in one hand, measure the ceiling. Much time of moving the ladder about and looking for faint marks is thus saved.

In measuring the ceilings of low rooms the rule is clamped at its middle and the extension used as a handle; a feeler bit is held in the other hand and used as a marker. When the center is found the bit is used to make a distinct mark.

A. R. Steinhaus.

The power station at Studley College, England, is in charge of a 20-year-old girl. It includes a gas engine, dynamos and storage battery.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Sacramento Gas Company was authorized to create a bonded indebtedness of $1,500,000 first-mortgage six-per-cent bonds, and to issue and sell $400,000 of these bonds at not less than 92.5 per cent face value.

DISTRICT OF COLUMBIA.

Jacobus Kappeyne will succeed H. C. Eddy as engineer of the Public Utilities Commission of the District of Columbia. He is to serve as both engineer for the Commission and valuation bureau chief in bringing to completion the work of valuing the properties of the public utilities in the District.

PENNSYLVANIA.

The Midvale Power Company applied for a certificate of convenience and necessity permitting the company to furnish electric service in Jenkins Township. The Citizen's Electric Illuminating Company filed a protest alleging that it is furnishing adequate service in the township and that the approval of the application would mean the duplication of facilities in a locality where only one company can subsist. The Commission finds that the present company is able to furnish adequate service, and is also financially able and willing to build and install additional facilities to meet any future demands for power; that the existing company has given fair and adequate service in the township for a long period of years; and that under the evidence, there is no public necessity for a new company. The application is dismissed.

The Philadelphia & Reading Railway Company refused to furnish passenger service over a certain branch road, alleging that the furnishing of the service would result in a heavy loss. The Commission holds that, "even though a railroad suffers some incidental loss in furnishing adequate facilities, a public service company may always be required to perform its charter duties to the public."

The White Oak Light, Heat and Power Company. A complaint filed with the Commission by the White Oak Light, Heat and Power Company, alleged that the Borough of Benson was about to construct an electric light plant and compete with the company in the supply of electric service in the Borough. The complaint raises the question of the right of the municipality to construct a plant to furnish street lighting service and to supply commercial service where a private plant is already established. The complainant had formerly furnished street-lighting service under a contract with the Borough. It appears that the service was unsatisfactory and the Borough would not enter into a new contract when the old expired. The complainant has continued to furnish electric service to private consumers. The Borough has entered into a contract with the Penn Electric Service Company by which the company is to furnish electric current to the Borough and its inhabitants, and has provided facilities for the distribution of this current. The Commission has been asked to approve this contract. The Commission holds that the Borough of Benson, under the circumstances in this case, should not be authorized to acquire or construct a plant for furnishing electricity to the public unless it should acquire the plant of the existing company; but, that the approval of the Commission to the construction by the Borough of a plant for furnishing street lighting was not necessary. The contract between the Borough and the Penn Electric Service Company is approved.

Foreign Trade Promotion Through Strong Organization.

A corporation to develop American export trade has been organized in New York City with a capital of $50,000,000, the leading figures being men well known in the electrical industry. It is proposed to issue $49,000,000 in common stock and $1,000,000 in managers' shares. The organization will be known as the American International Corporation and Charles A. Stone, head of the firm of Stone & Webster, has been elected president, and while not severing his connection with the engineering organization, will devote all of his time to the new enterprise. R. P. Tinsley, treasurer of the Standard Oil Company, is secretary and treasurer of the new company.

The board of directors is composed of Charles A. Stone, Stone & Webster; Theodore N. Vail, American Telephone & Telegraph Company; Frank A. Vanderlip, National City Bank; Albert H. Wiggin, Chase National Bank; Edwin S. Webster, Stone & Webster; William L. Saunders, Ingersoll-Rand Company; Percy A. Rockefeller, Standard Oil Company; Otto H. Kahn, Kuhn, Loeb & Company; James J. Hill, Great Northern Railway Company; Charles A. Coffin, General Electric Company; Joseph P. Grace, W. R. Grace & Company; William E. Corey, Midvale Steel & Ordnance Company; Ambrose Monell, International Nickel Company; Henry S. Pritchett, Carnegie Foundation; Robert S. Lovett, Union Pacific Railroad Company; Charles H. Sabin, Guaranty Trust Company; Beekman Winthrop, Robert Winthrop & Company; James A. Stillman, National City Bank; John D. Ryan, Anaconda Copper Company; J. Ogden Armour, Armour & Company.

Fig. 1.—Redlands Concrete Post.

Some California Types of Street-Lighting Standards.

A study of electric street lighting in the towns of southern California discloses the use of a number of ornamental posts which are not only attractive in themselves, but which in some cases have a peculiar local significance. The accompanying illustrations show a number of designs which

Digitized by Google

Fig. 2.—Alhambra Post.

Fig. 4.—Riverside Post.

Fig. 6.—Upland Post.

have been utilized in connection with tungsten incandescent lamps. Much originality has been shown in the novel design and ornamentations of some of these posts.

Fig. 1. shows a unit which is in use in Redlands. This is a concrete post characterized by simplicity, dignity and beauty of design.

Fig. 2 shows a type used in Alhambra, which is known as the "Crescent City." The idea involved in this name has been applied in the design of the lamppost, where the individual lamps are mounted in crescents. The upper part of this post is iron, while the base is of concrete. Fig. 3 shows another post in this town. One of the lamps here is supplied with a red globe of frosted glass and indicates a fork in the road.

Riverside is known as the "Arrow City" and here again the designation finds application in the lamppost. This is shown in Fig. 4. The cross at the top of this post and the bell-like white-glass reflectors are typical of the old Spanish missions of this place.

Fig. 5 shows a unit which more accurately represents an arrowhead, however. This post is used in San Bernardino. Fig. 6 shows a concrete model which is in use at Upland. This post is pleasing in appearance, but shows poor design in providing no protection or diffusing glass for the bare lamps.

Fig. 7 shows an iron post used in Pasadena. The number painted upon the globe in this case has a peculiar significance. In Pasadena many of the houses are set well back from the street, with a parking in front, and considerable shrubbery and trees, so that it is difficult at night to see the house number from the roadway. The number shown on the globe of the lamppost is the same as the street number of the house in front of which it stands, and this constitutes a point of considerable convenience, especially for those using automobiles.

Fig. 3.—Post with Red Globe.

Fig. 5.—Post in San Bernardino.

Fig. 7.—Post in Pasadena.

Digitized by Google

TESTING FOR GROUNDS AND INSULATION RESISTANCE.[1]

By L. H. Henderson.

Accidental grounds on wiring or distribution systems are likely to occur in spite of all precautions. In practically every electric wiring or distribution system there are certain conductors which should normally be free of all connection with the earth, that is, free from grounds. In installing such systems every reasonable effort is ordinarily made to prevent the connection—accidental or otherwise—between the system and the earth. Such connection may occur directly between the wiring system and the earth, or it may be due to the contact of some member of the wiring system with a conductor which connects with the earth. Thus porcelain or glass insulators should be used to support conductors away from the surface on which they are carried or from adjacent objects, and porcelain tubes are used where the conductors pass near pipes or through walls or partitions. Furthermore, rubber-insulated conductors only should be utilized in concealed locations. In conduit work, rubber-insulated conductors are used to prevent the grounding of these conductors on the metallic conduit system, which is itself connected with the earth.

However, in spite of all these precautions electrical conductors which should be normally insulated from ground sometimes make contact with it. These accidental grounds may occur where insulated wires have become displaced or lie against damp walls or timber, or against some piece of metal work which is in contact with the earth.

Ordinarily one ground on a wiring system will produce no adverse effects but if another ground occurs on the other side of the system (that is, on a conductor of the opposite polarity), then a short-circuit will result and interruption of service and fire may possibly follow.

The Function of a Ground Detector.

It is obvious then that it is always desirable to keep a system entirely free of grounds. The function, therefore, of a ground detector is to indicate when a ground occurs on a system so that it may be cleared immediately.

Low-voltage ground detectors may be divided into two general classes: Incandescent-lamp detectors, Fig. 1, and voltmeter detectors, Fig. 2, *II*. Each of these types will be briefly discussed in the paragraphs which follow.

Ground detectors should, as a rule, remain continuously in circuit, because if they are so arranged that they may be cut in and out of circuit it is quite possible that one ground may occur on the system and not be noticed until another ground occurs on a wire of opposite polarity, in which case a short-circuit, with the attendant dangers outlined above, might result. It is for these reasons that ground detectors employing incandescent lamps are, where their application is feasible, probably better than a voltmeter ground detector, because ordinarily the lamps can be so connected that they will remain continuously in service, whereas voltmeter ground detectors are usually so connected that they are switched in and out of circuit.

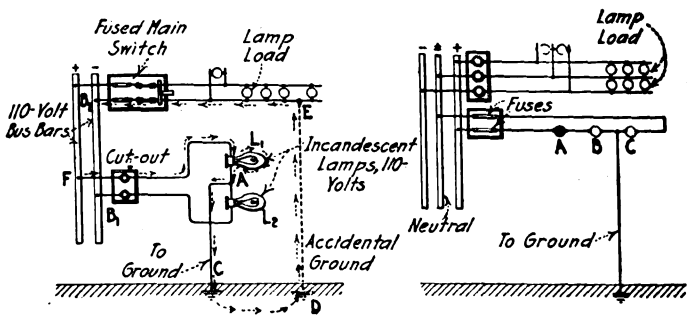


Fig. 1.—Lamp Ground Detectors for Two- and Three-Wire Circuits.

Lamp Detectors.

The principle of the incandescent-lamp ground detector is illustrated in Fig. 1, *I*, which shows the connection for the simplest possible arrangement. Note that two lamps, L_1 and L_2, are connected in series through a cutout across the busbars or across some portion of the distribution system which the ground detector is to protect. From point A between the two lamps, a permanent ground connection is made to C. Obviously, since the two lamps, L_1 and L_2, are connected in series across the busbars, current will flow through them and the lamps will burn. If two 110-volt lamps are used in series, as shown in the illustration, half the normal current will flow through them and hence both of the lamps will burn dimly.

Now assume, for example, that an accidental ground occurs at any point, E, on one of the negative wires of the wiring system with which the ground detector is associated. Then there is a conducting path from the positive busbar to the negative busbar, as shown by the dotted arrows, that is, from F around to B_2. Now, if the accidental ground is of reasonably low resistance, the effect is that the lamp L_1 is connected directly between the positive and the negative busbars, and hence will burn at practically full brilliancy. It should be noted that incandescent lamps have relatively high resistances. For example, a 16-candle-power, 110-volt lamp has a resistance of about 220 ohms. Now, the path *ACDE* really constitutes a low-resistance shunt around the high-resistance lamp L_2, so that practically no current will flow through it and it will not give out light.

Hence with a ground on one of the negative wires of the wiring system, the ground lamp connected directly to the positive busbar will burn brightly and the lamp connected to the negative busbar will go out. If a ground occurs on the positive side of the system, the lamp connected directly to the negative side of the system will burn brightly and the other one will go out. If the accidental ground on the system is of high resistance, the

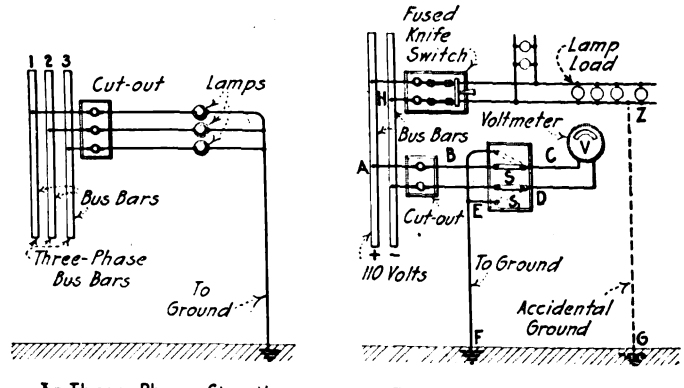


Fig. 2.—Three-Phase Circuit and Voltmeter Ground Detector.

[1] All rights reserved. Reprint forbidden.

Digitized by Google

lamp L_2 will not be extinguished entirely but may burn dimly at an intensity proportional to the resistance of the ground. The principle thus outlined is the general one upon which practically all types of lamp ground detectors depend for their operation.

Two-wire-circuit lamp ground detectors can be arranged substantially as shown in Fig. 1, *I*, for either direct- or alternating-current circuits.

A three-wire-circuit lamp ground detector is shown in Fig. 1, *II*. With the circuits arranged as shown, if a ground occurs on the negative leg of the system, all three lamps, A, B and C, will burn brightly. With a ground on the neutral conductor of the system lamp C will be dark and A and B will burn dimly. With a ground on the positive leg of the system, C will burn brightly, but A and B will be dark. Lamp A may be mounted on the back of the switchboard or in some location where it is not visible, inasmuch as with only lamp B and C visible the attendant will be notified of grounds on the system. For a 125-250-volt three-wire system, use for A, B and C three 110-volt lamps. For a 250-500-volt three-wire system, use three 220-volt lamps.

A lamp ground detector for a three-phase system is shown in Fig. 2, *I*. The lamps are connected in star, one lamp between each of the phase conductors and ground. If a ground occurs on any phase-wire the lamp connected to that wire goes out and the other two lamps burn brightly.

Voltmeter Detectors.

Voltmeter ground-detector connections are shown for a two-wire circuit in Fig. 2, *II*. By changing the position of the switch S the voltmeter may be connected across the busbars of the system, thus indicating the station voltage, or it can be connected between either of the busbars and ground. Assume, for example, that the voltage between the busbars is 110, and that an accidental ground Z occurs on the negative side of the system. Then with the lower switch lever in the dotted position S_1 and the upper switch lever in the position shown, the voltmeter will be connected by the accidental ground directly across the buses. Current would flow through the voltmeter by way of the route A B C V D S_1 E F G Z H. Therefore, if the resistance of the accidental connection ZG were very low, the voltmeter would read 110 volts. If the resistance of the accidental ground connection were high, the voltmeter would indicate a correspondingly low reading. Thus it is possible to estimate the resistance of an accidental ground from the reading of the voltmeter connected as shown.

For example, assume a voltmeter which has a resistance of 10,000 ohms gives a reading of 100 volts when connected across a 100-volt circuit. Then if this same voltmeter gives a reading of 50 volts when connected in series with an accidental ground across a 100-volt source, it is evident that the total resistance in this circuit must be twice the resistance of the voltmeter itself, or 20,000 ohms. Obviously, then, the resistance of the ground is 10,000 ohms. Other values may be computed by using the method of proportion just indicated. A schedule can be tabulated from these computations indicating the resistance of a ground for certain scale deflections—say 5 volts apart—of the voltmeter.

The general directions which should

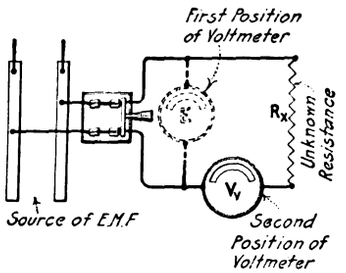


Fig. 3.—Method of Measuring Insulation Resistance.

be followed in installing lamp ground detectors are as follows: A keyless lamp receptacle should be used. Switches should be omitted from the detector circuit. The detector lamp circuit should be protected with fuses. The ground lamps should be within an inch or so of each other so that differences in their brilliancies may be readily visible.

Ground-detector ground wires should not be connected to gas pipes for the reason that there is always a possibility of a ground connection carrying a

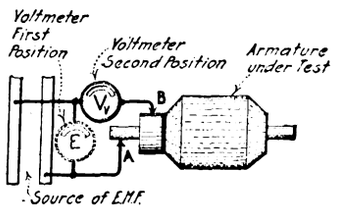


Fig. 4.—Testing for Insulation Resistance of an Armature.

heavy current which might ignite the gas and cause a fire.

Continuously indicating detectors are in some localities required for all circuits. For example the Factory Mutual Insurance rules specify that ground detectors of the continuously indicating type will be required on all ungrounded systems for voltages below 250. For voltages greater than 250, continuously indicating detectors which do not permanently ground the system (electrostatic ground detectors for example) are recommended and in some cases may be required. Electrostatic ground detectors can be obtained for operation on circuits of almost any commercial voltage. Obviously, lamp ground detectors are not applicable to circuits operating at voltages exceeding, say, 500. Voltmeter (non-continuously indicating) ground detectors are in many cases used for circuits operating at voltages above 500, but the electrostatic detector is obviously the safer and more desirable.

Insulation Resistance.

The insulation resistance of a wiring system or of a piece of electrical apparatus is the resistance between the conducting portion of the system of apparatus and the earth. Inasmuch as the metallic frames of electrical machines and devices are, after the apparatus is installed, in electrical contact with the earth, the insulation resistance of such a device is ordinarily taken as the resistance between the conducting portion of the device and the metallic frame.

Although the conductors in a wiring system are supported on so-called insulators and the windings of electrical machines are "insulated" from the metallic frames thereof, it should be remembered that there is no such thing as a perfect insulator, and that all substances are electrical conductors to some extent. Substances that we call insulators are such poor electrical conductors that almost no current flows through them. Although the resistance of insulators is extremely high, it can be measured quite readily, as can the insulation resistance of a wiring system, or of a piece of apparatus. If the insulation resistance of a wiring system to ground is very low we say that the system is grounded. If the resistance of the winding of an electrical machine between conducting portions of the windings and the metallic frame is low, we say that the machine is grounded. Hence the term "low insulation resistance" implies a heavy ground on the system or apparatus in question. It is obvious that it is desirable to maintain the insulation resistance of a system at a high value, that is, to keep the system free from grounds. In accomplishing this desirable end it is very helpful if tests for insulation resistance are made periodically.

The instruments for measuring insulation resistance are many. Certain special types, such as the ohmmeter and the megger, are frequently used. The Wheatstone bridge is often applied in this work. For many cases in practical work the most convenient instrument is an ordinary voltmeter, which can be readily utilized as shown in Figs. 3, 4, 5 and 6.

The theory of the voltmeter method of measuring insulation resistance is as follows: When the same current

Digitized by Google

flows through two conductors in series, the volts drop across each of the conductors will be proportional to the resistance of the conductor. Then with an unknown resistance R_x (Fig. 3) connected in series across the source of electromotive force as shown, the volts drop across R_x will be proportional to its (unknown) resistance. Furthermore, the volts drop V_v, across the resistance of the voltmeter, as indicated by the reading of the voltmeter itself, will be proportional to the resistance of the voltmeter. It follows then that a proportion can be written, thus:

$$V_v/V_x = R_v/R_x \quad \ldots\ldots (1)$$

Solving for R_x, the unknown resistance, the following formula results:

$$R_x = R_v V_x/V_v \quad \ldots\ldots (2)$$

wherein, V_x = the drop across the unknown resistance, R_v = the resistance of the voltmeter in ohms. The resistance R_v of the voltmeter is known, and the drop across the voltmeter V_v can be read from the instrument and is therefore known. Now V_x can be ascertained by subtracting from the electromotive force, E (impressed across the voltmeter and the unknown resistance in series), the voltage drop across the voltmeter (see Fig. 3).

$$V_x = E - V_v \quad \ldots\ldots (3)$$

Then substituting this value in (2) the resulting formula is

$$R_x = R_v (E - V_v)/V_v \quad \ldots\ldots (4)$$

The above is the working formula used in measuring high resistance with a voltmeter. Its application is illustrated below.

First, measure the voltage E, Fig. 3, available for the test. The source of this electromotive force may be any that will remain reasonably constant while the test is being made and that will give nearly a full-scale deflection of the voltmeter used. A direct-current generator, a storage battery or, in certain cases, a primary battery can be used. Second, a voltmeter, the resistance of which must be known, is connected in series with the unknown resistance across the electromotive force E, and the reading V_v that the instrument then gives is noted. Knowing the values of E, V_v, and R_v, the resistance of the voltmeter, these values may be substituted in formula (4) and the unknown resistance computed. It is not necessary to use the same voltmeter for taking the reading E and the reading V_v, although it is desirable to do so. A high-reading instrument can be used for ascertaining the voltage of the source and a millivoltmeter for the determination of the V_v value. Where the insulation resistance is very high the deflection with the voltmeter at V_v may be so small that it cannot be detected.

The resistances of voltmeters are usually high. Frequently the resistance of an instrument is marked by the manufacturer in the cover of the case containing it. If the resistance is not thus indicated it will be necessary to either measure the resistance of the instrument with a Wheatstone bridge or by some similar method, or to write to its manufacturer, giving him its serial number, for the information.

Example.—With the apparatus connected as shown in Fig. 3, using a direct-current lighting circuit as a source of electromotive force, the readings were as follows. The voltmeter, when connected as at E to measure the impressed voltage, read 105 volts. When connected as at V_v in series with the unknown resistance, it read 3.2. The resistance of the voltmeter as ascertained from its manufacturer was 20,000 ohms. What was the resistance in ohms of the unknown resistance?

Substitute in the formula:

$R_x = R_v \times (E - V_v)/V_v$

$= 20{,}000 \times (105 - 3.2)/3.2$

$= 636{,}300$ ohms.

Armature insulation resistance may be measured with a voltmeter as suggested in Fig. 4. In taking these readings the voltmeter is first connected across the source of electromotive force and is then connected in series as shown. One of the leads to the armature, A, is connected to the shaft, while the other, B, is connected to one or all of the commutator bars of the armature. That is, the voltmeter is connected to the source in a circuit comprising (1) the voltmeter itself, (2) the conductors of the armature, (3) the insulation of the armature from its shaft and (4) the shaft of the armature. The insulation resistance of the armature and that of the voltmeter are so great as compared with the resistances of the other components of this circuit, that the resistances of these other components may be disregarded.

Example.—In measuring the insulation resistance of an armature, a voltmeter having a resistance of 10,000 ohms was used. The voltage of the source was 108. With the voltmeter connected in series, it read 0.8 volts. What was the insulation resistance of the armature?

Substitute in the formula:

$R_x = 10{,}000 \times (108 - 0.8)/0.8$

$= 1{,}340{,}000$ ohms.

The method of measuring the insulation resistance of the stator windings of an electrical machine with a voltmeter is illustrated in Fig. 5. The procedure is much the same as that described in connection with Fig. 4. One lead from the source of electromotive force connects to the conducting portion of the stator windings of the machine, while the other lead from the source is connected, but through the voltmeter, to the frame of the machine, thus placing the voltmeter in series with the insulation resistance.

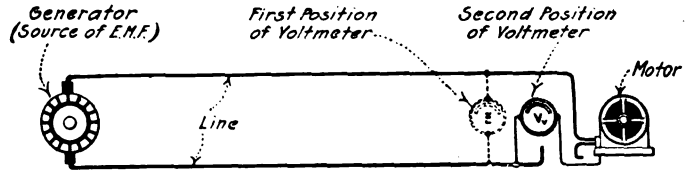


Fig. 5.—Testing Insulation Resistance of Motor or Generator Between Winding and Ground.

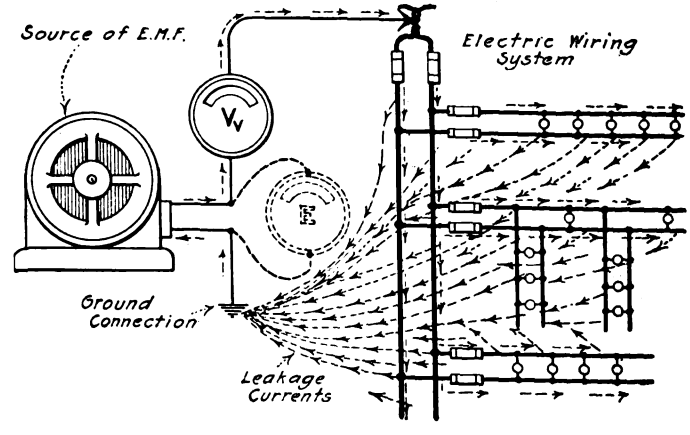


Fig. 6.—Testing Insulation Resistance of a Wiring System.

The measurement of the insulation resistance of a wiring system can be made as shown in Fig. 6. The voltmeter is first connected across the terminals of the source of electromotive force (in the case shown a generator is used), giving the reading E. Then one terminal of the source is grounded and the other is connected through the voltmeter to the electric wiring system. The almost infinitesimal leakage currents impelled by the source would flow through the volt-

Digitized by Google

meter, through the wiring system to ground, and back to the source, somewhat as indicated diagrammatically in Fig. 6. As noted in Code Rule 88, the insulation resistance of wiring systems is very high. No difficulty whatever is encountered in satisfying the requirements of this Rule 88 if the Code rules are followed.

Example.—A voltmeter having a resistance of 2,200 ohms is used to measure the insulation resistance of a wiring system. The source produces a voltage, as shown by the reading of the instrument, of 115 volts. When connected in series with the wiring system and ground, the voltmeter reads 0.5 volt. What is the resistance of the system?

Substitute in the formula:

$R_x = 2{,}200 \times (115—0.5)$

$= 503{,}800$ ohms.

Stream Measurements in the North Atlantic Coast Drainage Basins.

The measurement of streams was begun by the United States Geological Survey in 1888, and since 1895 the appropriations by Congress for the Survey have each year included an item for gauging the streams of the country.

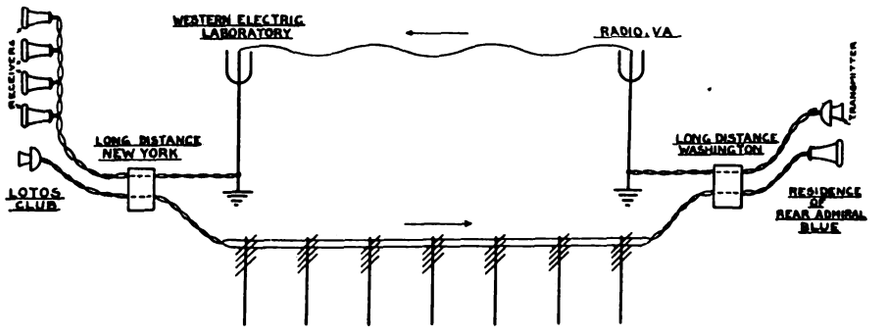
A report on the North Atlantic coast basins, just issued, represents the results of co-operative work between the Federal Survey and the states of Maine, Vermont, Massachusetts, and New York in 1913. It gives the results of investigations of the streams that enter the Atlantic from St. Croix River, Me., to Rappahannock River, Va., which discharge into the lower end of Chesapeake Bay, and includes also the measurements of flow of St. John River, which reaches the ocean through the province of New Brunswick. The records includes descriptions of the stations at which the measurements were made and tables of gauge heights and daily and monthly discharge.

The report is published as Water-Supply Paper 351 by the U. S. Geological Survey, Washington, D. C.

HONORING JOHN J. CARTY.

The Chief Engineer of the American Telephone and Telegraph Company, Guest of The Lotos Club, New York.

The Lotos Club, of New York, famous on two continents for its entertainment and recognition of men of distinction and achievement, gave a dinner and reception, November 7, 1915, in honor of John J. Carty, whose recent work in organizing and completing long-distance telephoning between New York and San Francisco and wireless telephoning from New York to Hawaii and to the Eiffel Tower, Paris, is well known to every reader of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. Three hundred and twenty members and guests gathered at the Club House on Fifty-seventh Street, New York, and extended a cordial and enthusiastic greeting to their fellow member, Mr. Carty, who in responding to the tribute paid him by President Frank R. Lawrence, of the Lotos Club, and others, insisted that great credit should be given to his associates in the wonderful developments the year 1915 has brought in telephone science. In the course of his interesting remarks Mr. Carty stated that there were 500 men of science on the engineering staff of the American Telephone and Telegraph Company—a larger number it is believed than any university has in its faculty.



A photographic reproduction of this diagram was presented to each of those present at the dinner at the Lotus Club, New York, on November 27, to John J. Carty, chief engineer of the American Telephone and Telegraph Company. The diagram represents the wire and ether connections between the Lotus Club at New York and the radio station and residence of Rear Admiral Blue at Washington, D. C. The telephone conversation from New York to Washington was over the wire line and the conversation was transmitted through space from Washington to New York. Every word that came via wireless was clearly heard and understood in New York.

Mr. Carty emphasized repeatedly his appreciation of the work of the engineering staff and mentioned particularly Messrs. Gherardi, Jewett, Colpitts, Arnold, Heising, Englund, Blackwell, Osborne, Robinson, Stevenson, and a number of others who took a prominent part in the work.

With regard to the further use of the ether as a medium for telephone intercommunication, Mr. Carty suggested that the use of the wireless would be supplemental to the use of the wire system rather than supplanting it. The greatest use of the wireless would be to establish contact from ships at sea and points not accessible by wire lines to shore stations. As the service of the wireless extends, the use of the ether will undoubtedly have to be restricted to serve those who have no other means of intercommunication available. As the instruments are properly developed and get into wider practical use, this single conductor, the ether, must be reserved to serve in cases of emergency those who have to depend upon this sole means of establishing communication.

A demonstration of the excellent working of the transcontinental telephone line from New York to San Francisco, with a roll call of leading cities between, was given. The members present had a watch-case receiver at their plates and easily heard all that was said. Greetings were exchanged between President Lawrence in New York and President Frank P. Deering of the Bohemian Club, in San Francisco. There was given in addition, a demonstration of wireless telephony between New York and Washington, Mr. Carty and others talking through the ether with Rear Admiral Victor Blue at his residence in the National capital.

Hon. Josephus Daniels, the Secretary of the Navy, was one of the guests of the club, and talked with the admiral from his seat at the guests' table. Others at the head table were: President Theodore N. Vail, of the American Telephone and Telegraph Company; Samuel Insull, Captain William H. G. Bullard, U. S. N.; Colonel Samuel Reber, U. S. A.; Frank J. Sprague, Union N. Bethell, Melville E. Stone, John P. Gavit, Chester S. Lord, and Charles W. Price. There was a large attendance of electrical members of the Lotos Club and their guests, among whom were: T. Commerford Martin, N. C. Kingsbury, B. E. Sunny, H. B. Thayer, Angus S. Hibbard, Thomas D. Lockwood, Frank H. Bethell, Thomas B. Doolittle, Cyrus O. Baker, W. P. Bowman, John R. Carty, H. Durant Cheever, Bancroft Gherardi, H. A. Halligan, E. T. Holmes, F. B. Jewett, George T. Manson, Walter Neumuller, F. A. Pickernell, A. L. Salt, C. E. Scribner, Gerard Swope, John I. Waterbury, H. J. Pettingell.

Telegrams and letters were received from Prof. Alexander Graham Bell (from his country place, Cape Breton, N. S.). Thomas A. Edison, Hon. Lindley M. Garrison, Secretary of War; and Gilbert H. Grosvenor, editor of the *National Geographic Magazine,* who said everyone connected with geography greatly appreciated "the wonderful work of Mr. Carty." Mr. Edi-

Digitized by Google

son's telegram from his laboratory at Orange, N. J., was addressed to Mr. Carty and said: "I am sorry I cannot be with you tonight to congratulate you in person on the great achievement of yourself and your engineers in the transmission of high-rate complex electric waves over great distances. May your powers never grow less."

At the end of the demonstration the wireless time signals sent from the chronometer at Washington, D. C., to all ships and elsewhere were heard on all the telephones and then followed the wireless weather reports.

Secretary Daniels, Mr. Vail, Dr. Sprague, Captain Bullard, Colonel Reber, Mr. Bethell and Mr. Gavit spoke of the interesting and valuable work of Mr. Carty.

Mr. Vail said: "I cannot refrain from saying a few words in appreciation of this most delightful and considerate tribute to the foremost genius in electrical personal intercommunication—Our Carty. We, that is, all of us associated in that organization called the Bell System, associates who act and think and work together, are very proud of our Carty and are honored by anything that honors him.

"When our Carty was born electrical science was in its swaddling clothes, still being nursed in the laboratories of scientific institutions.

"There were a few, who were looked upon as dreamers, outside these laboratories trying to teach the art how to walk and work—were trying to develop its industrial activity. Such men as Bell, Edison, Brush, Thomson and many other now-notable names, were not then names to conjure with as they afterward became. And yet so rapid has been this development that those same men who were the beginners are yet in their prime of active life.

"Our Carty came with the telephone while it was yet being taught to speak, and has been either a co-laborer or leader in the development of that perfect comprehensive world-wide electrical conversational intercommunication which is rapidly bringing the whole world and all its people within speaking distance.

"While in the establishing of the methods for bringing all people together for electrical speech our Carty has been the most useful and constructive, and is now considered by all the foremost genius in this work, his work has by no means been confined to that branch, for in all other and collateral electrical development, whether affecting his particular work or not, he has been recognized as having a grasp of conditions to be overcome and a vision of what may be accomplished, which few possess.

"This tribute, from this club, is unique in that it is not a scientific tribute from fellow scientists; it is not a commercial tribute from corporation or association, but it is a layman's tribute, to one who is recognized and acknowledged as having made their business and social intercourse more easy, more comfortable and more agreeable and contributed so important an element into their daily life.

"And as one member of the associates who claim Carty as ours, I want to thank you, Mr. President and members of the Lotos Club, for all."

Chicago Vehicle Men Discuss Ways to Boost Sales.

An informal discussion of feasible co-operative measures for increasing the electric business in Chicago occupied the attention of the Chicago Section, Electric Vehicle Association of America, at its regular weekly meeting on November 30. A. J. Brechtel, a commercial truck salesman, led in the discussion, pointing out how garage men, who come in intimate contact with electric passenger-car users, can spread the gospel of the electric truck and aid materially in uncovering prospects. The business man who operates an electric passenger car is acquainted with the merits of the battery vehicle and should be a likely prospect for an electric truck.

J. W. McDowell thought that the Chicago Section could do the greatest good, first, by influencing vehicle manufacturers to maintain greater representation, numerically, and secondly, by inaugurating a co-operative billboard advertising campaign in the interest of the electric truck. He thought the greatest need is to educate the business man to the strength and stability of the electric vehicle industry and to the inherent merits of the vehicle itself. Greater representation in the field is necessary, he thought, to combat the influence of the army of gasoline-truck salesmen who compete for the business.

Harry Salvat voiced the garage man's sentiments by the statement that the manufacturers could gain their active co-operation and support only by making it financially worth while for them to act as electric truck missionaries. He believes the garage man should be the logical electric-vehicle merchant and be permitted to sell vehicles and accessories. Manufacturers should co-operate and not compete in this activity.

Gail Reed presented a motion which was unanimously carried, to the effect that every member of the Section submit at least one definite plan for greater co-operation in Chicago between the various elements of the industry.

G. B. Foster, chairman of the Section, called attention to the desire of the central station to co-operate.

ELECTRIC SERVICE FOR A CITY HIGH SCHOOL.

By C. L. Vestal.

Nothing better shows the peculiar fitness of electricity for general service than its use in the modern public high school. Aside from its general use for lighting, it offers a flexibility for power uses which makes it indispensable. Also in the modern large city high school the quantity used is an attractive one from the central-station point of view.

In the first place, it is almost entirely a day load. The lighting load comes on the peak in the building where night school is held, but the bulk of the school load is off the peak. This article will describe briefly the general service, and some of the special electrical equipment, of one of the large Chicago high schools, the Carl Schurz, located on the northwest side of the city, at Milwaukee and Addison Avenues.

The service is furnished by the Commonwealth Edison Company, one of whose large stations is on the northwest side, about two miles directly east of the school. At the rear of the building, near the northwest corner, is the group of transformers, as shown in Fig. 2. The three upper ones are of 30 kilowatts capacity each, in a bank, and step the distribution pressure of 2,300 volts down to 220 volts for the motors in the shops, and elsewhere. The single lower one is of 50 kilowatts capacity, and carries the lighting load. The secondaries are led through conduits to the main switchboard just below them on the other side of the wall.

The Power Circuits.

Referring to the picture of the main switchboard, Fig. 3, the large switch at the right side of the board is the main power switch. Just above it is a 220-volt, 200-ampere, multiphase watt-hour meter, made by the Fort Wayne Electric Works. The 220-volt energy is then distributed through the upper rows of three-pole switches shown at the left of the board.

There are in the building 26 permanently installed motors, ranging in size from 0.5 to 35 horsepower. The former drive emery wheels, the latter, two in number, drive the fans which force the fresh air over the steam heating coils and into the various rooms. These motors are all three-phase, 220-volt induction machines, for 60 cycles. Above one horsepower in size they are, with one exception, connected to General Electric drum-type controllers. In addition to the uses already mentioned, they drive lathes, forge blowers, trip hammers, saws, surfacing machines and suction fans.

Digitized by Google

Fig. 1.—Carl Schurz High School.

A seven-horsepower motor in the engine room is direct-connected to a centrifugal pump which, in warm weather, when the steam heating plant is not in operation and the steam pumps are therefore not run, steps up the city water pressure to a serviceable figure for the building—about 45 pounds per square inch at the reservoir in the engine room.

A five-horsepower motor is direct-connected to a three-kilowatt Wood generator for furnishing direct current at 125 volts and at 4 to 8 volts to the Physics and Chemistry Laboratories. This motor-generator set is in a room near the Physics Laboratory, and is furnished with a complete switchboard of its own, with voltmeter and field rheostat, as well as distributing switches. This generator also supplies three-phase alternating current at 75 to 80 volts. A Scott connection changes some of this to two-phase four-wire if desired.

The total conected load in motors is about 130 kilowatts at the normal rating. In each of the shops—woodshop, forge, foundry, machine shop—all tools are motor-driven, both the individual and group systems being used. Each of these shops of course contains the regulation control and fuse board.

The Lighting Circuits.

Just to the left of the main power switch will be seen the main lighting switch. In circuit with this switch are two 115-volt, 300-ampere Fort Wayne watt-hour meters, and just above each of these is a Weston alternating-current voltmeter across the lighting line. The two lower rows of three-pole switches control the distribution of the lighting current to the various control boards about the building.

All corridor lights are controlled from a small board in the wall midway of the first-floor corridor. There are four corridors, one on each floor, and the total number of 16-candlepower equivalents in use in them is about 80. Because these corridors can get very little natural light, these lamps are in use about 8 hours a day, not counting the time the building is used for night school, when practically every lamp in the school is in use from 7:15 to 9:30 p. m.

The various room lights are controlled from cutout boxes near each end of each of all four corridors. A typical one of these boxes is shown in Fig. 4. In addition there is a special control box for the Assembly Hall, and one for the lunch room. It goes without saying that these boxes are fireproof.

Each standard classroom, which contains about 48 individual desks, is equipped with six-chain fixtures, with bell-shaped milk-glass shades, each fixture carrying a 100-watt tungsten lamp with frosted bowl. The five laboratories are each furnished with 16 to 18 similar fixtures. The shops are equipped with from six to ten 250-watt Nernst lamps. The ceilings and walls of most of the rooms being cream and tan calsomine, this general lighting is very pleasing. It has been found, however, that some of the night-school work requires a little stronger lighting, and this has been secured by adding a three-foot extension to each fixture in the rooms having certain kinds of work, with a light metal reflector over each lamp. When night school is over for the year—it lasts 20 weeks—these extensions are taken down.

Among the examples of heavy wiring in the building is that for the lanterns. No provision has been made to furnish direct current for these, and they are therefore put on the commercial lighting circuit. Each lantern outlet is conduit-wired directly from the cutout box for that end of that floor. The wiring is in each case sufficient to carry 50 ampers continuously. There are eight such outlets in the building, and a special form of receptacle was devised for them. (See Fig. 5.) The plug for this receptacle is simply a handle of hard wood, bored

Fig. 2.—Transformers for High School.

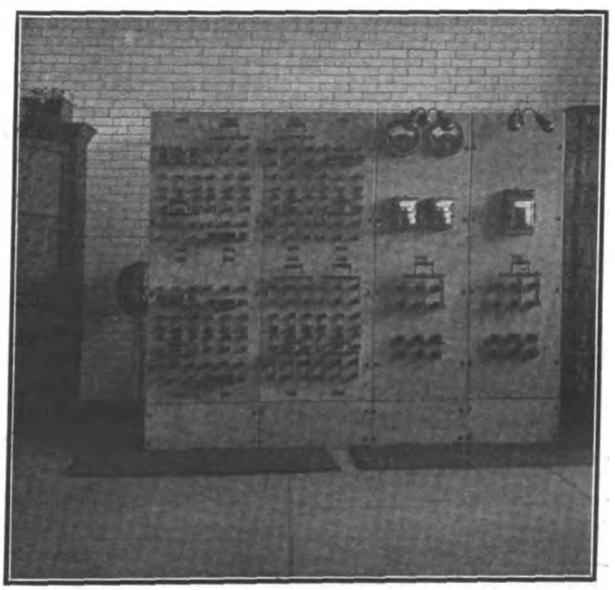


Fig. 3.—Main Switchboard for Building.

Digitized by Google

through lengthwise to receive the cord. (See Fig. 6.) The terminal end is wedge-shaped, and on each face of the wedge is a heavy copper plate, to which is attached one terminal of the cord which connects with the arc rheostat. This wedge fits tightly in the receptacle, and its copper plates make close contact with similar plates in the outlet. When not in use, the receptacle is closed by means of a polished metal door.

Since the study of electricity is one branch of physics, considerable and special provision is made for its accessibility and flexibility in the laboratory for that subject. The room contains, besides 32 seats for recitation, 8 students' experiment tables, each 7 by 3 feet. At each corner of each table there is a small box, 4 by 6 inches on the face, which contains two outlets, which may be used for any current desired. The first cover is a mere wooden door, opening downward on hinges. Behind this is a second door of slate, one-half inch thick, which is pierced with two holes, three-eighths inch in diameter, meeting the holes in the hard copper terminals behind it, Fig. 7. No. 8 wire comes to the two lugs in the lower part of the box, and fits into holes in these, being held by screws, which in these circumstances was considered superior to soldering. Connection is made to the hollow lugs on the upper side of the fuse gap by special connectors, similar in principle to the lantern plug already described, except that the contact is not divided. These are shown in Fig. 8.

The Wood generator already described delivers current to a distributing switchboard for this laboratory, situated directly behind one end of the lecture table. This switchboard is of white marble, 2.5 by 3.5 feet, and carries 10 double-pole double-throw knife switches for distributing energy to the tables. Each switch is numbered to correspond to the table it controls. The upper points give alternating current of 60 cycles, at either the commercial voltage of 115, or the 75 volts from the generator. There are two main switches, one for direct current and one for alternating current. The lower points of the small switches give direct current.

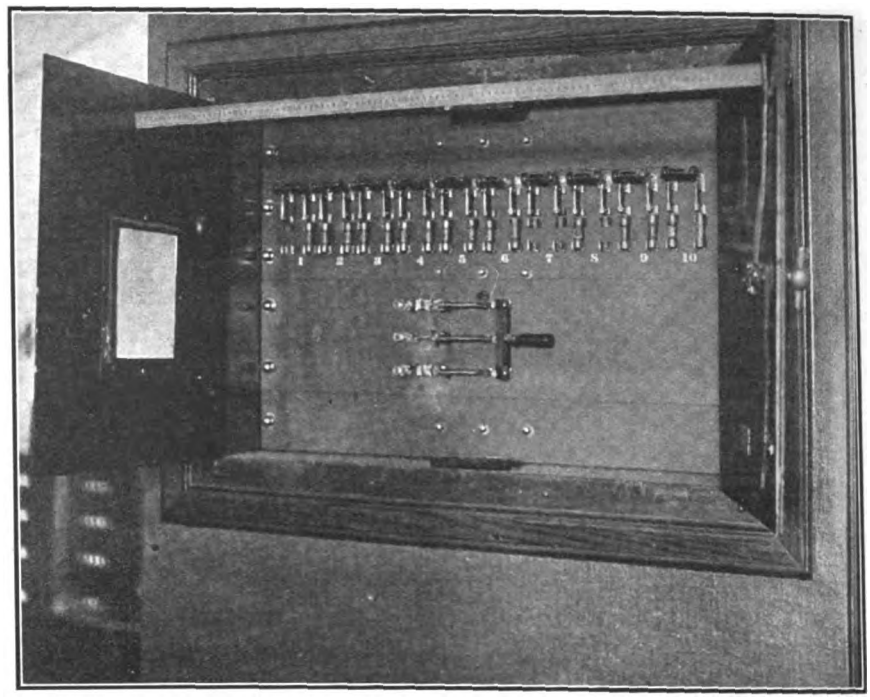


Fig. 4.—Typical Corridor Cutout Box in Schurz School.

Fig. 6.—Special Plug for Lantern Outlet.

At the end of the lecture table is a small switchboard, from which all these voltages, both alternating and direct, are available, beside two and three-phase alternating current from the generator before described. At the middle of the back of the table is a similar set of outlets.

The total connected lighting load of the building is about 77 kilowatts. This gives a total connected load of about 205 kilowatts. The load-factor will average 35 to 40 per cent during the five hours a day of active operation, or about 10 per cent for the entire 24 hours.

Water Power in Spain.

When the new water system for Madrid, Spain, is completed, it is estimated that the supply will exceed 206,000 gallons per minute and that, in addition, there will be a constant hydroelectric production of 21,000 horsepower.

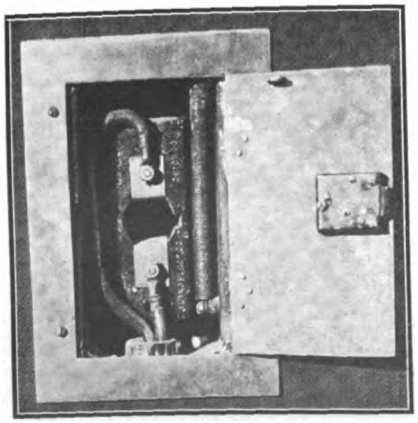


Fig. 5.—Special Lantern Outlet, Carl Schurz High School.

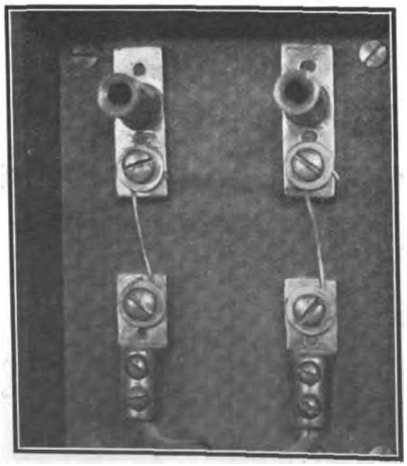


Fig. 7.—Special Table Outlet in Laboratory.

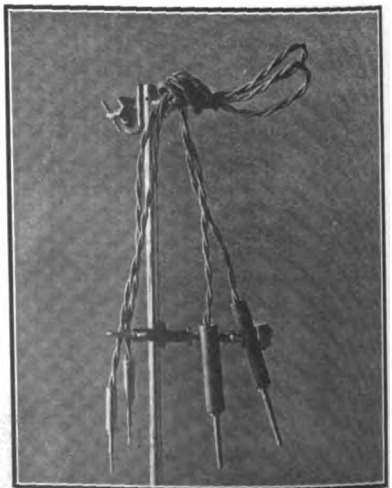


Fig. 8.—Special Table Connectors in Laboratory.

Digitized by Google

BOOK REVIEWS.

"Plane Geometry." By C. I. Palmer and Daniel P. Taylor. Chicago: Scott, Foresman & Company. Cloth, 277 pages (5x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $1.00.

This book presents the essentials of geometry with some of their applications. It is written for high school pupils and departs decidedly from the methods of presentation of Euclid, while not going as far in this direction as some of the other modern texts. Logic has been intentionally sacrificed to insight whenever it was believed by the authors that the general geometric interest of the student would thereby be materially subserved. This idea has been continually kept in mind in presentation. The actual geometrical study is begun after a preliminary statement showing its uses, without a formidable array of definitions, axioms and principles. A large number of original exercises are included to test the student's comprehension of the subject. These exercises range from quite elementary ones to others of considerable difficulty. While intended for class-room use under the direction of an instructor, the book seems suited to individual study. It is well presented and the diagrams are clear and well drawn.

"Electric Wiring Specifications." By J. H. Montgomery. New York: D. Van Nostrand Company. Cloth, 139 pages (4x6¼ inches). Supplied by the Electrical Review Publishing Company, Inc. for $1.00.

This book is intended primarily for the convenience of architects, general contractors and others who may find it necessary to draw up specifications for electrical work. It is intended to provide good modern construction for work of comparatively small extent. Forms of specifications are given, with samples of actual schedules and a table of illumination values suited to different applications. Alternate pages are left blank for the insertion of notes.

"Examples in Alternating Currents." Vol. 1. By F. E. Austin. Hanover, N. H.: Published by the author. Flexible leatheroid, 223 pages (4¾x7½ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $2.40.

This volume considers the subject of alternating currents mathematically, and a considerable portion of the book is taken up with problems leading up to the work in alternating currents. This is done with the object of making the reader conversant with the properties of quantities undergoing simple harmonic variations. This necessarily involves considerable geometry, trigonometry and algebra, as well as some calculus. Some of the formulas given are not fully explained and the reader may be somewhat jolted by having quantities stated in seven significant figures in a formula which is only an approximation. The latter part of the volume contains many problems in inductance and capacity under various conditions, with applications to transmission lines. There are altogether 57 problems and a table giving values which are convenient for purposes of computation.

Electrical Prosperity Dinner in New York.

Under Jovian League auspices, New York's leading electrical men to the number of 300 met on December 1 in Hotel Martinique at an enthusiastic Electrical Prosperity Week luncheon. Letters were read by Chairman James M. Wakeman, general manager of the Society for Electrical Development, from President Wilson and Thomas A. Edison, commending the widespread participation the week enjoys and expressing congratulations on the success of the country-wide campaign which has done so much to restore the nation's prosperity to a firm basis.

Delos F. Wilcox, deputy commissioner of the New York Department of Electricity, spoke of the necessities of electricity in the progress of municipalities and paid a high tribute to the local Electrical Prosperity Week committees in achieving an event of national importance. Mayor Mitchel, who is ill with appendicitis, sent, by his secretary, Theodore Rousseau, a message of congratulations to the Jovians and to the electrical industry. John Tyrone Kelly, of the Society's staff, spoke of the more serious thoughts the week inspires.

President Wilson's letter follows:

"I am glad to learn from your favor of the eleventh instant that the Society for Electrical Development will celebrate Electrical Prosperity Week from November 29 to December 4 and to be advised that the object of this celebration is to create in the public mind a firm confidence in the business institutions of America. There can be few things of greater importance to the people of the United States than that they should have strong confidence in themselves and in the institutions and the industries which they have created. I earnestly commend the effort on your part to develop and maintain reliance by our people in their own ability to meet the problems of industrial and national life. Such reliance may be wisely based on what we have achieved heretofore. With such a reliance we may look fearlessly to the future."

Mr. Wakeman stated that the example of the electrical industry in aiming its attack against depression and in promoting a nation-wide campaign intended to show how electricity and prosperity go hand in hand will live long after this week is closed. He said other industries may well study this enterprise and determination of the electrical industry to establish in the public mind a firm faith in the future of America's business.

From every section of the country reports by telegram and letter reaching the Society for Electrical Development record celebrations which far surpass in point of enthusiasm and interest all expectations.

Electrical Supply Jobbers Debate and Play Golf.

Discussion of the co-operative movement of the Pacific Coast jobbers and electric lighting companies, recommendations relating to marking standard packages by the manufacturers for more convenient handling, the decision to become affiliated with the American Fair Trade League, Electrical Prosperity Week, price maintenance and the annual golf tournament of the jobbers and manufacturers were the features of the Hot Springs, Va., meeting of the Electrical Supply Jobbers' Association, November 17-19.

James M. Wakeman, general manager of the Society for Electrical Development, aroused the members to a high pitch of enthusiasm with a spirited address relating to the campaign now being conducted by this organization.

E. W. Rockafellow and Thomas M. Debevoise discussed at length and in plain language the necessity for a more sincere manifestation of the spirit of co-operation by jobbers and the other elements of the industry.

Ernest H. Gaunt, of Boston's Statistical Organization, addressed the meeting, showing by means of a graphic analysis the recurrence of definite cycles of business activity and depression.

Hereafter central-station managers will be invited to attend the jobbers' meetings, and in connection with the next meeting, which will be held in February at Detroit, Mich., special effort will be made to have a large attendance of central-station men from territory contiguous to that city.

Bangkok's Power Houses.

In the November 23 issue of *Commerce Reports*, the daily official publication of the Bureau of Foreign and Domestic Commerce, Washington, D. C., is given an account of the two electric power plants at Bangkok, Siam. This should prove of interest to electrical exporters desirous of building up trade with the Far East.

Digitized by Google

NOTES ON TELEPHONE PLANT ORGANIZATION.

By F. Day.

Before the general inauguration of the principles of scientic management, as applied to telephone plant organizations, can be effected, certain conditions must be accomplished which will make any extensive results possible. The entire organization of each plant concerned must be educated to the desirability of this form of management. Their personal welfare must be looked into in such a manner as will instill confidence and trust in all employees. It should also be remembered that the object of scientific management should be for the mutual benefit of the employees and of the company, and in any case where the benefits and savings effected are not mutually enjoyed this form of administration must be considered a failure. Therefore, too much stress and emphasis cannot be placed upon a proper setting for the inauguration of this plan.

There are but four basic principles of scientific management, and they are defined as follows:

(1) The development of a true science of work.

(2) The scientific selection of workmen.

(3) The workman's scientific education and development.

(4) Intimate friendly co-operation between the management and the men. (Taylor.)

Although these principles are named in their logical order it has been found far more practical to develop them, together and not in the sequence given. None of these principles are independent, and in order for any success to be made in their adoption they must be judiciously co-ordinated, developing each, step by step.

Probably the first step to be taken in the development of a true science is to familiarize the men of the organization with the standard practices, specifications and other rulings that have been made relative to their work. In this connection their scientific education and development can be gradually accomplished. It has been found that an excellent means of accomplishing these developments are "Plant Meetings," "Corporation Schools" or "Corespondence Schools." The plant meeting, as it is familiarly termed in our organization, where these plans have been adopted, is an informal weekly meeting of all the employees interested, for their education and development by mutual experience and by instructions from well informed superiors. The work taken up in these meetings was the telephone subscriber's set, its circuit, operation and faults. Next the handbook of substation wiring, each page discussed at length. Following this the handbook of exchange construction, with similar discussions.

It was found that the second principle automatically worked itself into plant meetings, the desirable and progressive employees attending without fail, while the less desirable failed to attend. The attendance at the meetings was not compulsory, thus giving each man his own choice in the matter. It is an almost infallible rule that those who do not, through their own choice, attend these meetings, or have other means of acquiring knowledge, are unsatisfactory, if not undesirable employees.

Theoretically, the development of a true science, as set forth by the authorities on this subject, is accomplished as follows: Select 12 or 15 different workmen from as many different exchanges, and if possible from different parts of the territory, who are especially skillful in doing each particular kind of plant work. Study the exact series of elementary operations or motions, the means and methods which each of these men uses in his work, as well as his tools and other equipment. After each man's program of work has been developed, study each operation or motion with a stop watch, and ascertain the time required to make each of these motions or operations. It will be found that each of these especially skillful men differ widely in the time required for the various elementary operations of his work.

With the information now on hand, a composite program can be made of the work under study with the quickest necessary motions, movements and operations. Likewise the best tools and implements required for the work can be selected from the outfits of the 12 or 15 men.

The object of such time studies, as outlined above, is to determine the actual time necessary for any specific operation. It has not been found at all satisfactory or practical to use time studies for this purpose in telephone work. The cause is the great variety and classes of work which any member of the organization may be called upon to do. However, it has been found very profitable to make time studies for the purpose of showing the men where they actually lose time, how to organize their crews, and how to make themselves better and more valuable employees. The selection of tools is practical, although it meets with opposition to some extent on the part of individual employees. After a trial, however, most men are pleased with a scientifically selected tool. In order to see the exact progress made in this work it is well to make a general survey of the organization, cost of line-order execution and trouble clearance, as well as the quality of work done. With little effort these data may be kept chronologically, and in the form of curves makes a surprising graphic sketch of the possibilities of this plan. Following is given a sample of the organized and classified data for trouble clearance:

This report covers one week, ending January 9, 1914. To both the trouble man and the wire chief it shows his exact standing and desirability as a trouble man. The personal equation is eliminated, thus presenting the facts of the case. It will be seen that 94/223rds of the visits made were general inspections. These consist, primarily, of low-insulation lines discovered by the ballistic test. Also that only 8/223rds of the total tickets handled were reported "No trouble found" by the trouble man, and that but 9/223rds were repeated troubles within the past 30 days.

This report was made three months after the initiation of this plan.

Name.	Trouble Tickets.	General Inspections.	Total.	N. T.	Troubles Cleared.	Repeated Troubles.	Troubles Cleared Per cent of Own.	Troubles Cleared Per cent of Total.	Repeated Per cent of Own.	Repeated Per cent of Total.
Kinley.....	27	54	81	3	78	2	96.3	36.3	2.5	22
Swanson.....	50	29	79	2	77	4	97.5	35.8	5.5	45
Van Houten.	52	11	63	3	60	3	95.2	27.9	4.8	33
Total.....	129	94	223	8	215	9	96.5	100.	4.1	100
Rating.		First.			Second.			Third.		
Quality.		Swanson.			Kinley.			VanHouten.		
Quantity.		Kinley.			Swanson.			VanHouten.		
Repeated.		Kinley.			VanHouten.			Swanson.		

Foreman	Orders Handled Class A	B	C	M	W	Total	Cost Per Order Class A	B	C	M	W	Total	Cost per Crew
F. I. G.....	3	4	2	6	4	19	$4.59	$0.88	$1.39	$2.89	$2.50	$2.60	$49.44
J. M. V.....	7	4	2	5	8	26	2.96	1.10	1.45	2.40	1.23	1.87	48.81
W. G. J.....	1	3	2	2	1	9	0.26	0.37	0.49	1.12	1.29	0.65	6.10
Total.....	11	11	6	13	13	54	3.16	0.82	1 11	2.43	1.63	1.56	104.35

	F. I. G.	J. M. V.	W. G. J.	Total
Unfavorable inspection reports	1	3	0	4
Subscriber's complaints	0	0	0	0
Orders not worked on schedule	2	1	0	3
Orders handled, costing over $5.00	2	0	0	2

Similarly classified data of Line Order execution and costs are shown in the above table.

This form shows the quality and quantity of work performed by each crew.

Digitized by Google

Although these two tables are very valuable in determining the progress made by the inauguration of this form of management, they are far more so when used as competitive reports to the workmen. The institution of competitive reports instills in the workman the spirit of the game, and creates in him a new interest in his work; interest with which he has never before been acquainted. Some of the most obstinate cases of indifference have been cured by these means. Particularly, one man, who had been employed on trouble work, staying at the bottom of the "quality and quantity list" for three weeks, and seeming unable to make any progress, came to the wire chief, and frankly admitted that he was not suited for trouble work, and asked to be changed to another job. At that time this man was doing what, under ordinary management, is generally conceded to be a good day's work. (This is another case where the second principle works automatically.)

These "reports" should be given to all trouble men and line-order foremen at the end of the week for which they are made.

The cost of keeping this information is insignificant, when compared with the results obtained. All the necessary information for the records and reports appears on the face of the trouble ticket, or line order. The trouble report can be made for five cents per thousand stations per day, plus twenty to fifty cents per week. The line-order information cost is approximately 1.5 cents per order handled.

Co-operation.

Although much is being said of co-operation, it seems that the fact that it pays, and pays well, has not been taught to many men, of all stations in life. Those who have seen the light have given it the newer name of "Enlightened Self-Interest"—which is truly the case of co-operation.

Although the intimate friendly co-operation between the management and the men is cited as the fourth principle, it must, with the other three, be treated and administered co-ordinately. The co-operation on the part of the management, which will in all cases consider the man's boss or immediate superior, does not commence at 7 a. m. and stop at 5 p. m. Instead it should be strongest during the employee's absence from duty, for during the day the boss has one eye upon him at all times—even if the employee does not know it.

Co-operation to be of real value must go with the employee to his home, to his difficulties, to his joys and his misfortunes. Perhaps this will seem strange to you—but it is nevertheless true. Do you not expect some study on the employee's part during his hours of recreation and rest? Most certainly. Then why not consider both sides of the proposition?

Next to his home folks, be each employee's confidant. Know him—even well enough for him to call you by your given name. Again you are surprised. Why not? Are you not both working for the same company? Are you not even partners in that work? Let him address you "Mr." through well founded respect, and not by fear of losing his job.

Let not your interest in or co-operation with the employees with whom you work stop at the present. Know their ambitions. These are the most valuable asset a man has. They are the seeds which when properly developed, grow to bear fruit of which any man should be proud.

If a man fails at his job don't fire—he is only half to blame at the worst—remember that he represents an investmen of from one hundred to one thousand dollars, that he may be ill fitted for the work you have placed before him—and that perhaps you have failed to teach him how to properly do the work. Look into his case and see for what kind of a job he is fitted; put him in that job. If you have no such job transfer him to some one who has.

Do not hold a man down. This is one of the largest factors of many men's failures. Give a man all he can do and let him have the joy of hard work. If you can recommend him to a better job, do it. Let him go. He will learn something of value to himself and in nine cases out of ten if you ever want him again he will return, better fitted to relieve you of responsibilities and cares—taught by experience to appreciate a good boss who can co-operate.

And if one of the men of whom you are boss wants your job—and can hold it—arrange by all means to give it to him, for no better indication of a man's ability could be made than for him to develop his own successor.

Plant Schools.

The various factors that enter into a well managed plant school will now be considered in the order of their importance. No man, however well chosen, will make much of a success without some teaching. The successful men in most organizations today were taught, but usually self-taught. These men are successful for no other reason than, having developed energy enough to learn new things, they found the execution of the principles comparatively easy.

To teach men, regardless of their present standing, position or occupation, will develop them to some extent at least, and in many instances to a surprising extent.

The object of the plant school is to help men learn things pertaining to their work. As before stated, the attendance is not compulsory, but advised. No plant school is complete without a competent teacher, a suitable teacher, a suitable room, a blackboard, chalk and eraser, and sufficient chairs to accommodate the attendants.

The teacher should be competent to explain elementary problems in physics, electricity and magnetism, should have a working knowledge of the specification handbooks, and, most important of all, should believe in himself, his job and his fellow workmen.

The room may be a stock room, but preferably an office, where there will be less to detract the attention from the school work. The blackboard should be at least four feet square, and larger if possible. "Beaver board" painted dull black, is very suitable for this purpose. The problem of sufficient chairs is very easily solved by using chairs from the retiring room, which should not interfere with the retiring room during the evening.

It has been found well to have plant school but one night per week, although oftener is desirable. The time taken each Monday night was from 7 to 9:30 o'clock.

The meeting should be opened promptly at the appointed time, with a roll call, and any employee arriving late should be so recorded in the roll book. Each employee is furnished with a memorandum book for any kind of use he desires in connection with his work, such as suggestions, memoranda to be taken up at plant meetings, information for work orders, etc.

Next after the roll call, a second call is made of those present for any questions, suggestions or recommendations. These are taken up and discussed under the careful supervision of the teacher. Next the lesson for the evening is explained, discussed and all questions satisfactorily answered.

Among the lesson subjects to be discussed are:

(1) Classification of accounts with detailed graphic explanation of the accounting system, paying especial attention to the "why" of all accounts.

In this lesson it is a good plan to consider the accounting system as a whole, explaining the reserve accounts for depreciation, maintenance and rearrangements; how they are accumulated and how disbursed.

Consider a new pole placed in plant charged to the Construction Account. This is the expenditure of new money—authorized by the Board of Directors. This department of organization has now performed its function till the pole is taken out of plant. The executive officers have been notified of the increase in plant, and out of the revenue they proceed to lay aside each year

Digitized by Google

eight per cent of the cost of this pole placed in plant, as reserve for depreciation or replacement. In addition to this, five percent is laid aside for maintenance or keeping the pole in ordinary repairs. Further, one per cent is laid aside for rearrangements and changes.

At the end of four years the pole has been washed out, having been set very close to a ditch. We dig a new hole and set the pole again and charge the cost to the repair account. The auditor then knows that this expenditure has not increased or decreased the value of plant, and that the cost should be paid out of his reserve for maintenance and ordinary repairs. At the end of six years we must move the pole to a new curb line—a distance of, say, two feet. This we do and charge the cost to the rearangement or "move" account, which tells the auditor to pay this expense out of his fund for moving and rearranging poles.

At the end of twelve years our pole has lived its life, rotted off at the ground line and ready to fall. Above the ground the pole is sound, and conditions will permit of resetting—this we do. Since the pole was originally 35 feet high and we have reset it, after it has lived its natural life of twelve years, it must now be 30 feet high. We cannot truly say that resetting the pole in this case was an act of maintaining it. Rather we prolong the life of part of the pole, and the cost of such work should be charged to the depreciation or replacement account, which the auditor has been laying aside each year, and which by now (12 years at 8½ per cent) represents the original cost of the pole, plus the cost to dismantle it.

Therefore, in prolonging the life of the pole, we would allow the depreciation or replacement account to continue to increase beyond the actual value of the pole—but for the fact that the cost of prolonging its life were charged to the depreciation account.

Eventually conditions require that we take this pole out of plant—absolutely—and place the wires which it carries underground. The cost of removing the pole is charged to the depreciation account, as was the cost of prolonging its life, and the auditor immediately returns the original cost of the pole, from the reserve for depreciation and replacement account to the general cash capital of the company, subject to the will of the Board of Directors.

This method of explanation of all of the accounts will give accuracy and intelligence to the classification of time and material.

(2) Next the subscriber's set, its circuit and faults, with an explanation of the construction, operation and relation of each part to others is taken up. Circuit diagrams on the blackboard should be made by all present. In making these sketches, colored chalk should be used to more clearly show the direct current, the alternating current and the ringing-current circuits.

In order to clearly show the function and operation of each component part of the subscriber's set, it will be necessary to make several elementary experiments in electricity and magnetism.

Practical Applications.

The keynote of economic production of work is the planning of work and the working of that plan.

In order to plan work intelligently a perfect knowledge of the work to be done, of the time required and of the men that are to do the work is necessary.

There are in general four classes of work carried on in a telephone exchange, viz.:

Executive and supervision, routine outside, routine central office and job or estimate work.

In the adoption of this or similar plans, it is best to begin in the executive office.

The office arrangement should be such as to take best advantage of the natural light and ventilation. These should be supplemented by good lighting and, when necessary, electric fans.

The office furniture should consist of sufficient desks, files, clothes lockers, stationery cabinet, table and chairs, but no superfluous fixtures, as such have no direct usefulness and are usually used for storing useless articles.

In addition to the necessary fixtures and furniture, various office appliances are necessary. They are a good drawing board with a set of instruments, a typewriter, a slide rule, a duplicator and office manual.

The desks should be preferably of the sanitary flat-top type.

The file requirements vary in nearly every office; however, the only high-grade file necessary is that used for current correspondence and drawings. The permanent file should be of the "Stow-away" type.

Metal clothes lockers of sufficient capacity for the employee's requirements, and no more, should be provided.

The stationery cabinet manufactured by the Terrell Equipment Company, of Grand Rapids, has been found very satisfactory as it permits of the vertical storing of standard-sized forms. In this method tabs with a protruding edge are inserted between the supply of each form. This edge is folded over to present a flat surface to the front of the cabinet. Upon this surface may be marked the form number and use.

Forms for supplies and material, disbursements, accounting, instruments, accidents, etc., are then placed in groups so that a form, pad or package of stationery may be readily located and removed without the loss of time and the disarrangement of the cabinet.

The office appliances are of standard make and are, except the slide rule, duplicator and office manual, commonly known and used.

The duplicator can be used in furnishing instructions of a permanent nature. From 50 to 100 copies of written, typewritten or drawn matter may be made from one impression. This in most cases replaces the blue print with its difficult process and special requirements. Full instructions for use are furnished with the standard makes of duplicators.

The office schedule is the organized instructions for handling all routine office work. Since the schedules for various offices differ widely, no hard and fast general plan can be advocated.

The primary object of a schedule of any kind is to set a standard time for any given series of operations, thereby eliminating lost time, lost motion and lost effort.

It is placing into practice the principle of having a place for everything and everything in its place, with the time element considered.

That the work of the average employee can be done in half the time ordinarily taken may be contested by many, but cases have been found where a "day's work" has been done in two hours without exhaustion or even fatigue by the adoption of a schedule.

That routine exchange work can be effectively and efficiently scheduled has been satisfactorily proven by the reduction of forces 30 per cent within 30 days after its adoption. The whole plan of scheduling this part of plant work revolves around the idea of "getting organized."

The specialization of station wiremen, linemen and foremen solves the problem to a certain degree, in that at the beginning of each individual job or order the work is planned in the foreman's mind and each man knows what to do, how and where to do it.

The same idea is worked out by the chief installer by having each crew assigned to a certain territory for each day in the week. That this plan may be flexible and easily worked out under the strain of extraordinary conditions, written instructions must be prepared for reference at such times. These instructions must not conflict with the present general instructions in circular letter, handbook or bulletin form, but should, instead, modify them.

If such general instructions are in error, the proper authorities should be consulted with an aim to correct them.

As applied to the general instructions of one operating company, the follow-

Digitized by Google

ing routine has been adopted with gratifying results.

Plant Routine of Line and Work Orders.

Line Orders.—Copies No. 1 to 4 of all exchange line orders will be received from the commercial organization by the chief installer. These orders will be transmitted by an invoice showing the class and serial number of each order.

The chief installer will mark all copies of each order with the date received, and check with the invoice, which is then receipted.

The No. 4 copy of the orders are detached, filed numerically in a style "Y" sheet holder, and the remainder forwarded to the wire chief, who enters assignments on all copies, forwards No. 3 to the chief operator and returns No. 2 to the chief installer.

The No. 2 copies are then filed under territory, day and foreman, in, on and by which they will be executed. These territories may be readily determined by analyzing the location of two or three hundred line orders' addresses.

Each foreman's district or week's territories should include but five days' work, allowing Saturday for completing any work not finished during the week, due to handling extraordinary cases or conditions which could not be foreseen and scheduled. This proves flexibility from an "expansion of work" viewpoint.

When the line orders have been assigned to the proper districts, notation of the schedule date of completion shall be entered on the receipted invoice, which is then returned to the commercial organization as a guide to future requests from subscribers and others as to when the order will be executed.

In order to handle change of location under the single-order plan, a rubber stamp reading "Move Order—Station Removed at Old Address by..... .....Date....." effects a two-order system, the foreman completing the "In" portion of the order O. K.ing the line order proper, while the one working the out portion O. K.'s the rubber stamp blank.

Work Orders.—Work orders are of two classes, immediate and routine. Either of these two classes may be originated by any person, whether an employee of the company or not, but are especially expected from employees of the Plant Department. The nature and number of work orders originated by plant employees indicates their quality of observation and judgment.

All work orders are made in duplicate by the testboard man at the request of the originator, and bear the names of the originator and maker. Immediate orders are handled by the crew nearest the order. Routine orders are handled as follows.

The duplicate copy No. 1 is filed at the testboard pending execution, and the original copy No. 2 is forwarded to the chief installer, who, as in the case of line orders, locates the order, and assigns to the proper foreman for execution on a predetermined date. It is not anticipated to execute all routine work orders to schedule, but as spare time appears in each day's work. This provides further flexibility to this plan.

Execution of Orders.—We now have the line and work orders ready for assignment, each day's work in a certain territory by a certain foreman on a predetermined date.

There is considerable economic advantage at this point, since each man of each crew knows his duties on each job, and each foreman knows where his work will be on any given day, knows the availability or congestion of facilities in that location, knows the peculiarities of street numbers and addresses and is familiar with every alley short cut, every terminal and in more cases than would be supposed of the cable distributions and even open duplex lines.

Every order in a day's territory is assigned to the foreman on the morning of that day. These he assigns in a route while enroute to that territory, giving line orders preference over work orders.

Upon arriving at a job the test board is called and any switchboard marking, number plate, lamp-cap or frame work is immediately commenced, so that when an O. K. is given to the foreman, it is final and includes the entire job, leaving the station ready for service.

The time and material for each job is entered on the line order at the time of completion.

At the end of the day, a summary time report is made for the crew and team for the day under the various account numbers. All line and work orders completed during the day are attached to this summary and returned to the chief installer.

The No. 4 copies of the orders completed are removed from the numerical file in the style "Y" sheet holder and the copy is now ready to file in numerical order in series of 100 for permanent record.

After being scrutinized by the chief installer for duplication of work, or other inefficiencies or errors, the day's orders are forwarded to the time-and-material clerk for final editing.

All calls for information as to the date of completion of orders, made to the plant organization, will be referred to the commercial line-order clerk. The commercial organization should be so advised and requested to refrain from referring calls for such information to plant employees.

Job and Estimate Routine.—Except the plant foreman, no regularly authorized employee shall work on a job or estimate without the specific permission of the district plant chief.

Under no circumstances shall work not covered by a job be charged to that job, or job authorization be used for any other purpose than that covered by the job specification.

Only unit labor costs that are accurate for the location of the work to be performed are to be used in preparing jobs and estimates.

Each job assigned to a foreman shall be completed before another job is assigned to him, unless specifically recommended by the chief installer and plant foreman and approved by the district plant chief.

Jobs and estimates may be prepared by the chief installer, plant foreman and district plant chief, and forwarded for approval. The copies of a job shall not be distributed till the stockkeeper has checked the list of material and segregated such items as are covered by the job. Should the necessary material not be in stock, requisition for the difference shall be placed, and the job held till all the necessary material has been received.

When all the material for a job has been placed in stock, the job specification and authorization sheets shall be distributed, the chief installer receiving two copies, he furnishing the job foreman with one copy. The foreman shall proceed with the work covered by the job with the most economic crew, as follows:

Class of work.	Foremen.	Linemen.	Groundmen.	Wiremen.	Team.
Pole line	1	–	3	–	1
Stringing wire and messenger	1	2	3	–	1
Stringing cable	1	2	2	–	1
I. B. distribution	1	1	1	2	0
Overhauling stations and cut-ins	1	1	–	1	1
Installation of stations	1	–	–	1	1
Underground cable	1	2	2	–	1

Routine Central-Office Maintenance.—That part of central-office maintenance of the routine or preventive class can be scheduled to a great advantage to the employee and employer. Such a schedule must be adjusted to the local conditions, but as in all other work, should not be adjusted to the employee doing the work.

Street-car employees of Edinburgh, Scotland, have recently received an increase of wages of two shillings per week. This represents more than $27,000 per year, as there are over 1,000 employees.

Digitized by Google

New Electrical and Mechanical Appliances

Attachment Plug with Soldered Connections.

The use of electrical appliances of many kinds that are connected by cord and attachment plug to wall or fixture outlets is rapidly increasing, particularly in the home. This increase is due largely to the great convenience and safety of such devices, which two important considerations appeal strongly to the feminine members of the household. It happens, however, that occasionally the connection in an attachment plug becomes loose or broken, which not only puts the appliance out of commission, but may instil trepidation on the part of the user.

To overcome this difficulty there has been placed on the market a new attachment plug which has no binding posts or screws of the usual pattern but in place thereof uses soldered connections. The

Fig. 1.

Fig. 2.

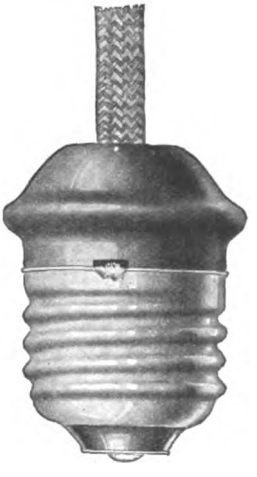


Fig. 3.

method of wiring is shown from the accompanying illustrations. The wire is inserted through the center hole in the solid body and one end bent over in the groove as shown in Fig. 1. The brass screw shell with attached center contact is then screwed into place and clinched to the plug body by a suitable tool, leaving the cord projecting as shown at *A*, Fig. 2. The wire ends are then soldered, completing the plug as illustrated in Fig. 3. It will be seen that this plug is very simple and has but two parts. The assembly and connection of the plug takes but a few moments, it is claimed. It eliminates the liability to loose connections or short-circuits.

This plug is known as the Attacho; it is manufactured by R. S. Mueller, 425 High Avenue, Cleveland, O.

New Electrical Equipment for Boston Elevated Railway.

The Boston Elevated Railway Company is about to make extensive additions to its power plant and substation equipment, at an estimated cost of over $1,000,000. The plan is to increase the size of the main alternating-current generating station at South Boston and to install a 35,000-kilowatt horizontal turbogenerator with surface condenser, the generator wound for 13,200 volts. A 200-kilowatt combination turbine and motor-driven exciter, and switchboard panels for the new apparatus and for the additional feeders, will be installed. Three new 4,000-kilowatt rotaries will probably be installed in substations.

The proposed new unit is considered more practicable than one of smaller capacity, though a generator of 20,000 kilowatts would probably meet the requirements for a few years. The engineers, however, recommend one of 35,000 kilowatts, though costing about $200,000 more, on the ground of greater economy of station operation. It is estimated that for five years, beginning 1917, based on 200-pounds boiler pressure, a total output of 1,180,000,000 kilowatt-hours can be produced, with 35,000-kilowatt unit installed, for $3,200,000, while with a 20,000-kilowatt unit the cost would be $3,400,000.

The three 4,000-kilowatt rotaries are planned to be so located as to reduce the radius of feed of the company's direct-current generating stations and to displace 2,000-kilowatt units which would be located in substations on the outskirts of the territory.

The total capacity of the Elevated Company's stations and substations is now about 83,000 kilowatts in direct current and 48,500 kilowatts in alternating current.

A bond issue to cover construction costs has been authorized.

Composition Side-Outlet Current Tap.

To accommodate the steadily increasing demand for electrical fittings that can withstand general hard usage much better than porcelain, the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., has placed on the market a composition side-outlet current tap. It is made of a tough, heatproof material with high insulating qualities. In railroad shops, shipbuilding yards and other industrial plants devices of this type are subject to considerable rough usage and it was for this class of electrical users that this fitting was primarily designed. It is serviceable, however, in many other places where a current tap of rugged nature is desirable.

The side outlet is of the T-slot type and therefore permits the interchangeable use of all the nonpolarized Hubbell caps. A deep groove is provided to permit the ready attachment of shade-holders.

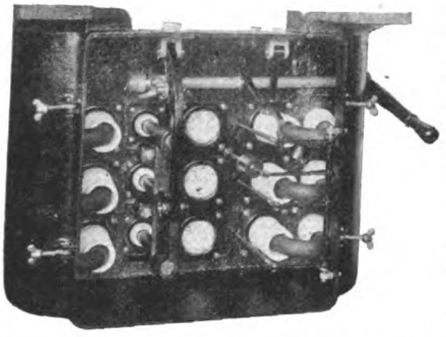
New Current Tap.

Automatic Pole-Line Oil Switch.

A new pole-line oil switch has been developed which automatically opens the circuit in which the switch is connected if the current in that circuit exceeds a certain definite amount for which the tripping mechanism is set. In many cases the use of this switch in connection with pole-type transformers obviates the necessity of bringing high-tension lines into a building.

Digitized by Google

The switch is closed by a handle affixed to the frame. The automatic operation on overload is effected by tripping coils in series with the line. These coils are located in the oil vessel under oil and are connected to a common tripping lever by separate wooden rods. The tripping device may be actuated by any one of the overload trip coils, or by a hand-operated trip rod, not visible, but outside the switch frame. The switch cannot be opened by the closing handle. An inverse-time oil dashpot (see illustration) connected to the tripping device affords a time delay in automatic tripping.



Top View of Switch with Cover Removed, Showing Time-Limit Dashpot.

Insulated cables enter the switch from below through porcelain bushings in an overhang on the switch frame. The space between cables and these bushings, as well as other bushings through which the cables partly run, is filled with insulating compound. There are no uninsulated parts within the switch frame.

The oil vessel has an insulating lining, wooden barriers between poles and between trip coils, drain cock and filling tap so that the oil may be changed without lowering the vessel; it also has handles to assist in handling the switch or in removing the vessel for inspection of the contacts, which are of the sliding-wedge type of construction.

The switch is thoroughly weatherproof with the exception of the operating lever and hand-tripping rod; all parts are enclosed and protected from the weather. The cover is grooved on the under side to fit closely over the edge of the frame. The oil vessel fits around a flange on the bottom of the frame.

This switch can be obtained single, double, triple or four pole, single throw, for use up to 15,000 volts and 300 amperes. It is built by the General Electric Company, Schenectady, N. Y.

Automatic Oil Switch with Three-Coil Time-Limit Trip.

Electrically Driven Garbage-Collecting Wagon in Use in Boston.

Electric Garbage Wagon Effects Economy.

Economical costs of garbage hauling are obtained by the Sanitary Department, City of Boston, by the use of electric trucks. The city owns two five-ton General Motors Truck Company's dumping wagons, each equipped with a 44-cell, 29-plate Philadelphia battery. The vehicles are charged at night at the garage operated in connection with the Public Works Department.

Each vehicle has a capacity of 10 cubic yards of refuse, which consists mainly of ashes collected from private premises and removed to the public dump. An average of four loads a day are hauled, the aggregate mileage being about 25 per day. Six men are assigned to each wagon, the driver, his assistant, who handles the loading, and four street men who roll the barrels to the van and throw them aboard.

Accelerator for Hardening Concrete.

Experiments have been made by the United States Bureau of Standards to develop a method for accelerating the hardening of concrete, in order that the material might be used in revetment work in place of the willow mats that have been used in the past along the Mississippi River. The Bureau finds that 4 per cent of calcium chloride added to the mixing water increases the strength of the concrete at the age of one day 100 per cent or more. In some cases the strength of the concrete in which the calcium chloride was used at the age of two days equaled 75 per cent or more of the strength normally attained in one month.

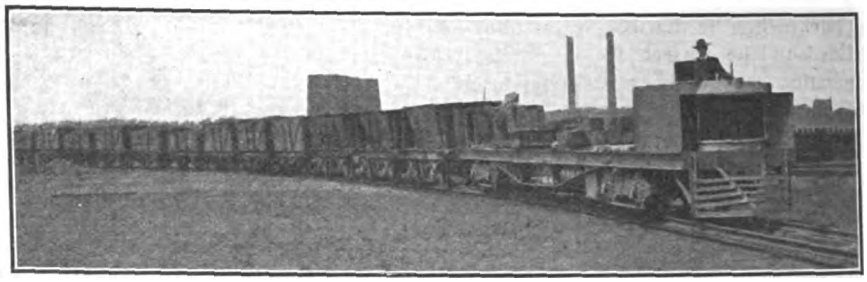
The Bureau of Standards believes that the findings of this investigation will be of appreciable value in concrete construction.

New Toy Transformer.

An improved type of toy transformer has been placed on the market by the Thordarson Electric Manufacturing Company, Chicago, Ill. To protect the transformer from overloads or short-circuits on the secondary side, it is provided with a self-contained automatic cutout. A push-button projecting from the case permits connecting the transformer to the circuit again, but only after the overload or short-circuit condition has been removed.

Digitized by Google

Electrical Transmission on a New Zealand Gas-Electric Motor Car.

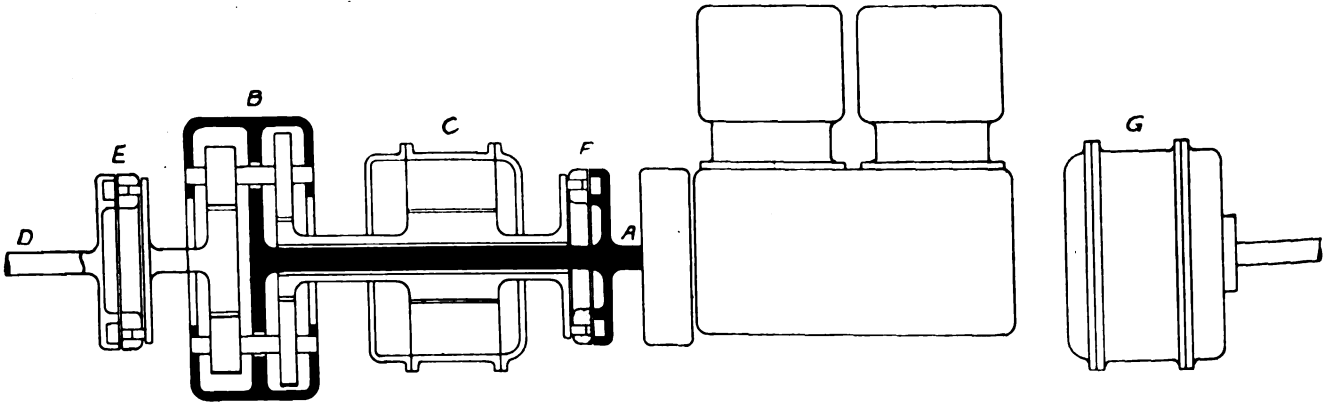


Gas-Electric Motor Car Hauling Trailing Load of 200 Tons. Car Shown Without Body.

What has been termed by its English builders as a "petrol-electric locomotive coach" has been constructed and equipped in England on the Thomas transmission system for use on the New Zealand Government Railways. Herewith it is shown hauling a load of 200 tons, an interesting performance in view of the fact that the engine is only 200 horsepower, and the car is geared up to give a top speed of about 45 miles per hour. In ordinary service it will have to haul two 25-ton trailers, each carrying passengers. The body does not appear in the illustration as that is being made in the New Zealand Government workshops at Wellington. The eight-cylinder engine is of the "V" type, 7 inches bore by 8 inches stroke, and has a normal speed of 900 revolutions per minute and a maximum speed of 1,500 revolutions.

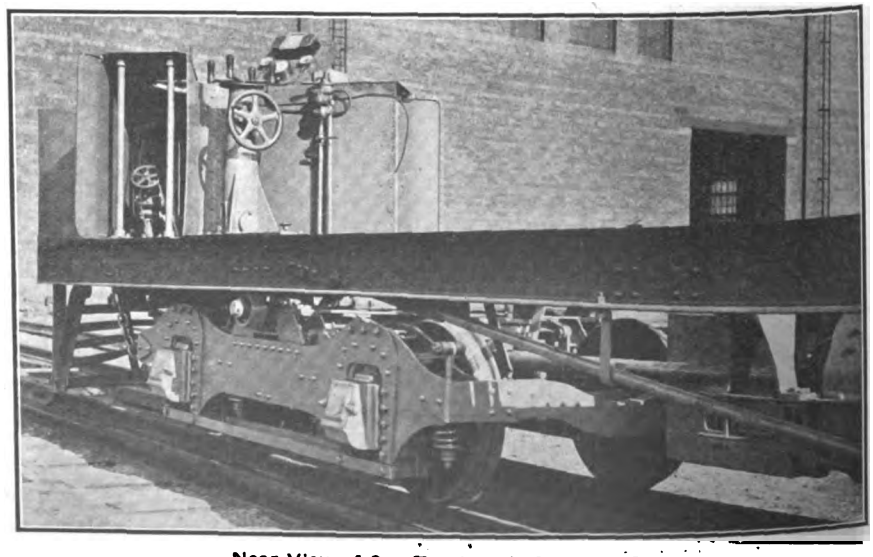
The transmission system is the particular feature of interest for electrical men. Briefly stated, the Thomas system comprises the use of two electrical machines (each about one-third the normal horsepower of the prime mover) and a planetary gearing which interconnects these electrical machines with the engine and the load. On top speed all the power is transmitted direct mechanically, and in starting, and in climbing heavy grades, part of the power is transmitted mechanically and part electrically. The division of the power at these periods, and the direct drive on top speed, give flexibility and efficiency. In the car illustrated the two electrical machines are totally inclosed and only weigh about 1,680 pounds each. The planetary gears are all cut double helical to ensure quiet and efficient running, and they are provided with forced lubrication, the oil being kept cool by means of an oil radiator. The chief novelty in the transmission is the use of magnetic clutches which are simple to control and suitable for large power.

The first electrical machine forms one complete unit with the planetary gearing and the two magnetic clutches. This unit is quite rigid and perfect alinement is thus assured. It transmits the mechanical drive to the outside axle of one truck. The second electrical machine is mounted independently of the engine and transmission unit referred to, as it drives the outside axle of the second truck purely electrically. Tubular Cardan shafts are provided for the drives to the two trucks, and suitable interposition of universal joints assures perfect uniform angular velocity.



Diagrammatic Arrangement of Thomas Transmission System for 200-Horsepower Motor Car.

The control of the car can be effected from either end. The main controller provides for 12 forward speeds, including direct drive on top. The reverse for continuous running is obtained by reversing the direction of rotation of the engine. Two reverse notches are provided in the controller for reversing for short distances when switching, etc., the power being transmitted purely electrically. This is effected by coupling up No. 1 machine direct to the engine and transmitting the power electrically therefrom to No. 2 machine, which is permanently coupled to one of the driving axles. In addition to the main controller an auxiliary switch is provided, which is used to control the car in much the same way as the clutch pedal on an ordinary touring car. There are two magnetic clutches: first the free-wheeling clutch, which is engaged for all running speeds, and second, the top-speed clutch which is engaged only for the direct drive, starting the engine, and emergency reverse. Both of these

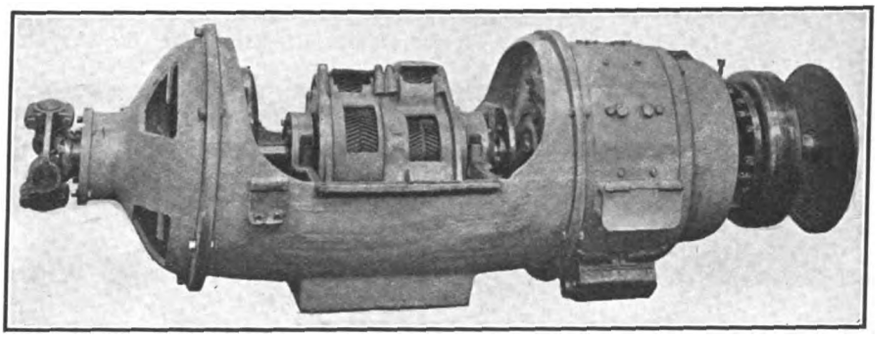


Near View of One Truck and of Control Gear.

Digitized by Google

clutches can be disengaged by putting this auxiliary switch in the "off" position. To bring the vehicle to rest, therefore, it is not necessary to move the main controller, the act of freeing the engine being obtained by moving only the auxiliary switch lever.

In order to put the car in motion the control handle is moved into the "start engine" notch, which connects the battery across No. 1 machine (the battery is used purely for starting up the engine and lighting the car); the auxiliary switch is then closed, thus coupling No. 1 machine by means of the top-speed clutch direct to the engine. As soon as the engine has been started, the auxiliary switch is put into the "off" position and the main controller moved into No. 1 notch. By slowly bringing the auxiliary switch into the "on" position, the free-wheeling clutch is gradually engaged, thereby causing machine No. 1 to be driven round in the reverse direction to the engine. As the car gains speed, the main controller is gradually moved to the top-speed position, when the direct drive is obtained by engagement of the top-speed clutch, which locks the epicyclic gearing, and at the same time reduces the current generated to zero. The notch beyond top speed provides for charging the battery.



Electrical Transmission Unit on Motor Car.

The car has a Westinghouse air-brake equipment, also emergency hand brakes. The complete vehicle, excluding the body, weighs 18 tons, the engine, transmission and radiators weighing about seven tons out of this. The car was designed and equipped throughout by the Thomas Transmission, Limited, 14 Leonard Place, High Street, Kensington, London, W., England.

New Electrically Driven High-Vacuum Pump.

The new May-Nelson oscillating-ring high-vacuum pump consists of four parts, the body, impeller, cover and shaft. Fig. 1 shows the pump with the cover removed.

In the body and impeller there are cut a series of concentric grooves so arranged that each of the rings thus formed in the impeller projects into a corresponding ring in the stationary half. In each of the grooves cut in the body, there are dividing walls, and the corresponding parts of the impeller rings are cut away.

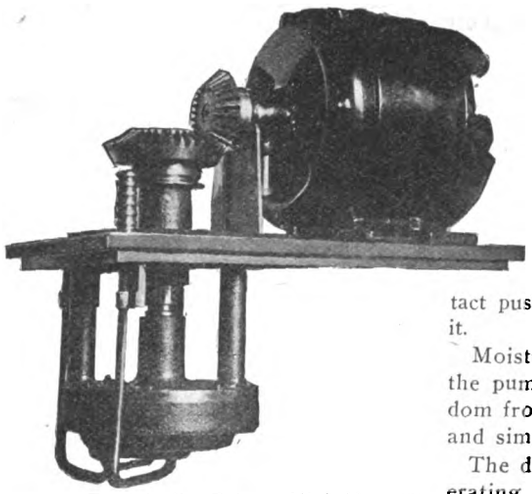


Fig. 1.—Electrically Driven High-Vacuum Pump.

The two, three or whatever number of grooves there may be (depending upon the particular pump referred to) are connected in series by posts. The action of the pump depends on the rolling contact made between the external cylindrical surfaces of either piece and the adjacent internal cylindrical surfaces, the contact pushing the air and vapor ahead of it.

Moisture and liquid can pass through the pump without injury, and its freedom from valves make it a very robust and simple piece of apparatus.

The diagrams in Fig. 2 show the operating principle of the pump. The two cross-hatched rings represent the impeller and the solid rings represent the body of the pump. S^1 is the port connected to the vessel to be evacuated; D^1 is connected to S^2 and D^2 is the discharge.

The rotation of the shaft produces first an increase in size of the crescent-shaped space adjacent to S^1, thus drawing in the air. Then S^1 is closed off from the space by the further rotation of the impeller and D^1 is opened to it. The space now decreases in size, thus forcing the air out of D^1. S^2 draws the air away from D^1 and it is finally discharged out of D^2. Both sides of the impeller are effective; therefore, there are two double-acting rings working in series. The three ring pumps operate the same except that the air passes around a third ring in series with the other two before it is finally discharged.

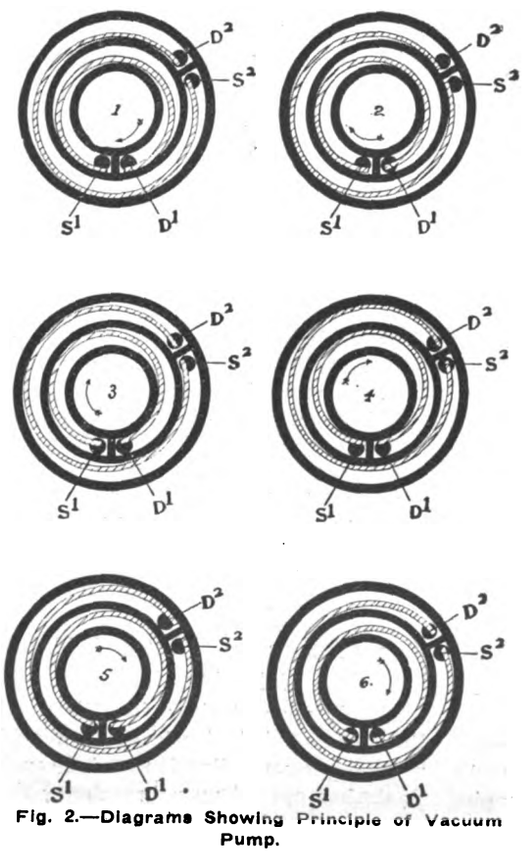


Fig. 2.—Diagrams Showing Principle of Vacuum Pump.

The pump is made of cast iron throughout, and is equipped with bronze bearings. The outfit illustrated, Fig. 1, is a three-ring pump with a displacement of 930 cubic inches of free air per minute and the maximum vacuum is 0.25 millimeter. It is direct-connected to a one-tenth-horsepower motor made by the Robbins & Myers Company, Springfield, O. The gears are covered with a guard and the outfit sits in a tank which contains oil. The rear guard and tank are not shown in Fig. 1.

The over-all dimensions of the outfit are: length 12 inches, width 7 inches, height to top of motor, 13.75 inches. The weight with oil is 75 pounds. The pump is manufactured by the May-Nelson Manufacturing Company, Washington, D. C., and is sold through Eimer & Amend, New York City.

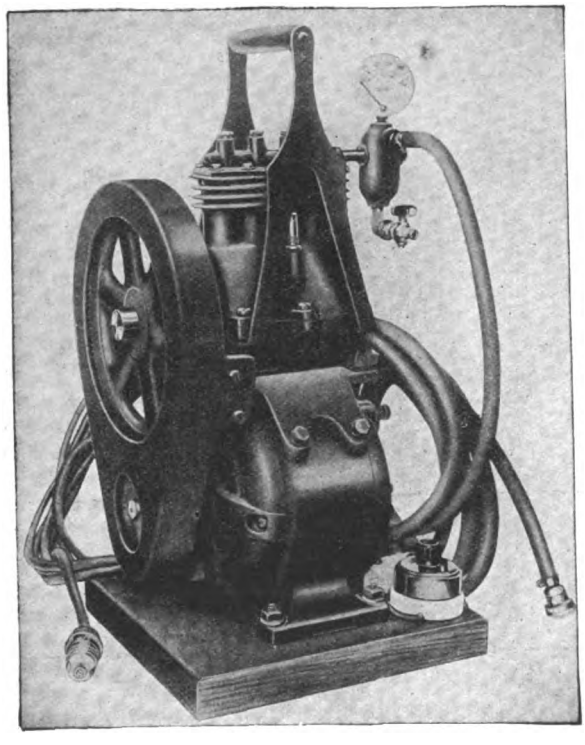
A good frosting for automobile headlights is had by coating the inside of the glass with saturated solution of Epsom salts, which is allowed to evaporate on the glass.

Digitized by Google

New Electrically Driven Tire Pump.

Among the many new devices that are constantly being exploited for use in the garage, the tire pump shown in the illustration is worthy of mention on account of several unique features.

The entire outfit is a self-contained unit mounted as shown. A handle is supplied, allowing it to be easily carried, or it can be mounted on a small carriage, if desired. The air pump, which is mounted on the motor, has four cylinders, insuring a steady flow of air. The corrugations on the cylinders assist in dissipating the heat generated by the compression of the air and keep the operating temperature low. Metal pistons, each fitted with two compression rings, are used, The connecting rods and main bearings are made of bronze. The motor used is the well known one-quarter-horsepower standard Westinghouse type CA or CD, depending on the nature of the circuit, whether alternating current or direct current.



Motor-Driven Tire Pump.

This pump is called the "Guco" and is manufactured by the General Utility Company, 1330 Ogden Street, Philadelphia, Pa. It will meet every "safety first" requirement; all electrical contacts are shielded and al working parts are inclosed, which, in addition to making it safe, makes is dustproof. All parts of the pump are lubricated by the splash system.

The complete equipment consists of a motor-driven pump, a pressure gauge, an air hose, an acorn connection and a snap switch for starting and stopping the motor.

Electric Storage Battery Sales Convention.

The eighth convention of the sales managers of the Electric Storage Battery Company, Philadelphia, Pa., was recently brought to a close after a week's session at the Bellevue-Stratford Hotel, Philadelphia. The managers of the New York, Boston, Chicago, Cleveland, San Francisco, Denver, St. Louis, Detroit, Pittsburgh, Atlanta, Washington, Rochester and Pennsylvania sales offices were in attendance.

The sessions opened each day at 9:30 a. m. and closed at 5:30 p. m., the president and general manager, Herbert Lloyd, presiding. Papers bearing upon the development of various fields of storage-battery service were presented by engineers and department heads of the general office and a number of subjects were discussed concerning important matters pertaining to the different territories.

While the convention was a hard working one the evenings were made attractive to the visiting force by a series of entertainments

While the convention officially adjourned at 5:30 p. m., Saturday November 13, important matters pertaining to certain territories necessitated the presence of several of the visiting managers through the greater part of the following week.

Opportunity for Electrical Trade With Russia.

The Russian Society for Electrical Enterprises, Limited, which is affiliated with the strong Russian and French Bank, has opened up a branch for the sale of electrical machinery and apparatus, insulating materials and supplies, also steam and oil engines and water turbines. It desires to enter into relations with first-class electrical manufacturers, with a view of becoming their agents in Russia, where there is considerable demand for electrical equipment, because former German sources are completely cut off. This firm owns the concessions for electric lighting sations in Pawlowsk, Uman, Kamenetz and Podelsk, and for electric railways in Elizabethgrad and Uman. Its address is 5 Marsowo Polje, Petrograd, Russia.

Loud-Speaking Telephone Window Demonstrations.

The drawback to window demonstrations of any character has been the inability of the demonstrator to get his "message across." He could clearly point out the talking points of the article under demonstration, but he could talk about it through the medium of lettered cards only. It is obvious that this method is very unsatisfactory. To overcome the objection and bring the demonstrator nearer his audience, the Western Electric Company has developed a loud-speaking telephone equipment in this connection.

Window Demonstration with Loud-Speaking Telephone.

This equipment consists of a special transmitter and a pair of loud-speaking receivers and horns. The operation is simple. The demonstrator connects the horns and receivers on both sides of his window, just high enough to be outside the reach of mischievous youngsters. In series with the transmitter, which is placed inside the window, is wired the battery of six dry cells connected in series and the receivers. The system is then ready for operation. As the demonstrator wishes to bring out each point, he simply speaks into the transmitter and his voice is magnified by the receivers and horns, and carried to the audience.

Digitized by Google

Electrical Equipment of New Factory of Holtzer-Cabot Electric Company.

A noteworthy feature of the factory equipment at the new plant of the Holtzer-Cabot Electric Company, Roxbury, Boston, Mass., is a distribution switchboard 30 feet long, that supplies energy to the various testing benches at voltages and frequencies of almost any conceivable combination. The board was designed and built by the company and consists of 12 panels, with 10 auxiliary machines in connection. There are 900 receptacles for plugging in leads to the benches, and current is available in volume up to 400 amperes, of any voltage between 5 and 575, direct current or alternating current and with frequency of 25 to 133 cycles single phase, and of 25 to 60 cycles, three phase. Each receptacle is provided with a fiber safety cap fitting, and the character of the energy it supplies is plainly painted in white on the black slate, the letters and figures being 1.25 inches high.

Adjoining the main board is a marble board for high-potential control, for testing at voltages ranging from 500 to 6,000. The first slate panel, which is five feet wide, controls 60 kilowatts in alternating-current auxiliaries which are connected to 75 horsepower in direct-current motors with slip rings on the back of the armatures, for three-phase current. The generator windings are arranged for series-parallel connection and for two and three-phase energy. The generator field is controlled through a motor-operated rheostat. The second slate panel, four feet wide, is for the same object, differing from the first only in the manner of making connections, these being by means of knife switches instead of by plug arrangement. The other 10 panels are each 26 inches wide and are fitted with plug receptacles, as noted.

Each bench has four main circuits for test connections, three circuits for field control of the booster, and a continuity-bell-test circuit.

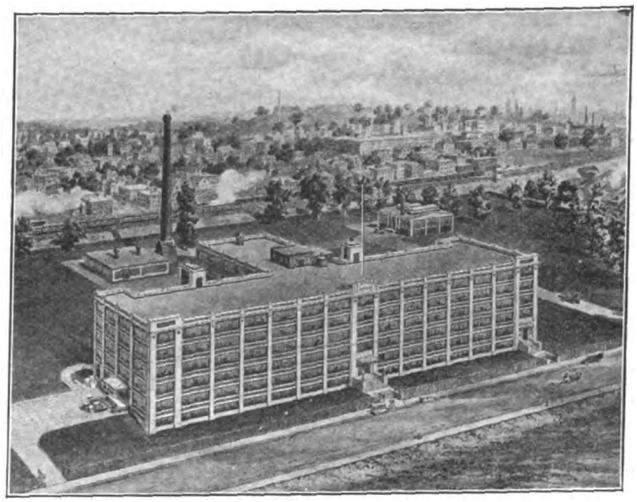
Energy for power and light in the factory is obtained from the Boston Edison Company, whose 4,400-volt mains run into a brick transformer house, 16 by 24 feet, located in the yard. The main switchboard for the factory is located in a recess of the wall directly inside the factory.

Seven three-inch conduits run directly from the transformer house to the south end of the third floor, where is located the test department. The board is located over a narrow opening in the concrete floor slab, the wires being carried thence through conduit inbedded in the floor. On the board is a five-kilowatt single-phase autotransformer, arranged with ten taps which allow voltages to be varied from 110, or 220, in steps of five volts.

A 50-kilowatt rotary converter produces direct current at 110 and 220 volts, being arranged with an induction regulator in the primary circuit to vary the voltages. The motor-generators used are of Holtzer-Cabot manufacture.

Machines throughout the factory are motor-driven by 220-volt, three-phase, 60-cycle current. In the concrete floor slabs inserts were cast at four-feet intervals in both dimensions, as a means for attaching shafting and motors, through short sections of joist bolted to the ceiling. In general, the machines are operated in groups from motors of 5 to 20-horsepower each.

The new factory is designed to house the entire business of the Holtzer-Cabot Electric Company, formerly carried on at Brookline and in two lesser plants in Boston. The building is of brick-faced concrete, 300 by 60 feet, and six stories high with basement, a six-story annex 100 by 60 feet, and a 60 by 60 foot sub-basement used as a garage. The area of the walls of the superstructure is 60 per cent glass, thus affording abundant natural light. A boiler house 42 by 42 feet, with chimney 120 feet high, houses two 250-horsepower high-pressure boilers with necessary equipment to drive generators, should the company desire to generate its own electricity for power and light. At present, this plant supplies heating by the Warren Webster vacuum system, automatically controlled from the main office by a Powers regulating system.



New Factory of the Holtzer-Cabot Electric Company.

Water is obtained from wells and is pumped to two 6,000-gallon tanks on the roof of the factory by a triplex pump in the boiler room, automatically controlled by an electric float switch.

Sanitary appointments are thorough, and rest and accident rooms are provided for employees. Lighting of the workrooms is by means of incandescent lamps installed in bell-shaped glass near the ceiling. A complete direct-current wiring system provides for telephones and factory signals, connecting all departments with the main office.

The business of the Holtzer-Cabot Electric Company was established in 1875 by Charles W. Holtzer, and was incorporated in 1889. During the early period the products were chiefly house and hotel annunciators, bells and batteries. With the coming of the telephone a large new field was opened up, and at present the Holtzer-Cabot motor-generator is prominent in the power equipment of many leading telephone exchanges in America and also abroad.

The manufacture of motors was begun about 18 years ago, this company being a pioneer in the making of the alternating-current motor. The present output includes dynamos for lighting and electroplating, motors for all sorts of industrial and domestic uses, and interior telephones, watchmen's clocks, igniters, and electric horns. The company has designed and developed much special apparatus for United States Government departments.

Ore Company To Employ Electricity.

The directors of the Complex Ores Company, Limited, have contracted with the Hydroelectric Department of the State of Tasmania for the use of a large supply of electricity. This company was organized several years ago to treat zinciferous ores and manufacture carbides.

As the process requires cheap power, the concern organized the Hydroelectric Power Company of Tasmania, but after spending a large amount of money on the construction of a power plant at Lake Coleridge it was found that sufficient capital could not be secured to complete the work. The unfinished electric power plant was therefore sold to the State of Tasmania and is now being completed by the State Government. Power will be transmitted to Hobart and other towns throughout the island, which is located south of Australia, and is a State of the Commonwealth of Australia.

Production of Aluminum in the United States.

Aluminum production in the United States totaled 80 million pounds last year, against 15 million pounds in 1906 and only 83 pounds in 1883. This year's output may reach 100 million pounds, or about half the world's production.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

FIXTURE PARTS.—John D. Raymond, 1601 Fort Dearborn Building, Chicago, Ill.

Fixture parts of Raymo-Light Type C Units, consisting of glass bowls, reflectors, pendent chains, canopies, shadeholders and the like, for use with gas-filled lamps of 100, 200 and 300-watt capacities.

Catalog Nos. 2200, 2220, 2222, 2222B, 2300, 2330, 2333, 2333B, 2400, 2440, 2500, 2600, 2700.

Listed October 18, 1915.

FIXTURE PARTS.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Fixture-supporting attachments for use with Benjamin ceiling fixtures and receptacles having threaded shadeholder shells.

660 watts, 250 volts, catalog Nos. 1413, 1416.

Listed October 27, 1915.

FLEXIBLE CORD.—A A Wire Company, Newark, N. J.

Marking: Two uncolored woolen threads parallel with conductor between rubber insulation and braid.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached to each coil.

Listed October 25, 1915.

GROUND CLAMPS.—M. I. Ginsburg, 104 North Sixth Street, Philadelphia, Pa.

Ground clamp for use with No. 4 B. & S. gauge wire. A single-piece clamp of copper, provided with suitably spaced holes and with a copper-plated bolt and nut for clamping to rigid conduit. Adjustable for use with conduit up to and including one-inch size. One end of clamp is channeled to form equivalent of a lug for soldering to ground wire.

Listed October 22, 1915.

PHOTOGRAPHIC PRINTING MACHINE.—Folmer & Schwing Division, Eastman Kodak Company, 12 Caledonia Avenue, Rochester, N. Y.

F. & S. Professional Printer, for printing photographs by incandescent lamps. A wood frame supports a metal-walled light chamber with lamp receptacles and control switches, and a special printing frame. Equipment includes a treadle-operated push-button switch for disconnecting all except one of the lamps when not in use, and a flexible cord with attachment plug for connection to supply circuit. 600 watts, 125 volts, No. 1.

Listed October 29, 1915.

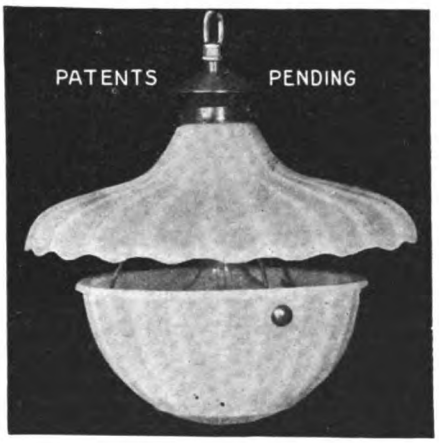
PICTURE MACHINES AND APPLIANCES.—The DeVry Company, 117 North Fifth Avenue, Chicago, Ill.

Portable hand-operated motion-picture machine having mechanism mounted in a three-ply veneer, asbestos-lined wood case. De Vry.

The electrical parts of this device comprise a 100-watt incandescent lamp of special form, with socket and portable cord for attachment to supply circuit.

Standard for use only with slow-burning film supplied by the manufacturer.

Listed October 25, 1915.



Fixture No. 2220.—John D. Raymond.

RECEPTACLES. — Candelabra and Miniature. The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, 75 watts, 125 volts.

Miniature, for decorative lighting systems. Christmas-tree lighting outfits and similar purposes. For indoor use only.

Sign, catalog Nos. 387, 389.

Cleat, catalog No. 366.

Listed October 25, 1915.

Weatherproof Receptacle No. 970.—Union Electric Company.

RECEPTACLES, Standard. — The Luminous Unit Company, submittor, 265 Washington Avenue, St. Louis, Mo. Manufactured by the Byrant Electric Company, Bridgeport Conn.

Keyless, porcelain shell. "L. U. Co."

Cleat, 660 watts, 250 volts, catalog No. 50.

1500 watts, 250 volts, catalog No. 100.

Fixture, 660 watts, 250 volts catalog No. 51.

Listed October 16, 1915.

RECEPTACLES, Standard.—Union Electric Company, Trenton, N. J.

Porcelain shell, 660 watts, 250 volts.

Sign or conduit-box type, catalog No. 704.

1,500 watts, 600 volts, cleat type, catalog No. 526; concealed type, catalog No. 527.

Listed November 1, 1915.

RECEPTACLES, Weatherproof. — Union Electric Company, Trenton, N. J.

Porcelain shell, 660 watts, 250 volts.

Conduit-box type, catalog Nos. 970-71.

Listed November 1, 1915.

ROSETTES, Fuseless.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, 3 amperes, 250 volts.

Molding, catalog No. BW-26.

Conduit box, catalog No. BX-26.

Listed October 25, 1915.

ROSETTES, Fuseless.—The Bryant Electric Co., Bridgeport, Conn.

Bryant or Perkins rosettes (with pull socket mechanism), 3 amperes, 125 volts, 1 ampere, 250 volts.

Molding, catalog No. BW-25.

Conduit box, catalog No. BX-25.

Listed October 26, 1915.

SOCKETS, Standard. — Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Benjamin, brass shell.

Pull, 660 watts, 250 volts, catalog Nos. 4225-6, 4236-7.

Keyless, 1,500 watts, 600 volts, porcelain-lined, catalog Nos. 4297-9 inclusive, 4275, 4277. Electrolier, for fixture use only, catalog No. 444.

Porcelain shell.

Key, lever type, 250 watts, 250 volts, catalog Nos. 249, 4425-28 inclusive.

Keyless, 600 watts, 600 volts, catalog Nos. 256-7.

Listed October 23, 1915.

SWITCHES, Automatic. — Chicago Safety Appliance Company, 122 Michigan Avenue, Chicago, Ill.

Elevator safety control system, consisting of "Shreve" elevator door switches connected in series with coil of remote-control solenoid switch. Contacts of solenoid switch are in series with controller in car. Emergency switch in car is provided to shunt out solenoid switch in case of inoperation of door switches.

Listed October 25, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

ST. ALBANS, VT.—The Vermont Power & Manufacturing Company, St. Albans, Vt., operating hydroelectric and steam generating plants and serving a large territory in northern Vermont with power and lighting, has been acquired by interests representing a new Massachusetts corporation, the People's Electric Lighting Company. The incorporators were J. W. Ogden, Malden; W. R. Dame, Clinton; W. H. Tylee, Worcester; D. V. Carruth, Clinton; A. G. Augur, Philadelphia, and H. B. Hodge, Boston. The officers are: President, W. H. Tylee; vice-president, W. H. Ogden; treasurer, W. H. Vorce, and on retirement of the latter the treasurership will be taken by Mr. Dame. W.

BROCKTON, MASS.—The Chamber of Commerce is considering a plan for the installation of an ornamental street lighting system on some of the principal streets at an estimated cost of $5,630.

BEAVER, PA.—Charters have been approved for seven new light companies for the establishment of lighting installations at Georgetown, Industry, Ohio, Center and Potter townships. Smaller plants will be located at Glasgow, a suburb of Smith's Ferry, and at Shippingport. The headquarters of the new lighting companies will be with the Beaver County Light Company. Address J. S. Magee.

GLENOLDEN, PA.—The H. K. Mulford Company will shortly erect a power house for its plant here. Thomas M. Seeds, Jr., 1207 Race Street, Philadelphia, Pa., is taking the subbids.

LIZARD CREEK JUNCTION, PA.—The Lehigh Valley Railroad Company proposes to erect large shops here. It is said that electric drive will be used throughout.

OAKMONT, PA.—The Autocar Company, of Ardmore, Pa., will erect a three-story brick and concrete building here. It is reported that all machines will be motor-driven. Stearns & Castor, Philadelphia, are the architects.

PHILADELPHIA, PA.—The Board of Education will erect a four-story school building at B and Westmoreland Streets. The cost will be about $350,000. J. Horace Cook is the architect.

PHILADELPHIA, PA.—In about one month the Misericordia Hospital will be ready for bids for the erection of the building and the machinery equipment of a power house to be constructed at Fifty-third and Cedar Streets. E. F. Durang & Son are the architects.

PHILADELPHIA, PA.—A twelve-story reinforced-concrete and steel office building will be erected here. The cost will be about $250,000. The lighting contract will be awarded separately. Robeson Lea Perot, 34 South Seventeenth Street, Philadelphia, is the architect.

FORT PIERCE, FLA.—Bonds have been voted for improving the electric light system. Address R. Whyte, mayor.

NORTH CENTRAL STATES.

CANTON, O.—The city council has finally determined on the use of electricity for the ornamental street lighting system on Tuscarawas Street, deciding that gas would be unsatisfactory. The Canton Electric Company will install the system under a five-year contract for maintenance, effective beginning January 1, 1915. L.

CINCINNATI, O.—Bids will be received until 12 o'clock noon, December 20, on the second section of the Eastern High School work, including the power house and equipment. C. W. Handman, business manager of the board of education, 511 West Court Street, should be addressed, and will furnish plans on deposit of $25. Separate bids may be submitted for the electrical work. L.

CINCINNATI, O.—H. Harig & Company have been awarded the general contract for the construction of a 10-story addition to the building of the Provident Savings Bank & Trust Company by Architect Harry Hake. It will cost $100,000, and will call for a considerable amount of electrical work. L.

MASSILLON, O.—H. O. Swoboda, Empire Building, Pittsburgh, Pa., has been retained as consulting engineer for the purpose of preparing plans and specifications for a new street lighting system.

ELKHART, IND.—The Board of Public Works will soon advertise for bids for the lighting of the city. Address president of the Board of Public Works.

SOUTH BEND, IND.—The city council is considering the question of establishing a municipal electric lighting plant. Address Mayor F. W. Keller.

AURORA, ILL.—Alderman James Sanders, of the city council committee on lights, will ask the city council to provide in the 1916 appropriation ordinance for an appropriation of $2,500 for electric lights. Address City Electrician Barclay.

ELGIN, ILL.—City Electrician E. A. Bell has completed plans for an ornamental lighting system on St. Charles Street. Z.

MARSEILLES, ILL.—The council will install decorative lights. Address town clerk.

ROCK FALLS, ILL.—Bonds amounting to $55,000 have been voted for an electric light system. Address town clerk.

LANNON, WIS.—The Lannon Light and Power Company has been incorporated with a capital of $15,000, by W. C. Leitzke, A. H. Christman and others.

MENOMONIE, WIS.—It is understood that the Wisconsin-Minnesota Light and Power Company is about to revive its project of building a power dam at Dunnville on the Red Cedar River. Application has been filed with the Railroad Commission asking for construction rights.

WASHBURN, WIS.—The Commercial Club is considering the question of a white way system along Main Street. Address chairman of Commercial Club.

HALLOCK, MINN.—A "white way" system will be established here. Address town clerk.

MONTROSE, MINN.—An electric light system will be built. Address town clerk.

BELLE PLAINE, IOWA.—Electric street lights will be installed here. Address city clerk.

ELDRIDGE, IOWA.—Otto R. Wuestenberg has been issued a permit for the installation of an electric light plant.

FAIRBANKS, IOWA.—Bonds in the sum of $6,000 have been voted for municipal lighting. Address city clerk.

IMOGENE, IOWA.—The council plans to secure electric lights. Address city clerk.

ORIENT, IOWA.—The council is considering the installation of a municipal electric light system. Cost $7,000. Address city clerk.

SPRINGFIELD, MO.—An election has been ordered by the city council for January 11, to vote on an issue of $400,000 in 20-year bonds for the building of an electric light plant.

KILDEER, N. D.—The Kildeer Electric Light and Power Company is planning to erect a power plant.

SOUTH CENTRAL STATES.

FLEMINGSBURG, KY.—An increase in the capital stock from $12,000 to $20,000 has been authorized by stockholders of the Flemingsburg Light and Ice Company. The money will be used to purchase and install a new generating equipment and to change over the lighting system from a direct to alternating current. This will enable the company to supply current to other towns in the county. The company has a bonded indebtedness of $6,000.

TUCKERMAN, ARK.—The Citizens' Light and Power Company will establish new electric light plant. Address general manager.

HEAVENER, OKLA.—Le Flore County has voted to issue $20,000 in bonds for the erection of a municipal electric plant. Erection of the plant will begin at once. Address county clerk.

DENTON, TEX.—With the money raised for the white way system about the courthouse square and on East

Digitized by Google

Hickory Street to the railroad station, agitation for extending the ornamental lights out West Oak Street to Fry Street in the residence section has been started.

GARLAND, TEX.—A crew of 50 men has started work here on the 33,000-volt transmission line of the Texas Power and Light Company, which will be built from Jenkins to Garland, Rockwall and Royse City. The crew will be divided and will work in both directions. It is expected to have the line finished in two months.

M'KINNEY, TEX.—At a popular election held on November 24, the people of McKinney voted to sell the local municipal plant to the Texas Power and Light Company. The sale includes a contract for electrification of the city water works.

PLAINVIEW, TEX.—The Malone Light and Power Company, including the plants at Plainview, Lubbock and Lockney, has been sold to the Texas Utilities Company, a new corporation recently organized in St. Louis, under Texas laws, with the principal office in Plainview, Tex. Approximately $230,000 was paid for the properties. Officers of the new corporation are H. Wurdack, St. Louis, president; H. C. Randolph, Plainview, vice-president; E. M. Kurtz, St. Louis, secretary-treasurer; Charles A. Malone, Plainview, general manager. Extensive improvements are contemplated.

PORTLAND, TEX.—At a mass meeting of citizens it was decided to issue bonds for the construction of an electric light plant. John W. Willacy, of San Antonio, can give information.

WINDOM, TEX.—The Board of Trade has contracted with the Texas Power and Light Company to put in street lights.

WESTERN STATES.

LIMON, COLO.—W. J. Cowhick, of Pueblo, has petitioned the city council for a franchise to install and operate an electric light plant in this town.

CHEYENNE, WYO.—C. A. Semrad, local manager of the Cheyenne Light, Fuel and Power Company, has completed plans and specifications for improvements to the local plant, estimated to cost about $50,000. The plans have been forwarded to the executive committee of the Western Power Company, at New York, the parent company. The proposed work involves the installation of new steam turbine and generator, boiler feed-water heater and feed pumps, automatic stokers, etc.

CHEYENNE, WYO.—According to S. B. Williams, chief of the Denver office of the United States Reclamation Service, private parties will shortly take steps for the construction of a gigantic water power and irrigation project in southern Montana and northern Wyoming, whereby a large amount of power will be developed and more than 100,000 acres of land reclaimed. The plans contemplate, he says, the utilization of the waters of the Big Horn River and the construction thereon of an immense reservoir for the storage of water. U.

WHEATLAND, WYO.—The city council has decided to expend between $6,000 and $10,000 for steam equipment at the city light plant. A new steam engine and two boilers will be purchased, and bids for the same will be called for at once. It is contemplated also to install a new electric generator in the near future. U.

CHOTEAU, MONT.—The city council is considering the installation of an ornamental street-lighting system, and it is planned to install 100-watt lamps with reflectors, on the corners in the residence district and ornamental lamp posts in the business district. Information in regard to this system can be obtained from the city clerk.

HEDGEVILLE, MONT.—Plans are being made for the installation of an electric light system. Address city clerk.

HELENA, MONT.—Residents of the Broadwater addition have petitioned the city council for the creation of a special improvement district in their section, which will provide for street grading, cement sidewalks, curbing and an ornamental street lighting system.

POLSON, MONT.—J. H. Cline has been granted a permit by the Interior Department for the construction of a hydroelectric plant on Big Creek in the Kalispell land district. He will utilize this plant for the purpose of furnishing electricity for municipal purposes in the town of Polson.

POCATELLO, IDAHO.—The city council is seriously considering the creation of several new lighting districts, and, accordingly, has instructed the city engineer to prepare maps, estimates, plans, etc., of the proposed districts to be created. Reported the council also considers a change in the street lighting from the cluster light to the single light type, although the making of this change is not assured.

ROBERTS, IDAHO.—The Utah Light and Power Company, which maintains Idaho offices at Idaho Falls, under the direction of W. C. Gates, general manager, will, according to reports, extend its transmission lines to this city, work to begin at an early date. The town of Roberts has granted the company a franchise and the company has petitioned the Public Utilities Commission at Boise for permission to make the extension. O.

ST. ANTHONY, IDAHO.—It is reported the council is considering the installation of a curbstone ornamental lighting system on Center and Bridge Streets, and has instructed the city engineer to prepare plans and estimates of the cost, and report back to the council at an early date. O.

MONTICELLO, UTAH.—There are strong indications that the efforts being made to install a waterworks system and electric light plant will prove successful. The stockholders of the Blue Mountain Irrigation Company have agreed to finance and install the proposed systems. Information may be obtained from the secretary of the company. U.

PROVO, UTAH.—The county commissioners of Utah County have granted a franchise to John D. Childs and others, to run a power, light and telephone line from Springville to Spanish Fork. Mr. Childs and his associates are planning to develop power and light near Springville. U.

TUSCON, ARIZ.—It is likely the city council will call an election early next spring to vote on a $50,000 bond issue for the installation of an ornamental street-lighting system.

NUEVO LAREDO (State of Tamaulipas), MEX.—General Luis Caballero, governor of this state, with headquarters at Victoria, has appropriated $5,000,000 Mexican silver, equivalent to about $2,500,000 United States currency, to be used in making public improvements here, including the construction of an electric light and power plant.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed by the Great Western Power Company, with a capital stock of $60,000,000, divided into 600,000 shares of a par value of $100 each. Of this number 300,000 are preferred shares and 300,000 common. The incorporators are: Mortimer Fleishacker, Washington Dodge, James Irvine, P. W. Ham, W. F. Eccles, E. Mackennall and William Forrest, all of San Francisco; Guy C. Earl, W. H. Spaulding and Chaffee E. Hall, of Oakland; H. A. Cooke, of Easton; L. A. Reynolds, of Alameda, and J. A. Koontz, of Palo Alto. Incorporation is for a term of 50 years, and San Francisco is named as the principal place of business. This action, according to Mortimer Fleishacker, president of the existing Great Western Power Company, is the first step in a new financial plan whereby the old company and its subsidiaries, which include the City Electric Company and the California Electric Generating Company, will be amalgamated.

EUGENE, ORE.—The installation of an ornamental lighting system on Ninth Avenue to cost about $2,000 is being considered by the council, which has been petitioned for the improvement. O.

GRANT'S PASS, ORE.—W. B. Sherman has been granted permission by the state engineer to appropriate 1,000 second-feet of water of the Rogue River at Hell Gate for the development of an irrigation and power project, involving an expenditure of about $200,000.

STAYTON, ORE.—Reported the town of Sublimity, near here, has granted a 25-year light and power franchise to C. E. Taylor, of the Stayton Electric Light Company, also that the Stayton Electric Light Company has signed a five-year contract with the town of Sublimity for furnishing street lights and supplying current for same. It is understood work of constructing the extension and installing the lighting system will be started as soon as materials can be placed on the ground.

ABERDEEN, WASH.—The city council has again been petitioned by George H. Tilden, of Seattle, for an electric light and heating franchise in the city of Aberdeen, and, according to all reports, the second petition is being favorably considered by the council. Tilden some time ago filed a petition for a like franchise, but was refused same on the grounds that he could not produce proof that he could control a power site at Lake Cushman, where he purposed constructing a power plant for the generation of power to serve nearly every town in the Grays Harbor Country, including the towns of Olympia, Montesano, Chehalis, Aberdeen, Hoquiam, Cosmopolis, etc. Later the state courts ruled that Tilden and associates had prior filings and rights to the Lake Cushman site. According to reports Tilden and associates, who maintain offices in the Hoge Building, Seattle, will shortly begin construction

Digitized by Google

on the power plant at Lake Cushman and the erection of transmission lines throughout the territory to be served.

BREMERTON, WASH.—The Kitsap County Commissioners, at Port Orchard, have been petitioned by the Bremerton-Charleston Light and Fuel Company here for a franchise to construct, operate and maintain electric power transmission lines over certain county roads. O.

PORT ORCHARD, WASH.—The Paulsbo Light and Power Company, located on Liberty Bay, near this city, has been granted a franchise by the Kitsap County Commissioners to construct, operate and maintain electric transmission lines along certain county roads. The company will connect with the lines of the Olympic Power Company, which own and operate the Elwha power plant, the largest hydro-electric development in Kitsap county.

SEATTLE, WASH.—Recent advices from Dawson, Alaska, report that the power plant of the C. K. Mining Company, on Bear Creek, near Dawson, was totally destroyed by fire recently. The loss, unofficially, is given at a quarter of a million dollars. O.

VANCOUVER, WASH.—It is reported the North Coast Power Company is making preparations to construct a new power transmission line from this place to Woodland, via Ridgefield and LaCenter, this improvement necessitating the reconstruction of the transmission line from Woodland to Kalama. The line to be constructed from Vancouver to Woodland will connect the company's Vancouver power plant with others north of Woodland. As heretofore reported, this company recently assumed control of the properties of the Washington-Oregon Corporation, located in southwestern Washington. It is understood the company has other plans for extensions and improvements.

VANCOUVER, B. C.—Reported the city council will install a cluster lighting system in upper Tipperary Park, between Third and Fourth Streets, and that bids for the installation will be called for at an early date. Plans and estimates are being prepared by the city engineer. O.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,321. ELECTRICAL SUPPLIES.—A report from an American consular officer in Russia states that an organization has requested catalogs, price lists, samples, and terms from firms manufacturing electrical supplies, such as carbon for direct-current arc lamps; material for street lamps; switches; safety devices; sockets, with and without keys; meters, etc. Correspondence should be in Russian.

NO. 19,322. DOMESTIC LABOR-SAVING DEVICES.—An American consular officer in England reports that a firm desires to correspond with manufacturers of domestic labor-saving devices and novelties of various descriptions. References given.

NO. 19,325. ELECTRICAL APPLIANCES.—An American consular officer in the Canary Islands reports that a business man in his district desires to establish commercial relations, on a commission basis, with manufacturers of electrical appliances. Correspondence should be in Spanish.

NO. 19,330. COTTON INSULATION.—A firm in the United Kingdom informs an American consular officer that it is desirous of importing cotton yarn suitable for covering electric bell wire, electric-light flexible cords and cables. Samples of the yarn desired may be examined at the Bureau or its branch offices. (Refer to File No. 68,764 for sample.)

FINANCIAL NOTES.

C. Loomis Allen, former president of the American Electric Railway Association, was appointed co-receiver of the Empire United Railways, Incorporated, New York, and will take charge of the operation of the properties of the company. Hendrick Holden, of Syracuse, was appointed receiver of the company November 1. The bondholders' protective committee of the Rochester, Syracuse & Eastern, one of the companies involved, announced, November 25, that approximately $2,000,000 of the first mortgage five-per-cent bonds have already been deposited and the committee expects soon to have more than half of the issue of $4,896,000.

The Washington Water Power Company has provided for the maturity of $3,336,000 six-per-cent notes, due February 2, 1916, by the sale of $1,700,000 two-year five-per-cent notes, dated February 2, 1916, largely to holders of the maturing notes; and $1,700,000 first refunding mortgage five-per-cent bonds, due 1939. White, Weld & Company and Lee, Higginson & Company have purchased the bonds and are offering them at par and interest. This sale makes $6,408,000 outstanding of the authorized $15,000,000 first-refunding-mortgage bonds. Reserved bonds are issuable for additions and extensions at not to exceed 50 per cent of cost. Net earnings for the twelve months ended October 31 were over four and one-half times total annual interest charges on all bonds now outstanding. Since 1902, $13,243,700 stock has been sold by the Washington Water Power Company at par for cash. The property represents a cash cost in excess of $20,000,000 and there are less than $7,000,000 bonds outstanding against it.

Dividends.

	Term	Rate	Payable
Am. Pw. & Lt., com.	Q	1 %	Dec. 1
Baton Rouge Elec., com.	—	$2.00	Dec. 1
Baton Rouge Elec., pf.	S	$3.00	Dec. 1
Blackstone Val. Gas & Elec., pf.	S	$3.00	Dec. 1
Blackstone Val. Gas & Elec., com.	Q	$2.00	Dec. 1
Brooklyn Rapid Transit	Q	1.5 %	Jan. 1
Chicago Telephone	Q	2 %	Dec. 31
Conn. River Pw., pf.	S	3 %	Dec. 1
Indianapolis St. Ry.	S	3 %	Jan. 1
Louisville Gas & Elec., pf.	Q	1.5 %	Dec. 20
Louisville Traction, com.	Q	1 %	Jan. 1
National Carbon, com.	Q	1.5 %	Jan. 16
Pennsylvania Ltg., com.	S	1 %	Dec. 1

Reports of Earnings.

WESTERN POWER COMPANY.

	1915	1914
October gross	$ 295,472	$ 227,598
Net	206,029	172,254
Surplus after charges	90,048	70,002
Ten months' gross	2,424,116	2,206,521
Net	1,856,120	1,645,367
Surplus after charges	790,060	645,741

COMMONWEALTH POWER, RAILWAY & LIGHT.

	1915	Per cent gain over 1914
October gross	$ 1,245,866	5.19%
Net after taxes	664,270	8.30%
Surplus after charges	222,328	16.96%
Balance after preferred dividends	142,328	29.29%
Ten months' gross	11,650,885	1.49%
Net after taxes	6,042,916	2.90%
Surplus after charges	1,741,547	0.64%
Balance after preferred dividends	941,547	1.19%
Twelve months' gross	14,173,088	0.54%
Net after taxes	7,415,127	3.04%
Surplus after charges	2,254,850	0.71%
Balance after preferred dividends	1,294,850	1.24%

PACIFIC GAS & ELECTRIC.

	1915	1914
October gross	$ 1,567,353	$ 1,409,694
Net after taxes	660,083	591,617
Total income	696,967	613,297
Surplus after interest	357,143	246,551
Balance after amortization	343,428	206,184
Ten months' gross	15,291,114	13,919,995
Net after taxes	6,554,682	5,719,084
Total income	6,855,084	5,960,875
Surplus after charges	3,377,431	2,008,763
Balance after preferred dividends	2,376,715	1,393,779

Gross for October, 1915, includes $31,667 in dispute because of rate litigation as compared with $29,668 in October, 1914, while the ten months gross includes $330,483 in dispute as compared with $489,181 in 1914.

NORTHERN STATES POWER.

	1915	1914
October gross	$ 461,427	$ 389,109
Net	271,560	222,514
Ten months' gross	4,073,600	3,603,191
Net	2,257,398	1,924,531

NEW INCORPORATIONS.

BOONEVILLE, ARK.—The Booneville Light and Power Company has been incorporated with a capital of $50,000. C. S. Greenway is president.

NORTH PLEASANTON, TEX.—The North Pleasanton Ice and Electric Company has been incorporated with a capital of $30,000, by L. B. Myers and others.

NEW YORK, N. Y.—W. & B. Electrical Contracting Company, Inc. Capital $1,000. Incorporators: Samuel Wallenstein, Saul Wallenstein and Chaim Bravo.

AUGUSTA, ME.—The Union Light & Power Company has been incorporated with a capital of $50,000, by Ernest L. McLean, Frank E. Southard and others.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 29.	Nov. 22
American Tel. & Tel. (New York)	128½	128½
Commonwealth Edison (Chicago)	143¾	144
Edison Electric Illuminating (Boston)	241	240½
Electric Storage Battery common (Philadelphia)	67	67
Electric Storage Battery preferred (Philadelphia)	67	67
General Electric (New York)	176	174⅞
Kings County Electric (New York)	125	125
Massachusetts Electric common (Boston)	7	7
Massachusetts Electric preferred (Boston)	39	39
National Carbon common (Chicago)	150	146
National Carbon preferred (Chicago)	119¾	120
New England Telephone (Boston)	132	132
Philadelphia Electric (Philadelphia)	27½	27⅜
Postal Telegraph and Cables common (New York)	80½	80
Postal Telegraph and Cables preferred (New York)	65	65
Western Union (New York)	88	87¾
Westinghouse common (New York)	69¾	67½
Westinghouse preferred (New York)	—	—

Digitized by Google

ST. LOUIS, MO.—The T. C. White Electrical Supply Company has been incorporated with a capital stock of $10,000, to do a general electrical supply business.

BROOKLYN, N. Y.—Electric Case Company, Inc. Manufacturing metal novelties, etc. Capital $20,000. Incorporators: Roy A. Pierce, Lewis J. Morrison and Florence M. Greer.

NEW YORK, N. Y.—Thistle Electric Company, Inc., November 24, 1915. Manufacture electrical devices, etc. Capital $10,000. Incorporators: Boyd Thistle, Richard H. Fehler and Willard D. Bass.

NEW YORK, N. Y.—Mine Equipment Corporation. Manufacturing electric appliances for use in mines, drills, etc. Capital, $250,000. Incorporators: James G. Shepherd, L. Ward Prince and Michael J. Murphy.

NEW YORK, N. Y.—The Home Engineering Company, Inc., electric fixtures, etc. Capital, $12,000. Incorporators: George Tiernan, Frank H. Parcells and John B. Purcell, all of 64 Wall Street, New York City.

MADISON, WIS.—Articles of incorporation have been filed by the Southern Wisconsin Electric Company. The company is capitalized at $100,000. Incorporators: John B. Sanborn, Chauncey E. Blake and J. P. Alberg.

CHICAGO, ILL.—The Rotary Electric Sign Company has been incorporated. The company's capital stock is $10,000, and it is to manufacture and deal in electric signs and electric appliances. P. M. Gunnell, Thyra Carlson and Harold J. Finder are the incorporators. Z.

WILMINGTON, DEL.—The Pocock Safety Lamp Company has been incorporated for the purpose of manufacturing electric safety lamps. The capital is $500,000. Herbert E. Latter, Norman P. Coffin, Wilmington, Del., and Clement M. Egner, Elkton, Md., are the incorporators.

PERSONAL MENTION.

MR. E. W. BOND, traveling the Oklahoma and Kansas territory for the Bryan-Marsh Division of the National Lamp Works of the General Electric Company, was married to Miss Eunice Dimelow, of York, Pa., at Chicago, Ill., on November 24. They will make their residence at Hutchinson, Kans.

MR. ALFRED P. WATERMAN, who is in charge of advertising and publicity for the Holtzer-Cabot Electric Company, Boston, Mass., recently completed 25 years in the company's service. The occasion was signalized by the gift of 25 American Beauty roses from the president, Mr. Holtzer.

MR. HENRY I. HARRIMAN, vice-president of Chace & Harriman, Inc., Boston, industrial engineers, connected with the hydroelectric enterprises on the Deerfield River in Massachusetts, and the Connecticut River Transmission Company, has been chosen second vice-president of the Boston Chamber of Commerce.

OBITUARY.

MR. W. T. JACKSON, for many years a representative of G. M. Gest, engineer and contractor, died November 13, at Atlantic City, N. J. Mr. Jackson was well and favorably known in the Middle West and in the South, by all interests who have had any conduit construction done within the past twelve years. He was of a cheerful and robust personality, and made many friends, and in his business tranactions was known for his integrity and fair dealings. A nervous breakdown followed by a complication of diseases was the cause of his demise. He was buried in Cincinnati from the Scottish Rite Cathedral on November 17. Mr. Jackson was a member of the Chicago Athletic Club and of the Young Men's Business Club of Cincinnati.

MR. JAMES I. AYER, manager of the Simplex Electric Heating Company, Cambridge, Mass., and one of the pioneers in the electric cooking and heating industry, died at his home in that city November 26. Death was caused by heart failure, and was very sudden, Mr. Ayer having been at his office earlier the same day. Two years ago he suffered from a severe illness, but had apparently completely recovered his normal health. Mr. Ayer was born in Medford, Mass., in 1854, and received his early education in that city, in the public schools. When 22 years of age he married and with his wife, who was Miss Lillian Cleveland, of Melrose, Mass., went to Mattoon, Ill., removing thence to Indianapolis and later to St. Louis. After 20 years' residence in the Middle States he returned to Malden, later removing to Cambridge. His business career in electrical appliances began in 1896, when he manufactured electrical heating devices in a small building at Cambridge. His associates, who had become discouraged at the slow progress of the industry and the tardiness with which the public took up the devices, left Mr. Ayer to pursue his chosen field alone. By persistence and determination he overcame all obstacles and built up a business which is one of the largest and most successful of the kind in the country. He was a member of the Engineers' Club, Boston, and had been president of the National Electric Light Association. Three daughters survive, besides the widow.

DATES AHEAD.

American Society of Mechanical Engineers. Annual meeting, New York City, December 7-10. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

National Independent Telephone Association; Independent Telephone Association of America. Joint convention, Hotel La Salle, Chicago, December 8-10. Secretaries, F. B. MacKinnon, Washington, D. C., and W. S. Vivian, 19 South La Salle Street, Chicago, Ill.

American Association of Engineers. First annual convention, Hotel La Salle, Chicago, Ill., December 10-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

American Association for the Advancement of Science. Annual meeting, Columbus, O., December 27-31. Secretary, L. O. Howard, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, Wis., January 17-19, 1916. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

With the Electrical Manufacturers

The Robbins & Myers Company, Springfield, Ohio, announces that its San Francisco office, in charge of C. R. Hunt, has moved to 701-702 Rialto Building.

Harry Hubbell, Incorporated, Bridgeport, Conn., has issued circular No. 156 on Hubbell interchangeable attachment plugs and T-slot receptacles. Over 20 different types of these convenient and safe devices are shown. The value of having wall, floor and other receptacles liberally provided in every room is well pointed out, also the advantages obtained by the interchangeable T-slot construction.

The Appleton Electric Company, 212 North Jefferson Street, Chicago, announces the opening of a branch office at 1007 Pine Street, St. Louis, Mo., in charge of R. V. Hawkins. The company has just issued bulletin No. 7-A, which is a supplement to catalog No. 7. This bulletin illustrates and describes interesting additions to the Appleton line of steel Unilets and conduit fittings. Copies will be furnished to those interested upon request.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a number of new leaflets, of which No. 3859, on "Mine Suspensions and Clamps," describes and illustrates a number of trolley fittings adapted for mine work. Motor-generator sets are described in leaflet No. 3742-A; sets from 2 to 200 kilowatt capacity, consisting of squirrel-cage induction motors and direct-current generators, are referred to.

Standard Underground Cable Company, Pittsburgh, Pa., has issued bul-

Digitized by Google

letin No. 540-1 on Standard motor cables for motor cars, motor cycles, motor boats, aeroplanes and stationary gas engines. Included in this line is an assortment of ignition, lighting and starting cables made up in various insulations and groupings to meet all conditions. Cable assemblies in harnessed form complete with terminals are also made up to specifications to fit any car.

King Foundry Company, St. Joseph, Mo., has ready for distribution copies of a neatly illustrated folder on King Monolite standards for the lighting of streets, boulevards and parks by means of series type C Mazda lamps. About a dozen different designs are shown, each equipped with General Electric Novalux units ranging from about 100 to 1,000 candlepower. These ornamental posts are furnished as complete units, ready to set up and connect to the circuit. The folder also gives valuable information regarding Novalux ornamental outdoor lighting units.

The Standard Paint Company, Woolworth Building, New York City, the manufacturer of P. & B. insulating tape, has just placed on the market a rubber friction tape, under its "Imp" brand. The Imp friction tape will not compete with or in any way displace the P. & B. tape, which is especially adapted for work in mines and weather-exposed locations. Imp tape is treated with rubber compound and finished by the friction process. It is suitable for all kinds of wiring work. The company is prepared to make quotations and insure prompt deliveries.

Central Electric Company, 320-326 South Fifth Avenue, Chicago, Ill., has issued a special catalog of electrical appliances particularly suitable for the Christmas trade. Included in this line are such appropriate electrical gifts as toy dynamos and motors, postcard projectors, electric lanterns and bicycle lamps, miniature electric railway sets, toy transformers, portable lanterns and flashlights, junior electric range, electrically lighted clock, Christmas-tree lighting outfits, flatirons, toasters, heating pads and other heating appliances, self-winding clocks, vibrators, sewing-machine motors, vacuum cleaners, washers, also automobile accessories.

The Pelton Water Wheel Company, San Francisco, has issued a bulletin on the utilization of the power of small streams. The many ways in which such power can be successfully used are pointed out and seven different installations are illustrated and briefly described. How to measure the flow of a stream by means of a weir is explained, also how to determine the head available and the length of flume or pipe. With these measurements and a knowledge of what the power is to be used for, the company is enabled to recommend the best type and size of Pelton wheel for the particular case. The outside of the bulletin is illustrated in attractive colors. It is issued in English, Spanish and Portuguese.

Hamilton-Beach Manufacturing Company, Racine, Wis., has ready for distribution a very handsome circular of Christmas suggestions, which portrays the well known electrical devices of the company in a manner that cannot help but appeal to the housewife. The circular is really one large sheet, 26 by 32 inches, so folded that it represents six double pages. Each page is decorated with a border of holly, which gives it a distinct Christmas atmosphere. The "Sew-E-Z" sewing-machine motor, which fits any machine, is given prominence as an admirable gift for the housewife. Illustrations show how it is operated, attached to and removed from the machine. Electric vibrators of four different types, ranging in price from $10 to $25, are shown in suitable carrying cases, which emphasizes the utility and suitability of these devices for Christmas giving. In the same class are hair driers and curling irons, which are also attractively displayed. In addition, the Cyclone shoe drier and the Cyclone drink mixer, two popular specialties of the company, are illustrated and described.

Record of Electrical Patents

Issued by the United States Patent Office, November 23, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,161,021. Automatic Starter for Electric Motors. L. Bradley, Milwaukee, Wis. Shunt magnet controlling resistance governed by series relay.

1,161,025. Railway Car. G. W. Carr, St. Louis, Mo. Gearing of motor.

1,161,035. Signal-Lamp System for Cars. C. C. De Witt, Shrewsbury, Mo. Signal lamps indicate when trolley has jumped wire.

1,161,036. Electric Fuse. L. W. Downes, Providence, R. I. Knife-blade end cap for cartridge fuse.

1,161,046. Electric-Switch Wall Case. M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Improved attaching means.

1,161,048. Telephone System. H. L. Harris, assignor to Garford Mfg. Co., Elyria, O. Exchange switchboard with provision for selecting one of the substation lines as an attendant line.

1,161,068. Time-Controlled Switch. R. Murray, Agenda, Kans. Clock-operated.

1,161,073. Electric Relay. H. A. Parrish, Kalamazoo, Mich., assignor of one-tenth to G. E. Dunbar. Arrangement of magnets, levers and contacts in casing.

1,161,080. Insulator. F. M. Spicer, Quincy, Mass. Body is loose and rotatable on pin; cap is screwed to pin.

1,161,081. Hanger for Trolley Wires. W. C. Starkey and G. H. Bolus, assignors to Ohio Brass Co., Mansfield, O. Catenary hanger of metal strap.

1,161,082. Testing Device. E. S. Stewart and C. D. Stewart, Ottawa, Ill. Portable magneto set for telephone-fault location.

1,161,096. Lamp Holder. H. E. Whitney, assignor to Dover Stamping & Mfg. Co., Portland, Me. Stamped support and contact springs for incandescent lamp in sheet-metal container.

1,161,105. Printing-Telegraph Receiver. C. G. Ashley, assignor to General Engineering & Construction Co., Ltd., Toronto, Can. Electromagnetically operated printing pens.

1,161,118 and 1,161,119. Lighting Fixture. A. C. Einstein, St. Louis, Mo. First patent: semi-indirect with top reflector of pane of ground, corrugated glass. Second patent: has translucent cylindrical body between top ventilating cap and conical reflector.

1,161,126. Selector for Telephone Plants. G. Grabe, assignor to Siemens & Halske A. G., Berlin, Germany. Has electromagnetic escapement with means for preventing overrunning of zero position.

1,161,130. Indicator for Vehicles. L. J. Horan, Detroit, Mich. Direction-indicator comprising electric audible signal and electric illuminated and operated signal arms.

1,161,142. Wireless Communication. C. V. Logwood, assignor to Federal Telegraph Co., Palo Alto, Cal. Receiving system with special resistance-varying device.

1,161,145. Shoe-Polishing Machine. L. Maire, Bonnots Mill, Mo. Motor switch interlocked with clutches driving brushes.

1,161,146. Electric Heating-Pad. N. E. Mann, assignor to Reliance Electric Heating Co., Columbia, Pa. Has thermally controlled resistor.

1,161,150. Combined Bushing and Clamp for Electric Cables. O. Moessner, Philadelphia, Pa. For use in outlet boxes.

1,161,173. Arc-Lamp Electrode. E. J. Watzl, assignor to National Carbon Co., Cleveland, O. Contains chemically united oxides of tungsten, titanium and rare earths.

1,161,175. Attachment for Headlights for Automobiles. E. O. Wheeler, assignor to Springfield Auto Deflector Co., Springfield, O. Light deflector for lamp bulb.

1,161,191. Process of Mounting Objects. F. B. Cook, assignor to Frank B. Cook Co., Chicago, Ill. Manner of forming contacts from strip material and mounting the same.

1,161,192. Mounting Structures for Electrical Conductors. F. B. Cook, assignor to Frank B. Cook Co. Conducting strips and mounting insulations formed in gangs and broken apart.

1,161,193. Process of Making Spring Jacks. F. B. Cook, assignor to Frank B. Cook Co. Manner of assembling component parts.

1,161,194. Process of Making Connecting Plugs. F. B. Cook, assignor to Frank B. Cook Co. Contacts positioned and secured by flowing insulation about them.

1,161,195. Lightning-Arrester. F. B. Corey, Edgewood, Pa. Reactance in series with number of spark gaps neutralized when equal current in each.

1,161,196. Telephone-Exchange System. E. R. Corwin, assignor to Frank B. Cook Co. Arrangement of link connectors.

1,161,214. Telephone-Exchange System. E. E. Hinrichsen, assignor to Western Electric Co., New York, N. Y. Common-battery and magneto telephone lines terminate at local position of board.

1,161,226. Electroplating Apparatus. W. F. Koken and H. J. Richards, St. Louis, Mo. Cathodes travel through solution between groups of anodes.

1,161,233. Starting Switch. S. J. Leveen, assignor to Trio Mfg. Co., Rock Island, Ill. Casing inclosing fused switch cannot be opened except when switch is in "off" position.

1,161,234. Sifting Apparatus. W. Lindsay, Chicago, Ill. Screen vibrated by electromagnet.

1,161,238. X-Ray-Control Device. W. Meyer, Chicago, Ill. Mechanism for resistance control of intensity of ray discharge.

1,161,278. Automatic Circuit-Breaker. A. R. Anderson, Columbus, O. Is automatically reclosed on restoration of normal conditions.

1,161,299. Magnetic Separator. R. M. Folsom, assignor to New England Gas & Coke Co., Reading, Mass. Cylinder has magnetizable member for moving magnetic particles from field.

1,161,320. Electrical Protective Device. A. J. Loguin, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Time-limit circuit-breaker.

1,161,322. Primary Electric Battery. G. A. Lutz, Plainfield, N. J. Battery elements and depolarizer in unitary structure suspended from cover.

1,161,341. Time Stamp. A. A. Radtke, assignor to Electric Time Recorder Co., Chicago, Ill. Movement of time train transmitted to type wheels through electromagnetic setting mechanism.

1,161,349. Electric Governor. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. Electromagnetic device for maintaining uniform speed of driven member.

1,161,351. Magnetic Ore-Separator. S. N. Smith, assignor of one-half to H. W. Hoops, New York, N. Y. Special provision for distributing material in pan beneath magnetic drum carrying endless apron.

1,161,361 and 1,161,362. Electric Switch. A. A. Tirrill, Schenectady, N. Y. First patent: special pull-operated snap switch. Second patent: pull switch with position indicator.

1,161,366. Process of Welding Metals. S. W. Wohlrab, Maple Falls, Wash. Metal

Digitized by Google

particles fed to arc in presence of non-oxidizing gas.

1,161,385. Electric Pump. A. E. Hall and G. H. Fraser, assignors to Automatic Electric Pump Co., New York, N. Y. Pump-driving worm gearing.

1,161,395. Volt-Ampere Meter. P. M. Lincoln, Pittsburgh, Pa. Elements operated by watt and wattless currents, respectively, jointly operate indicator.

1,161,397. Brush-Holder. L. R. Lord, Delagua, Colo. Box and pressure devices for carbon brush.

1,161,398. Storage Battery. J. O. Luthy, San Antonio, Tex., assignor of one-half to Y. Hicks. Electrolyte contains approximately one per cent of silver chloride.

1,161,400. Igniting Device for Explosive Engines. W. J. Martin, Buffalo, N. Y., assignor of one-half to W. McIntyre. Spark plugs of a magazine may successively be brought into operation.

1,161,411. Telephone-Exchange System. L. Polinkowsky, assignor to Western Electric Co. Arrangement of test and driving circuits for selector switch.

1,161,413. Vegetable-Paring Machine. H. Robinson, South Orange, N. J. Mounting and gearing of electric driving motor.

1,161,419. Method of Welding. E. E. Slick, Johnstown, Pa., assignor of one-half to L. L. Knox. Butt-welded edges are upset and extra metal fed between them, the joint remaining thick.

1,161,421. Trolley-Finder. D. P. Solomon, Berkeley, Cal. Normally horizontal finding fingers on harp pulled into upright position by rope.

1,161,425. Alternating - Current Vapor Lamp. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Rectifier has special starting cathode and smoothing reactance for load circuit.

1,161,434. Magneto-Electric Machine. F. Baier, assignor to Swiss Magneto Co., Buffalo, N. Y. Has removable distributor plate and arrangement of brushes therefor.

1,161,441. Table - Actuating Mechanism for Rolling Mills. F. C. Biggert, Jr., assignor to United Engineering & Foundry Co., Pittsburgh, Pa. Motor automatically controlled by position of roll to adjust position of table.

1,161,454. Method of Making Electric-Light Streamers. J. A. Covit, New York, N. Y. Lamp sockets connected along circuit wires at intervals and molded thereto. (See cut.)

1,161,461. Self-Firing Explosive Bomb. J. Dodgson, Seattle, Wash. Buoyant structure releasably held submerged has electromagnet on upper end and timed electric ignition.

1,161,474. Trolley-Wire Clamp. W. D. Hall, Port Huron, Mich. For clamping and suspending trolley wire.

1,161,477. Circuit-Controller. A. J. Horton, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Push-button-operated two-way switch member locked in "off" position or limited to operation with one contact only.

1,161,485. Vapor Electric Device. M. A. E. Leblanc, assignor to Cooper Hewitt Electric Co. Structure of W shape has provision for preventing unequal accumulation of mercury and short-circuits.

1,161,500. Selecting Mechanism. B. F. Merritt, assignor to Western Electric Co. Keyboard selecting equipment.

1,161,520. Quenched Spark Gap. R. Pfund, New York, N. Y. Special structure of spark-gap unit.

1,161,543. Continuous Brake. W. R. Smith, assignor of one-third to R. P. Wilson, and one-third to Consolidated Brake & Engineering Co., Ltd., London, England. Electrically controlled continuous pneumatic brake is applied when current falls below a certain value.

1,161,555. Igniter for Internal-Combustion Engines. J. A. Warren, assignor to Splitdorf Electrical Co., Newark, N. J. Particular structure of movable electrode of make-and-break igniter.

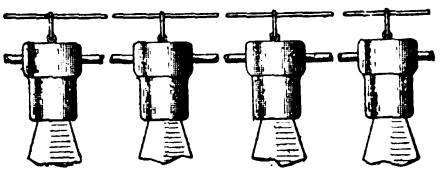
1,161,565. Automatic Train Control. R. G. Whipple, Chicago, Ill. Details of steam and air-brake control in electric block, train-stop system.

1,161,568. Apparatus for Determining the Period of a Pendulum. O. L. Wills, Portland, Ore. Comprises a Geissler tube in circuit with a standard clock.

1,161,575. Prevention of Disturbing Vibration. A. Aichele, assignor to Aktiengesellschaft Brown, Boveri & Cie, Baden, Switzerland. Stator of dynamo machine is elastically supported on foundation.

1,161,576. Liquid Resistance. A. Aichele, assignor to Akt. Ges. Brown, Boveri & Cie. Evaporated liquid is condensed and returned to tank.

1,161,582. Electrical Fitting. W. F. Anklam, assignor to C. M. Hall Lamp Co., Detroit, Mich. Tubular fitting has lamp at one end and plug at other, connection



No. 1,161,454.—Electric-Light Streamer.

being made and broken by axial adjustment of plug.

1,161,585. Electrolytic Production of Sodium Alloys. E. A. Ashcroft, London, England. Molten sodium hydroxide electrolyzed between electrodes of molten heavy metal at 400°C.

1,161,594. Circuit-Closer. J. E. Bishop, Fitzgerald, Ga. Particular structure of spring contacts held open by fuse.

1,161,596. Heating System. E. F. Bliss, assignor to General Electric Co., Schenectady, N. Y. Combination of groups of units of different heat generating capacities having the energy supplied to them respectively reduced by intermitting the current supply.

1,161,602. Overflow Trunking System. C. C. Bradbury, assignor to Western Electric Co. Groups of switches in automatic telephone system have overflow switches making available to each group idle secondary switches of other groups.

1,161,608. Semi-Mechanical Telephone-Exchange System. A. M. Bullard, assignor to Western Electric Co. Party-line system.

1,161,615. Call - Distributing Telephone System. H. P. Clausen, assignor to Western Electric Co. Arrangement of line-finder switches and indicators.

1,161,634. Electric Furnace. A. Dow, Detroit, Mich. Resistor bed in bottom of furnace has current magnetically deflected to its surface.

1,161,639. Loud-Speaking Receiver. H. C. Egerton, assignor to Western Electric Co. Electromagnetic structure for telephones.

1,161,655. Automatic Telephone Exchange. C. L. Goodrum, assignor to Western Electric Co. Interconnection of subscribers' lines to finder switches.

1,161,656. Protective Device. V. E. Goodwin, assignor to General Electric Co. Lightning arrester comprising aluminum-type electrolytic condenser submerged in oil.

1,161,663. Time - Controlled Protective System for Railways. C. Hansel, Cranford, N. J. Arrangement for track crossing in block system.

1,161,667. Electric Heating and Cooking Stove. L. P. Hays, Idaho Springs, Colo. Special provision for air circulation through cylinder containing heater.

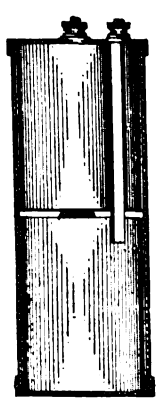
1,161,668. Electric Battery. G. P. Heinrich and J. E. Dunn, assignors to Interstate Electric Novelty Co., New York, N. Y. Superposed dry cells in tubular casing. (See cut.)

1,161,670. High-Tension Converter System. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. Alternating source supplies direct-current work circuit through vapor rectifier with provision against short-circuits.

1,161,681. Car-Axle Lighting. R. C. Hull and J. L. Woodbridge, assignors to Electric Storage Battery Co., Philadelphia, Pa Voltage regulated in three-pole, three brush generator.

1,161,683. Time-Controlled Shutter-Releasing Means. C. Hutter, assignor to General Electric Co. Time train controls magnet operating shutter detent.

1,161,708. Alarm Apparatus. W. McCleary, Hammond, Ind. Oil-sealed contact chamber.



No. 1,161,668.—Three-Volt Dry Battery.

1,161,716. Electric Switch. E. B. Merriam, assignor to General Electric Co. Venting arrangement for oil switch.

1,161,723. Protective Device for Cables. W. Pfannkuch, assignor to General Electric Co. Multiple conductors divided into insulated groups have low potential difference impressed; current flow indicates insulation breakdown.

1,161,734. Art of Electric Telescopy. B. Rosing, Petrograd, Russia. For transmitting luminous pictures.

1,161,746. Liquid Rheostat. G. Squire, assignor to General Electric Co. Circuit made through adjustable liquid stream.

1,161,748. Electric Heat-Storage System. W. Stanley, assignor to General Electric Co. Stove has highly heat-insulated storage mass for accumulating heat from electric energy supplied at low rate.

1,161,750. Apparatus for the Treatment of Fluids With Coagulants. A. P. Strohmenger, assignor to Ester & Co., Ltd., London, England. Fluid passed through cathode tube containing anode rod of aluminum.

1,161,752. Electric Switch. G. B. Thomas, assignor to Perkins Electric Switch Mfg. Co., Bridgeport, Conn. Rotary switch has auxiliary snap blade.

1,161,762. Holder for Telephones and Other Articles. C. H. Bartlett, Cambridge, Mass. Adjustable clamp adapted to grip telephone base.

1,161,783. Telephone Trunk - Release System. J. L. E. Meyer, assignor to Automatic Electric Co., Chicago, Ill. In automatic system, relative connections of release magnet for trunking system line switch, release relay and high-resistance supervisory relay.

1,161,793. Egg-Tester. F. W. Schroeder, Bemidji, Minn. Lamp lighted by placing of egg tray in position.

1,161,801. Vapor Electric Apparatus. E. E. Darmois and M. A. E. Leblanc, Paris, France. Light path in mercury-vapor lamp equally constricted near each electrode.

1,161,819. Magnetic Controlling Device. H. Grob, Zurich, Switzerland. Full movement of magnetically attracted member assured after initial movement.

1,161,820. High-Tension Converter System. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. Has anode-protecting band about throat connecting anode and main chambers of mercury-vapor rectifier.

1,161,822. Terminal Connection for Electric Lamps. F. G. Keyes, assignor to Cooper Hewitt Electric Co. Terminal junctions for tungsten filament.

1,161,823. Terminal Connection for Lamp-Filaments. F. G. Keyes, assignor to Cooper Hewitt Electric Co. For connecting metal filament with lead.

Reissue 14,015. Condenser Arrangement. A. R. Eullock, assignor to H. C. Lee, Los Angeles, Cal. Original No. 1,048,034, dated Dec. 24, 1912. In apparatus for converting alternating to direct current.

Reissue 14,020. Electric Connector. J. C. Stearns, Worcester, Mass. Original No. 1,096,138, dated May 12, 1914. For coupling plug with lamp base.

Patents Expired.

The following United States electrical patents expired on November 29, 1915:

614,819. Process of and Apparatus for Covering Wire with Asbestos. E. Albasini, Turin, Italy.

614,839. Method of Forming Electrical Connections. W. B. Cleveland, Cleveland, O.

614,875. Trolley for Electric Cars. H. W. Libbey, Boston, Mass.

614,882. Junction Box. T. J. Murphy, New York, N. Y.

614,914. Mechanism for Controlling Electric Circuits. G. H. Whittingham, Baltimore, Md.

614,930. Process of and Apparatus for Separating Metals from Ores by Electricity. G. D. Burton, Boston, Mass.

614,946. Telephonic Microphone. W. D. Ghorkey, Philadelphia, Pa.

614,964. Dynamo-Electric Machinery. J. S. Lewis and F. J. Howitt, Manchester, England.

614,982. Automatic Time Electric-Circuit Switch. F. Richard, Boston, Mass.

614,995. Underground Conduit for Electrical Conductors. C. S. Sewall, Chicago, Ill.

615,057. Electromechanical Striking Mechanism. C. E. Beach and H. W. Doughty, Binghamton, N. Y.

615,136. Electric Metal-Heating Process. G. D. Burton, Boston, Mass.

615,172. Primary Battery. H. K. Hess, Philadelphia, Pa.

615,186. Electric Safety Device. J. F. Kelly, Pittsfield, Mass.

615,209. Electrical Hinge Contact. C. Baxter, New York, N. Y.

Digitized by Google

Electric Vehicle Section

ELECTRIC VEHICLES IN MUNICIPAL SERVICE.

Data on Economy Effected in Numerous Installations.

Aside from the fact that there is a very extensive and profitable field for the sale of electric vehicles for municipal service, central-station companies and manufacturers could well devote greater attention to this class of prospects, if for no other reason than that the use of electrics by fire departments, police departments, street-cleaning departments, etc., would tend to place the electric before the public in a very favorable light. It is well recognized that every vehicle on the streets is an advertisement. This advertising value would be very materially enhanced were it shown that electric vehicles are used in services where absolute reliability is of the greatest importance, as, for instance, in fire-department or police work.

Some interesting data on this subject were presented in a paper recently by A. J. Slade and R. D. Dumont, it being shown that in practically all city work where haulage or transportation is required, electric vehicles can be used with attendant economy in operation and maintenance.

Fire-Department Service.

No municipal service presents such a complicated set of problems in mechanical haulage as does the fire department, and yet it is the department which has been motorized, not only in large cities but in small villages as well, for a longer time and to a far greater extent than any other. All conceivable types and combinations of types of motive power and application have been used, most of them with success, and one system can not broadly claim superior advantages over another in view of the widely divergent service requirements. One community has a fire district covering many square miles; another is limited to a small area. One has excessive grades; another is comparatively level. One has heavy winter snow falls; another has a semi-tropical climate. One has high-pressure pumping stations for its fire mains; another has not. One has many sky scrapers, districts where hazardous manufactures are carried on, densely populated tenement districts of non-fireproof character; another has entirely different types of business and residential sections.

These variations from any standard which one may choose to assume, as may be done in the case of commercial merchandise transportation problems, necessitate the wide variations in type of apparatus and motive power which we actually find in use.

To intelligently determine on a motor-propelled fire equipment, the existing local conditions must be investigated and analyzed, the existing horse-drawn equipment must be considered with reference to its utilization, and the organization of the department must be studied in its relation to the operation of the mechanical apparatus.

Among the varying conditions, instances are found where electric equipment has been installed and is giving satisfactory and economical service, notably in Philadelphia and Baltimore. Some recent figures furnished by the Philadelphia Fire Department on engine No. 20, both horse operated and electrically operated, are as follows:

HORSE-DRAWN APPARATUS.
Engine No. 20, Cost for 2 Years.

Two horses	$ 400.00
Forage	553.60
Shoeing	240.00
Depreciation	940.00
Repairs	600.00
Harness	96.00
Total	$2,829.60
Per year	1,414.80

MOTOR-DRIVEN APPARATUS.
Same Engine, Electrically Motor-Driven
Maintenance for 2 Years.

Current	$1,200.00
Repairs	480.00
Depreciation	922.40
Total	$2,602.40
Per year	1,301.20

The actual saving in cost of electric over horse operation appears to be only about 8 per cent, but its speed is nearly 300 per cent greater, a feature of vital importance in fire apparatus.

Street Cleaning and Refuse Collection.

The use of motor vehicles and especially electrics in street-cleaning operations has not yet become general, in fact may be considered to be in an experimental stage. The usual mechanical methods employed for cleaning streets are sweeping with rotary broom behind a water sprinkler to lay the dust; scrubbing with a rotary rubber squeegee in connection with a liberal water supply from a sprinkling tank which is a component part of the apparatus; flushing at 30 to 40 pounds water pressure from a tank supply, the nozzle pressure being obtained by a power-driven pump, though in some instances a tank pressure is obtained when filling from the hydrants if the pressure in the water mains is sufficient It is with this latter system that the limited number of electric street cleaners in North America have been equipped, and Canada probably has as many such vehicles as the United States. Few figures of operating cost are available, but it is obvious that as the duty of these electric vehicles is merely to transport gradually diminishing loads of water, the economy is as great as that of any merchandise carrying electric for similar mileages. The time of filling is practically the same as discharging, so that at 10 miles per hour during an 8-hour day, a battery capacity of 40 miles per charge is all that is required. The use of a power-driven pump would require a duplicate battery equipment, with means for quick interchange, as a discharge of 300 gallons per minute at 40 pounds would require about 10 horsepower, allowing 50 per cent combined efficiency of motor and pump, or 30 kilowatt-hours extra battery capacity. With adequate facilities for recharging, boosting and interchanging batteries of various capacities so that weather, grade and pavement conditions can be compensated for, it is not at all impossible that certain municipalities might find such a system very advantageous not only for flushing, but for sweeping and scrubbing, as well as for other operations.

Robert Mackay, superintendent of Electric Light, City of Calgary, Canada, supplies the following figures on trucks in municipal service in that city:

Capacity tons	1	1	3	3	5	5	5	1
Cost to date	1933.03	1955.85	2468.76	2417.52	2997.29	3033.54	2564.58	885.59
Average per month	214.78	217.32	274.31	268.61	233.03	337.06	284.95	177.12
Total miles	7,176	7,061	5,080	5,375	4,581	5,855	5,208	1,475
Nos. in service	9	9	9	9	9	9	9	9
Cost per mile	0.2692	0.2769	0.4860	0.4516	0.6542	0.5011	0.4924	0.6004

It will be observed that the mileage covered by these vehicles is very low, being from one-third to one-half of their mileage capacity, and in consequence the cost per mile is high. Garage expense, drivers' wages, estimated depreciation (figured at 20 per cent), and similar fixed charges and

Digitized by Google

distributed over too short a mileage to show marked economy. Nevertheless, Mr. Mackay states:

"Two 5-ton electrics in street-cleaning department effect a daily saving of $24 sprinkling and flushing during summer months. The sprinklers are operated in day and night shifts, of 9 hours sprinkling by day and 8 hours flushing by night at a saving of $24 per day of 17 hours over horse-drawn machinery. During winter months the tanks are removed and replaced by boxes which will hold six cubic yards of refuse.

"Calgary has 1,300,000 square yards of pavement, covering 54 miles of paved streets. The full equipment for keeping this clean consists of four horse flushers, four rotary brooms, two squeegees, five horse shrinkling carts and two 5-ton electric trucks. In a test the two trucks used by the street cleaning department averaged 38 miles each per day of 9 hours' sprinkling, and 17 miles each per night of 8 hours' flushing. The work cost $1.30 per truck for energy during the 17 hours."

Prominent phases of the problem to be investigated and analyzed include:

(1) Method of final disposal.

(2) Traffic conditions and the limitations on design effected thereby.

(3) Living conditions and effect of characteristics of inhabitants on motor vehicle design.

(4) Effect of variation in weather conditions.

(5) Seasonal variations in quantities of different classes of refuse.

(6) Type of street pavements and variations in grades.

(7) Functions required of the equipment.

(a) Refuse collection and transportation.

(b) Cleaning streets.

(c) Snow work (plowing, sweeping or carting).

An investigation along these lines in one of the districts in New York resulted in the design of a tractor trailer system, now being installed in service, by which house-to-house collection and transportation to point of disposal will be performed by day and various street cleaning operations at night. Thus the tractors will be operated on two shifts with different types of trailers and the saving over present methods will be substantial. While the conditions in the district in question and in other districts to which the system may later be extended led to the adoption of gas-electric tractors, it is highly probable that in many municipalities the storage-battery electric would prove to be the solution, especially with a battery interchange system.

As comparing the relative economy of electric and gasoline operation on transfer work, the following data have been obtained from the New York Street Cleaning Department on a 5-ton electric tractor and a 5-ton gasoline tractor, and estimates of operating costs of both machines have been made, based on this information:

Five-Ton Electric Tractor, and Five-Ton Gasoline Tractor, Department of Street Cleaning, City of New York.

The electric operates from stable at Flushing and Kent Avenues, Brooklyn, to Utica Avenue and Pacific Street, Brooklyn. Round trip, 7 miles; time, 1 hour, 10 minutes. Pulls trailer carrying from 14,400 pounds to 18,800 pounds. Repairs to electric tractor since beginning of operation, none. Renewals only on tires. Trailer has had several minor repairs. Makes five trips per day. Load equals six to eight carts. Gasoline tractor from same stable, makes trip with same load in 1 hour, 5 minutes. Breaks down frequently. Below is an estimated comparison of operating figure:

ELECTRIC.		GASOLINE.	
Depreciation at 10 per cent	$ 450.00	Depreciation at 20 per cent	$ 960.00
Interest at 6 per cent	270.00	Interest at 6 per cent	288.00
Battery renewals and repairs	399.00	Maintenance	420.00
Mechanical parts upkeep	189.00	Tires	656.25
Tire renewals and repairs	336.00	Gasoline	471.00
Electricity at 0.05 perkilowatt-hour	543.00	Oil and grease	131.25
Oil, water, etc	40.00		
Total cost per year	$2,227.00	Total cost per year	$2,926.50
Total mileage annually	10,500.0	Total mileage annually	10,500.0
Cost per ton mile	$0.0565	Cost per ton mile	$0.0743

A saving of approximately 40 per cent per ton mile.

Police Patrol.

The city of New York has in service one electric patrol wagon and a number of gasoline patrol wagons. The police department, through E. V. O'Daniel, fourth deputy commissioner, furnished the following figures and comments:

COST OF OPERATING ELECTRIC PATROL WAGON NO. 18.

Year	1913	1914	1915—1st half	Totals
Batteries	$325.00	$128.10	$155.45	$608.55
Repairs	126.06	465.03	43.38	634.47
Oil and grease	4.00	0.20	4.60	8.80
Sundries	1.33	7.17	6.94	15.44
Tires	119.70	40.09	.....	159.79
Mileage	11,136	11,742	6,667	29,545

Cost of current, 6 cents per kilowatt-hour. Total, $36.42.

Distance covered in this period, 1,223 miles.

The average cost per mile is $0.0871. This is on the assumption that the electrical cost per mile was standard at $0.0298.

"In 1914 the car was completely overhauled. During the whole period, the repair items have been larger than would be the case with a car of more modern construction. This particular car has been in use about eight years.

"The batteries are charged at the Twenty-third Precinct, where our electric current rate is six cents per kilowatt-hour. Although saving could be effected by having the batteries charged at a station where the rate is lower, we cannot arrange to do this well on account of taking the car away from the district which it covers."

Amount of current used earns a 5-cent rate. The average cost per mile will therefore be $0.0822.

Cost of operation of gasoline motor patrol wagons, based upon cost figures for three cars, for 1 year, from June 30, 1914, to June 30, 1915:

3,049 Gallons gasoline	$ 367.84
154 Gallons oils	34.32
178 Pounds grease	18.49
18 Casings	527.40
11 Tubes, inner	68.81
Operation	$1,016.86
Sundries	57.89
Repairs	312.64
	$ 370.53
Mileage	14,984
Cost per mile	$0.0923

Age of cars, 2 years.
Comparison, gasoline car $0.0923 per mile
Comparison, electric car 0.0822
Saving of electric 0.01 per mile or 11 per cent.

On the gasoline machines, Commissioner O'Daniel furnishes the above figures, with the information that these figures represent an average, based upon the data for three cars of the same type. One of the cars had a general overhauling during the year, so that the repair item represents what the normal yearly cost of gasoline cars would be.

Electric Vehicles for Street Flushing.

The trend in municipal development towards greater efficiency and economy has spread to the transportation departments, and has resulted in numerous installations of motor-driven fire apparatus, police patrols and ambulances and other motor-driven vehicles for general haulage work. The motor-driven street flusher, which combines the functions of a sprinkler and sweeper, is a newer development, but because of its many advantages is rapidly gaining in favor.

The accompanying illustrations show two new types of electrically driven flushers manufactured by the General Motors Truck Company. As this company manufacturers both gasoline and electric machines and as the tanks and flushing equipment can be mounted on either chassis, the advantages which it claims for the electric are of particular significance.

An electric chassis is simpler in construction, simpler in operation, and simpler to maintain than a gasoline chassis.

Digitized by Google

Electric Truck "Prosperity"

The first practical gasoline automobile was built about 1886—the first real Electric truck 15 years later. Neither had much of a great demand success until 1909 or, say, 7 years ago. It takes time to introduce things so revolutionary.

The great bulk of the Electric trucks of the world have been built in the past *five* years. Each good Electric sold eventually sells two more, so production will increase rapidly once a certain distribution is reached.

Electric Truck "Prosperity" is here, already, for if you discount everything else, G. V. *reorders* alone would keep a big plant running. In addition there are thousands of business men who are being converted to the economic side of Electric trucking. Others are installing Electric trucks because this is in line with the entire electrification of their plant or store. Don't forget that the future of the Electric truck is limited only by the future of Electricity itself. The business man who claims that the Commercial Electric is "impractical", "no good", "needs a nurse" and so on, very frequently gets a short arm jolt when his competitor installs Electric Delivery.

G. V. Electrics have demonstrated over 10 years' life in hundreds of cases. They have covered as high as 21,000 miles each per year. They are efficient in hilly cities like Pittsburgh and Cincinnati. They are efficient in Winnipeg and Manila—two climatic extremes. Every so called weak point of the Electric has been given the lie in actual performance—*somewhere.*

Get the facts—you doubters—get the facts! *Specific adaptability* is all that is needed to place the Electric (the G. V. at least) absolutely at the head of efficient trucking. Let it be our pleasure to show you Why. Our new catalogue awaits your address.

General Vehicle Company, Inc.

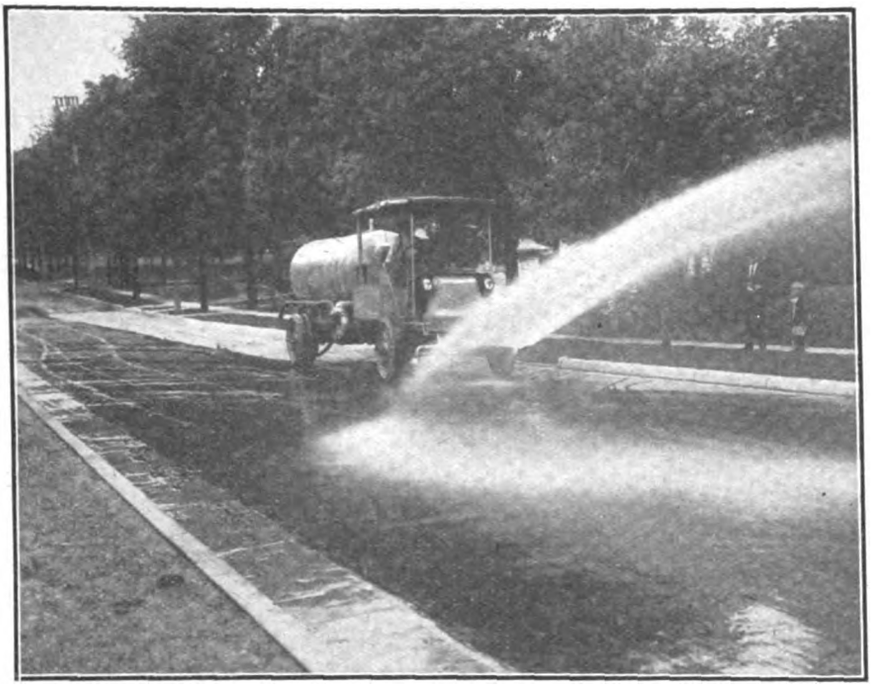
Long Island City, N.Y.

New York, Chicago, Boston, Philadelphia

Copyright, 1915

2522

Digitized by Google



Electric Flusher Throwing Stream of Water.

It has no gasoline motor with its multiplicity of rotating and reciprocating parts and auxiliary appliances, no clutch, and no transmission—the three units which cause 90 per cent of all gasoline-car troubles.

Under ordinary conditions it can be operated for 75 to 80 per cent of the cost of operating a gasoline truck of the same size; and where conditions are exceptionally favorable, this percentage can be substantially reduced.

The average unskilled laborer can be taught to operate an electric flusher with one day's instruction. No high-priced, temperamental, skilled mechanic required.

Its simplicity of construction and operation make it more reliable and efficient in its work than a gasoline flusher.

The history of electrical development during the past twenty-five years shows a constant reduction in the cost of electrical current. Who can say what gasoline will cost two years, or six months hence, or guarantee that it will not advance instead of decline?

The conditions under which a street flusher works are ideal for highly efficient and economical electric truck operation. As a flusher, it always works on paved streets. As a sprinkler, it always works on dry streets.

Its total daily travel is usually well within the capacity of the modern storage battery. In emergencies, "boosting" charges at convenient intervals will greatly increase its mileage.

It can be backed around and otherwise quickly manipulated for flushing street intersections (which is very important) without a slow and noisy shifting of clutch and transmission gears.

With its five forward speeds it can be speeded up or slowed down to deliver the right volume and pressure of water for the removal of sticky or heavy objects without the shifting of clutch and transmission gears.

The most effective flushing can be done at a speed not exceeding six miles per hour. To operate a gasoline flusher at that speed requires constant low-gear work, which greatly increases gasoline and oil consumption and materially shortens the life of motor, clutch and transmission. On the contrary, the electric motor operates with a lower current consumption at slow speeds and equal efficiency at all speeds.

ELECTRICAL VEHICLES PROVE GOOD HILL CLIMBERS IN DEPARTMENT-STORE DELIVERY SERVICE.

Low Cost Per Package Delivered.

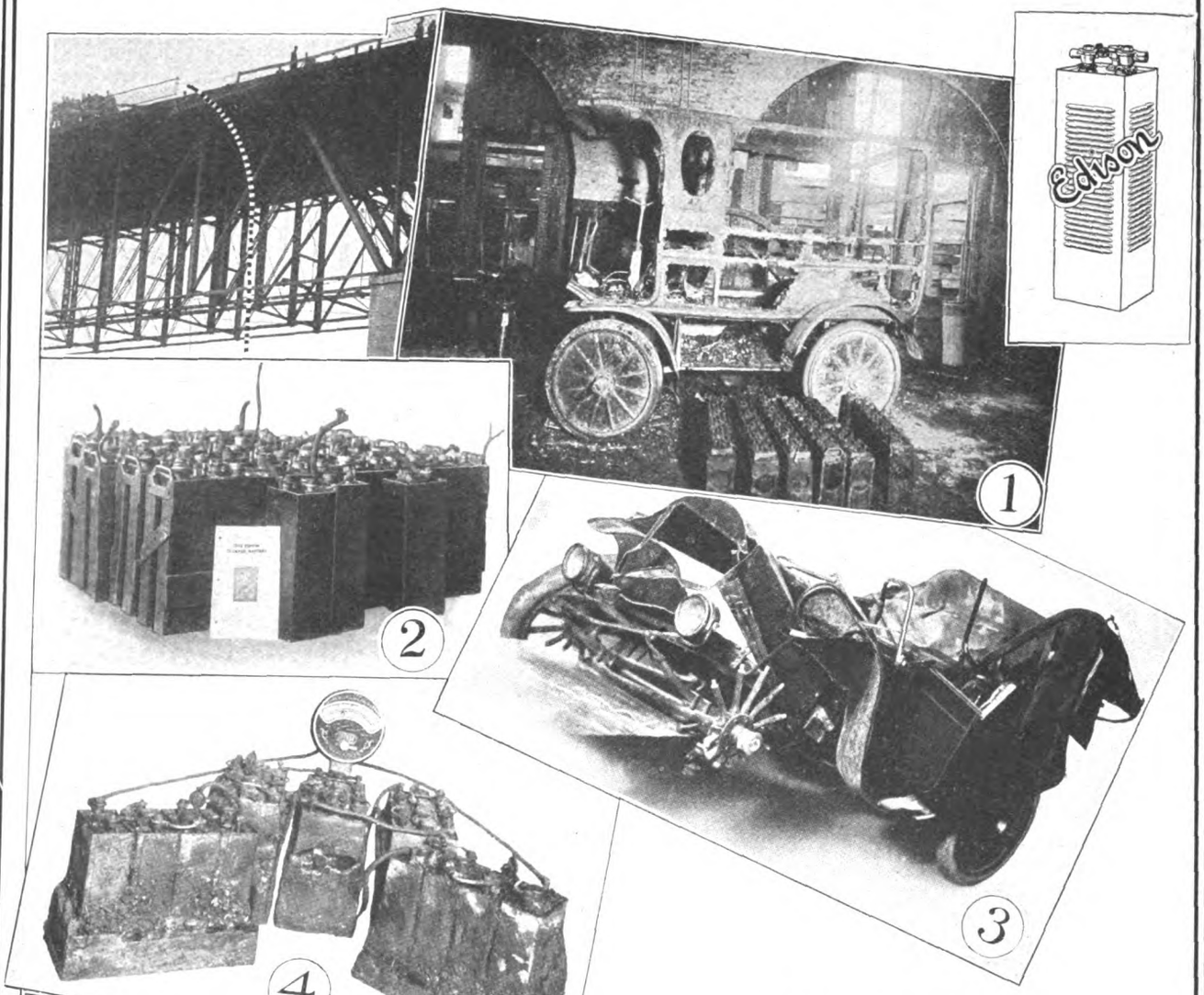
By A. Jackson Marshall.

When a change is made in any delivery system from the horse-driven vehicle to the motorized vehicle, there is not only a revolution in the actual work of delivery, but entirely new standard and general methods of handling and transporting goods are established. To successfully operate a motorized fleet of delivery wagons the entire situation and its relations to all other parts of the business must be thoroughly studied and established on an engineering basis. The Electric Vehicle Association of America, which has been making a special study of delivery problems for some time past, has been fortunate in securing the testimony of a man who has been unusually successful in operating a fleet of electric delivery wagons. This very resourceful operator is A. N. Stanton, superintendent of the delivery department of Meier & Frank Company, a large department store in Portland, Ore. His intelligent handling of the delivery problem and successful operation of electrical equipment in a city noted for its steep hills, goes far to prove the feasibility of the electric truck for delivery service under conditions usually thought by the uninitiated to be prohibitive for the electric. Mr. Stanton's success has been due to his persistent and careful study of the direct bearing which electric delivery service has upon every phase of the business—new

Electric Street Flusher in Action.

Digitized by Google

Remarkable Ruggedness of the Edison Battery



A few pictures of
extraordinary service to prove that

Edison Storage Batteries

require no repairs in
ordinary service

1. **FIRE BURNED** the trays but only two cells were beyond repair after a fire of the Cambridge Electric Light Co. Rubber parts replaced in recanning made the Edison Battery as good as new.

2. **CYCLONE WRECKED** the Omaha garage containing the Detroit roadster (3) carrying this Edison Battery. Buried under tons of brick, jumpers twisted, short-circuited and burned off but every cell above rated capacity after being dug out.

4. **THE SURVIVOR** of a fire in the New York Yacht & Engine Co.'s shipyard. The boat was totally destroyed, leaving these Edison cells on the wreckage. The charred insulation permitted a test: Voltage O.K. and a No. 14 wire made red hot.

5. **ONE HUNDRED FOOT DROP** of a Purity Baking Co.'s electric delivery wagon in St. Paul. Before any repairs were made on the Edison Battery every cell was found to be well above rated capacity.

Write for Bulletin 500 on Commercial Vehicle Batteries

Edison Storage Battery Company, Main Office and Factory **Orange, N. J.**

Distributors in New York Boston Chicago Detroit Washington San Francisco Los Angeles Portland, Ore. Seattle

Digitized by Google

methods of packing, receiving, storing, handling, shipping and discharging merchandise.

That electric vehicles have been chosen as the most efficient method of delivery by such an important company as Meier & Frank, and are giving perfect service in what is probably one of the hilliest cities in the world is a high tribute to the ability of the electric which is not always given due credit for its remarkably good hill-climbing qualities.

Particular attention is directed to Mr. Stanton's illuminating remarks relative to the multiplicity of motions required in the operation of the complicated gasoline machine. It is extremely doubtful if the lay mind can conceive of the great and continuous strain imposed on a gasoline truck operator in frequent-stop service or when operating in city traffic. Even an approximation of this drain on human energy is sufficent to realize the grave danger to which life and property are subjected in the operation of thousands of gasoline vehicles whose operators have well nigh reached the exhaustion point near the end of a day's arduous duties. The physical and mental strain on gasoline truck operators dims the mind's alertness and destroys the agility necessary for instant decision and action in congested city traffic, and it is likely that we may not expect any very great improvement in existing traffic conditions until the more general introduction of the simple, safe and sane electric vehicle takes place.

Just one more thought before we proceed with Mr. Stanton's admirable article, and that is the highly successful operation of electric vehicles in hilly cities. There is no question but that in certain quarters the impression has prevailed that the electric would not negotiate hills. Nothing could be further removed from fact. Not only will electric vehicles operate in a thoroughly satisfactory manner in hilly districts, but they will probably travel up grades which the average gasoline car would not attempt.

Possibly the fact that the average gasoline car in order to get up a hill must race its motor and attack the grade with a flying start maintaining an excessive speed, in order to reach the top, gives some the impression that the gasoline car is better than electric. However, it must be realized that the electric, if it were required, could take hills as relatively fast as does the gasoline car with its strain on the mechanism and woeful waste of energy. But the electric vehicle's action on a hill follows the practice of all natural locomotions. When arriving on a grade either a greater amount of energy has to be expended to maintain the pace pursued on the level or the speed must be reduced in proportion to the grade without using a disproportionate amount of energy. There are grades which many gasoline cars could not negotiate without a so-called flying start, although on these hills the average electric will start from a stationary position and will furthermore stop and even back and then continue up the hill at the will of the operator. Merchants, and especially those who drive pleasure cars—should get this fact firmly fixed in their mind that the driving of a pleasure car, even at a very high cost per mile is chargeable to pleasure and therefore not subject to the scrutiny directed toward commercial transportation. Furthermore, it should be understood that a pleasure car is not a truck and the same fundamental principles will not apply.

The following interesting facts are quoted from an interview with Mr. Stanton and should prove very valuable to those interested in house-to-house delivery:

"Our interest in the matter of electric cars dates back to December, 1909, at which time we made a comparative test between a gas and an electric car in the delivery service, the entire motive power of our delivery at that time being horses.

"During this month of December we ran both the gas and electric cars as hard as possible, the cars being driven to their limit, with the idea of ascertaining which would be better for our purpose in the delivery service. After a test covering three weeks, we found upon figuring over the cost of operation of both cars that the electric was 0.7 of a cent per package cheaper to operate than the gas car and that the electric had delivered practically as many packages as the gas car.

"This matter was then laid before Sigmund Frank, who became much interested and who was the deciding factor in the selection and purchase of an electric car at that time. I can recall his assertion that there was more than one reason for his adoption of the electric car and that was the fact that there would be very little inducement for the driver to joy ride, whereas in his opinion, there would be considerable temptation of this kind with the gas car.

"On March 23, 1910, following the test mentioned, we purchased our first electric car, which was a single motor vehicle and which has given very satisfactory service. Shortly after the purchase of this car, which was of 800-pounds capacity, we purchased three more of 1,500-pounds capacity, these being equipped with double motors. Following these three 1,500-pound cars we purchased a one and two-ton truck of the same make, the latter being for the furniture delivery. From the operation of these six cars we concluded that the single-motor car suited our needs better than the double-motor car for many reasons.

"We then decided to build some cars in Portland, after our own ideas, with the result that a certain company built for us four one-ton delivery cars and one two-ton furniture car. The first of these cars was delivered to us in September, 1911, and is yet in perfect running order and has given the utmost satisfaction in service, being very economical to operate and very low in upkeep cost.

"One of the earliest records made by this car was on September 30, 1911, at which time the car made 157 stops in 195 minutes and ran 14.5 miles from the time it left the garage until its return. Later in November of the same year we took out this car with 340 stops, covering a distance of 37.5 miles in one day. This was the star performance for an electric car in our service up to that time, but a later record eclipsed this, being 740 stops, covering 55 miles, which record we offer as a challenge to any department store in the United States.

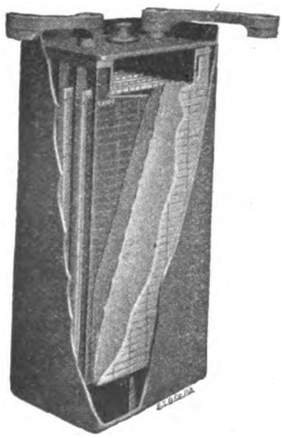
"We had then in our service up to the beginning of 1912, 11 electric cars, which was our entire equipment of motor vehicles. In June, 1912, we purchased four gas trucks, being the first gas cars operated in our delivery service, and after operating these cars for some months we again turned to the electric, ordering four 3,000-pound cars, all of which we put in service the early part of 1913. All of the later electric cars were equipped with nickel-iron batteries as against lead batteries in the first cars and although there has been a great deal of argument, pro and con, regarding the cost of operating the lead as against the nickel-iron, we find that there is, so far as the charging cost is concerned, practically no difference between them, but when steadiness of service is taken into consideration, the nickel-iron is more reliable. I will explain this by saying that the original radius of mileage given out by the nickel-iron is maintained much more uniformly than is the original radius of mileage obtained from the lead.

"It may seem a very small thing to consider the number of motions made by a driver in operating his car during the day's work, but when you stop to consider that the starting and stopping of a gas car requires 12 motions by the driver and the starting and stopping of an electric car but five motions, a difference of seven motions, and that during the busy day when 300 stops are made, that it requires 2,100 more motions on the part of the driver of a gasoline car than of an electric, you

Digitized by Google

Here Are The ELECTRIC VEHICLE MAKERS Who Use The "Exide" Batteries

"Exide" "Hycap-Exide" "Thin-Exide" "Ironclad-Exide"



"Exide" Cell cut away to show construction

AMERICAN ELECTRIC CAR CO., Saginaw, Mich.
(Includes Argo, Broc and Borland "Electrics")

ANDOVER MOTOR VEHICLE CO., Andover, Mass.

ATLANTIC ELECTRIC VEHICLE CO., New York, N. Y.

THE BAKER R & L CO., Cleveland, Ohio.

COMMERCIAL TRUCK CO., Philadelphia, Pa.

EMPIRE ELECTRIC VEHICLE CO., Owego, N. Y.

GENERAL MOTORS TRUCK CO., Pontiac, Mich.

GENERAL VEHICLE CO., Long Island City, N. Y.

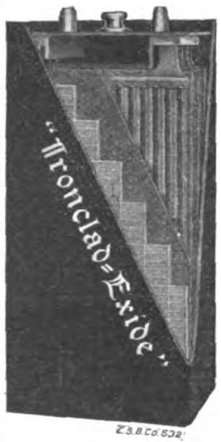
KENTUCKY WAGON MANUFACTURING CO., Louisville, Ky.

OHIO ELECTRIC CAR CO., Toledo, Ohio.

WALKER VEHICLE CO., Chicago, Ill.
(Includes Chicago Electric Pleasure Cars and Walker Electric Trucks)

THE WAVERLEY CO., Indianapolis, Ind.

WOODS MOTOR VEHICLE CO., Chicago, Ill.



"Ironclad-Exide" Cell cut away to show construction

THE ELECTRIC STORAGE BATTERY CO.

Manufacturer of
The "Chloride Accumulator", The "Tudor Accumulator"
The "Exide", "Hycap-Exide", "Thin-Exide" and "Ironclad-Exide" Batteries

New York Boston Chicago Washington **PHILADELPHIA, PA.** Denver San Francisco Seattle St. Louis
Cleveland Atlanta Pittsburgh Detroit **1888 1915** Rochester Los Angeles Toronto

Digitized by Google

will see that this is no small consideration. With even a slight motion of the body multiplied so many times, and added to the driver's other responsibilities, it is certainly a matter to be reckoned with and any of the drivers will confirm this.

"We met with considerable opposition among the drivers in our early purchase of electric cars, as it seemed to them that an electric car must necessarily be a cumbersome thing as well as tiresome to operate, but after operating both the gas and electric cars for a considerable time, the drivers will tell you the electric car is easier to drive, both from a physical as well as a nervous standpoint.

"The consideration of upkeep is a very interesting item. For the year 1914 we find that the upkeep cost per mile for gas cars was 3.62 cents; for the electric cars, 2.57 cents, a difference of 1.05 cents in favor of electric cars. Considering this matter per mile does not show in the aggregate, very favorably for the electric car as our gas cars traveled 134,614 miles as against the electric cars 90,180 miles, a difference in favor of the gas cars of 44,334 miles, but when money expended is considered, we find that $2,551.09 more was expended on a like number of gas cars than was expended on the electric cars. This is equivalent to more than 100 per cent in favor of electric cars in upkeep cost.

"In the matter of speed, all I need say in this regard is that the electric car holds the record for the greatest work ever done in one day in our delivery—namely 740 packages covering a distance of 55 miles, all this without an error. Nor would it have made any difference in this day's work had the car been capable of making 30 miles an hour for there was no opportunity to use such speed, the ability of the car to make a quick stop and start being the prime consideration and in this the electric car excels. In analyzing the routes I have not been able to list the stops by entering on the analysis sheets the number of the stops, number of packages delivered at the stop, the street address and mileage as quickly as the deliveries were made for they were frequently made in 30 seconds or less, and although everything was ruled and in readiness for the work, I was very frequently holding the driver back.

"We often hear the remark 'surely you must yield the palm to the gas car in hill climbing,' but we refer to our records for reply and at least take the edge off the gas car enthusiast by showing that every day and often three times a day we climb the following gradients (quoting from our records in percentages) 5, 9, 11, 15, 17 and 20. And, to quote again from our records:

"On 5 per cent grades our meters showed we were using 65 volts and a 75-ampere draw.

On 9 per cent grades 62 volts and 80 amperes.
On 11 per cent grades 55 volts and 125 amperes.
On 15 per cent grades 43 volts and 132 amperes.
On 16 per cent grades 43 volts and 140 amperes.
On 17 per cent grades 42 volts and 145 amperes.
On 20 per cent grades 42 volts and 170 amperes.

"The normal voltage of this motor is 60 and amperage 40 at 1,200 revolutions per minute and you can see what this outfit is doing year after year without complaint and partially without expense to its owners."

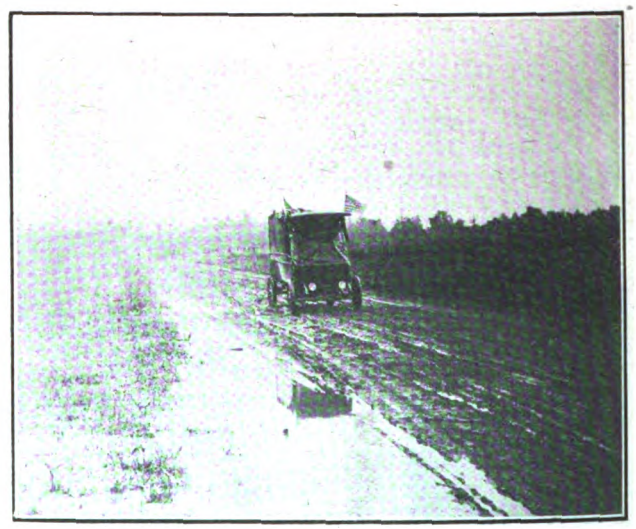
Plans for Boston Motor Show.

The Boston Auto Show, at which many electric vehicles are shown annually, will be held March 4 to 11 at Mechanics Building, Huntington Avenue. The exhibition of pleasure cars and trucks will be combined, as was the case at the last show. Boston's exhibition has the reputation of being the best "selling" show in the country, and the number of electrics contracted for in former years has been large.

The automobile industry in New England is enjoying increasing prosperity, especially in the motor truck branch. The coming exhibition in Boston will mark the greatest forward stride that the manufacture of commercial motor vehicles has taken since this type of transportation was developed. It is expected that a number of new makes will be shown for the first time.

The Ward Electric Cross-Country Trip.

The two accompanying illustrations show typical road conditions which had to be overcome by the Ward electric delivery wagon in its notable run from New York City to Cleveland, O., last October. Starting from New York on October 6, good roads were traversed until Utica, N. Y., was reached. From this point west, almost to Cleveland, much road-construction work was underway, and as it rained almost continuously during the run the roads were all but impassable. The fact that the Ward covered the distance of 733.7 miles at an average speed of eight miles per hour, in spite of poor road conditions, speaks well for the machine.



Two Views of Ward Electric Enroute from New York to Cleveland.

On the entire trip only 23 charges of battery were [illegible] current consumption [illegible] pere-hours.

The value of [illegible] of the United Stat[illegible] to the United S[illegible] vey, was $2,11[illegible] only by that o[illegible]

The metallic p[illegible] valued at $69[illegible] metal [illegible]

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 24. CHICAGO, SATURDAY, DECEMBER 11, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.
E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER THE SOCIETY FOR ELECTRICAL DEVELOPMENT DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
The Chicago Report on Electrification....1053
Unusual Flashlight Service....1054
Shortage of Central-Station Assistants in England....1055

DEPARTMENTS:
Commercial Practice....1061
Electrical Construction....1065
Public Service Commissions....1068
Questions and Answers....1069
New Electrical and Mechanical Appliances....1082
Latest Approved Fittings....1086
Current Electrical News....1087
Record of Electrical Patents....1091

LEADING ARTICLES:
Electricity in Pump Manufacture....1057
Business Hints for the Dealer and Contractor.—By G. D. Crain, Jr....1065
Electrical Prosperity Week Scores Big Success....1071

MISCELLANEOUS:
Electroplating Bronze....1056
Topeka to Have Electric Show....1056
Extension of Louisville City Limits....1056
Chicago Electric Club....1056
Program for Meeting of Electrical Inspectors....1056
Radio League Organized....1056
Nobel Prizes....1056
Electric Baking Demonstration at Salt Lake City Results in 12 Installations....1061
Value of Domestic Appliance Load to the Central Station....1062
Importance of Industrial Electric Heating Shown by Detroit Convention....1063
Ratio of Coal Consumption to Energy Generated....1064
Over 400 Houses Wired in Two Months....1064
Simple Direct Motor Drive for Two Machines.—By William T. Estlick....1066
The Cost of Liability Insurance....1066
National Code Final Authority in Massachusetts....1067
Among the Contractors....1067
1915 Edition of National Electrical Code Issued....1067
Telephony on Aeroplanes....1070
Boston Edison Company's Automobile Garaging Plan Recommended for City....1070
Wireless Relay Invented....1070
Chicago Electrification Report....1080

Copyright, 1915, by Electrical Review Publishing Company, Inc.

THE CHICAGO REPORT ON ELECTRIFICATION.

The committee which was appointed over four years ago by the Chicago Association of Commerce to investigate smoke abatement and the electrification of steam railroads in that city has at last made public its report. The Committee has had the assistance of competent engineers and it has thoroly studied the question of smoke abatement. Probably no such complete survey of a large city has ever before been made with respect to air pollution and its causes. The findings are authoritative and will no doubt meet with general acceptance.

With respect to the electrification of railroads, however, the report is generally disappointing. This is because the Committee has considered only complete electrification of all present steam trackage, and has given no data with respect to partial or progressive electrification. This attitude of the Committee may be justifiable when it is remembered that the subject was considered primarily from the standpoint of smoke abatement, but it does not meet the expectations of those who looked forward to an exhaustive study of the electrification problem. Any informed person could have foretold that the cost of complete electrification would be considered prohibitive. But the question of whether partial or piecemeal electrification is feasible or desirable is left just where it was before.

Operation of suburban passenger trains by electric power is generally recognized as easy from the engineering standpoint and the best paying from the financial standpoint. Two of the prominent reasons for this are density of traffic and absence of the switching difficulties met in freight yards. The Committee points out that suburban passenger traffic is responsible for only two per cent of the total dust and cinders in Chicago. But smoke abatement must begin somewhere, and if two per cent can be eliminated by a change to a system which will be profitable or can even be operated without loss, why should not this step be taken? It must be remembered, too, that the suburban roads penetrate to the heart of the city, thus affecting a large population, while certain of the large industrial plants, which are such gross offenders, confine their effects to limited sections of the city, such as South Chicago.

The Committee points out that if its idea had been to plan an efficient electrification, the estimate of cost would have been different. It is greatly to be

Digitized by Google

regretted that such an estimate was not prepared. That was what Chicago wanted; that was what it has been waiting several years for; and hence the unanimous action of the City Council in at once taking action to compel electrification is readily understood. The situation in Chicago is complicated by the vast amount of switching and freight work to be done. Many miles of unimportant track could be omitted from an initial plan, and of the 38 steam railroads involved, there are 13 which perform transfer and switching service exclusively.

In comparing Chicago with other cities, the Committee states that terminal electrification elsewhere has been incidental to other improvements. The inference would not be entirely unwarranted that if certain railroads can finance terminal improvements in which electrification is but a minor incident, the same railroads could easily finance a terminal electrification alone, but the Committee appears to take the reverse viewpoint. As a matter of fact, the railroad system which has inaugurated terminal electrification in New York and Philadelphia has begun, in connection with certain other railroads whose credit and ability to raise funds rank among the highest, the construction of a huge and expensive terminal passenger station in connection with which electrification for passenger service would seem to be a minor item of expense. Yet the Committee makes no mention of these circumstances as indicating that the present would be the most propitious time for these roads to electrify their passenger traffic, at least.

A parallel to the situation regarding electrification in Chicago is found in the earlier condition of grade crossings. Originally all of the steam railroads entered the city at street grade. About 20 years ago an ordinance was passed requiring the elimination of grade crossings. It was not strictly enforced, but represented a municipal policy in favor of safety in operation. The railroads have gradually conformed, some of them adopting grade-crossing elimination as a policy to be practiced whenever opportunity afforded, realizing that even if the direct returns did not cover interest on the investment for track elevation, there are indirect returns in the lessening of damage suits, elimination of crossing watchmen, higher speed of trains within city limits, greater freedom of train movements, longer length of trains, and other operating advantages. Similar incidental benefits of untold value would accrue from electrification.

The estimate of the Committee includes an item for the construction of a central power station. Yet this is an investment which it would be entirely unnecessary for the railroads to make, and this ten-million dollar item may be lopped off at one stroke. It is reasonably certain that any railroad desiring to electrify could purchase the necessary power on satisfactory terms from the local power company, as the Pennsylvania Railroad has done in Philadelphia.

The Committee has emphasized the fact that the railroads are not the principal culprits in the matter of air pollution, and suggests municipal action to control other sources. It appears that high-pressure steam plants are the largest producers of smoke, and that other industrial operations contribute largely to the output of dust and other solid ingredients of the dirty air. It is here that the application of electric power would do more for cleanliness than through the operation of railroad trains. These steam plants produce 44.5 per cent of the visible smoke and 19 per cent of the solids polluting the air. Metallurgical and other industrial furnaces contribute 29 per cent of the visible smoke and 64 per cent of the total solids. By purchasing electrical power the smoke production of these steam plants could be greatly lessened, and it is well known that the smoke from a large central station is less than from a number of smaller power plants, even if the air pollution from the gaseous products of combustion were not greatly lessened. Burning of coal for heating manufacturing plants and office buildings would still be required.

By utilizing electrical methods for the precipitation of dust and fumes from metallurgical and other industrial plants, these sources of pollution, which are the greatest offenders of all, could be made inocuous. The processes for accomplishing this end have been worked out and demonstrated to be successful. They have been applied principally to smelters and other metallurgical processes upon a large scale, but the time has arrived for making wider use of this established method.

With the precipitation of fumes and dust in these plants, the substitution of centrally generated power for that developed in individual manufacturing establishments and the partial electrification of the steam railroads, Chicago may take a long step in removing the sources of dirt, disease, discomfort, and unnecessary expense from atmospheric pollution, leaving household furnaces as the chief evil to be combated in a future campaign.

UNUSUAL FLASHLIGHT SERVICE.

Electrical supply dealers marketing small flashlights for the Christmas trade will do well to emphasize every novel application of these inexpensive little conveniences which comes within their purview. Until the day of the universal electric porch light, the mail carrier will find a pocket flash a real aid to more rapid and accurate deliveries, as will drivers of department store wagons rushed with holiday traffic in the late evening on suburban streets. The hotel waiter equipped with one of these little outfits increases his chances of an appreciative tip by his facility in locating dropped articles beneath the table linen. A recent accident in a lavatory illustrates the efficiency of the flashlight, even in a room provided with a good general illumination by a tungsten lamp. A watch fell against the side of the porcelain tub, breaking the crystal. The shattered glass fell into the tub and could not be seen sat-

Digitized by Google

isfactorily until a flashlight was employed, when every particle was thrown into sharp relief by the reflection and was then easily removed. In the same household a flashlight was effectively used in exploring the interior of the Thanksgiving turkey before preparing the bird for the oven. The uses of these little devices are legion, and the fact that many sizes cost considerably below a dollar complete renders them among the most acceptable Yuletide gifts.

SHORTAGE OF CENTRAL-STATION ASSISTANTS IN ENGLAND.

In the early days of electricity supply, opportunities for gaining practical experience in generating stations in England were much coveted and sought after. Stations were few, but many more were in prospect, and the chances of securing a post as "chief" were best for those who had been through the mill. In those days, and, indeed, until comparatively recent years, the chief electrical engineer was considered in a number of towns to have the first claim to the fees paid by premium pupils who came to have experience under him. Such premiums went to swell the comparatively small incomes then granted to men who were at the head of electric supply businesses—much as the waiter at a restaurant supplements a nominal salary with "tips" or gratuities. In the latter case it is merely the restaurant manager's way of transferring part of his responsibilities to the public, and in the former it was the municipal electric supply committee's way of allowing the said pupil to pay part of the salary of its engineer.

Since the premium pupil disappeared from this department of electrical activity, as thousands of assistants became necessary, the royal road to a chiefship became so congested that competition among the candidates put the post at the disposal either of the cheapest or the most efficient man. But far too frequently there occurred the exercise of favoritism, not on the part of the chief engineer, but by councillors who were in too many cases his masters. What is more human than for a councillor, who is in part responsible for the electricity undertaking and its policy, to regard the electric supply business as an excellent calling for his son to follow and the station nearest home as the best place in the world for him to pursue it?

Right up to the outbreak of the European war the competition for employment in electricity works was most keen, and as a natural result salaries to subordinate staffs were so low as to give rise to a fairly widespread organized propaganda, and favoritism was one of the grievances which the agitators had much to say about. It is most remarkable how the state of war has affected the situation. The men who were depressed because they had got into the central-station groove and could neither better their status nor profitably find other suitable employment, have now found their opportunity. Many of them enlisted in the British army or navy. Others have abandoned their particular branch of engineering service in order to enter engineering and other factories where their class of knowledge and ability is so greatly in demand. They have secured far higher salaries or wages and think that they have improved their general prospects for the future; it may be that they are right in this—time alone can show. But the result of it all is that what was not so long ago an overcrowded and to some extent underpaid calling now fails to draw anything like the requisite number of men.

Various measures have been, and are being, resorted to for meeting the serious problem that the understaffing of an electric light and power undertaking inevitably involves. The Government has been appealed to to prevent men from leaving this class of duty in order to take up work in engineering factories. They will probably yet find it necessary to do so, for the simple reason that electricity is the life-blood of an industrial community and it is to the maintained activity of industrial communities in all belligerent countries that the fighting forces look for the wherewithal to do their mutual killing.

One of the London municipal electric supply authorities (Marylebone) has before it just now a scheme of apprenticeship which is designed to overcome the difficulty experienced in retaining its subordinate staffs. It is proposed to admit a number of apprentices who, after a period of probation, would be indentured. Youths of fifteen years of age and upwards would in such a way be given facilities for gaining what is described as a thorough training in the various branches of the department's work. It is thought that after the first year's training they would gradually become useful and that towards the end of their period of apprenticeship they would be able to fill responsible positions. The difficulty of retaining "improvers," and the troubles recently experienced in running the station, may by this means be removed. During their apprenticeship the apprentices would be given every possible facility for attending evening classes at schools and technical colleges. A small progressive wage of from $1.25 per week to $5 per week would be paid and a watch will be kept for those who show special intelligence and ability fitting them to serve on the permanent staff.

It will be gathered that the effects of such a scheme can only be felt in the somewhat distant future; the immediate relief afforded will be very slight indeed—it may afford none at all because of the objection that naturally lies against the presence of too much uninitiated assistance in electrical work. But it represents an attempt to deal with what is an increasingly difficult situation in England. Those who have advanced it have doubtless not overlooked the possibility of it failing to commend itself to the mind of organized electricity works staffs who have remained at their posts, or to that of those who may at the end of the war desire to return to their former electrical surroundings.

Digitized by Google

Electroplating Bronze.

The electrodeposition of bronzes has been a difficult problem, but in a recent issue of *Zeitschrift für Elektrochemie,* W. D. Treadwell and E. Beck tell of successful experiments. A suggestion by Kreeman to dissolve copper and tin in caustic alkali, adding potassium cyanide and tartaric acid did not prove successful. Some similar baths answered, however—a great deal depends upon apparently unimportant features in such researches; but they experienced in the first instance unexpected difficulty in effecting the alloying of the two metals copper and tin to bronze. They deposited thin alternating layers of copper and tin, each 0.01 millimeter in thickness, from oxalate solutions on rotating cylinders of platinum, which they then heated to 230 degrees centigrade—that is, nearly to the melting point of tin, which is 233 degrees. The two metals did not appear to alloy. To obviate the possibility of an oxidation they heated a copper tube, on which copper and tin had similarly been deposited, in an atmosphere of carbon dioxide to 275 degrees centigrade for several hours, without obtaining an alloy; and when iron, similarly coated, was heated in CO_2 up to 500 degrees for eight hours, there was hardly any appearance of bronze formation. The alloying of copper and tin would thus appear to be far more difficult than that of zinc and tin. That may partly account for the difficulty of the electrolytic deposition of bronzes.

In ordinary solutions the deposition potentials of copper and tin differ by about 0.5 volt. The difference can be reduced by suitable additions to the bath, and the addition of cyanides, in which copper forms complex ions, seemed advisable. But Treadwell and Beck found baths of copper and tin, dissolved in caustic potash and potassium cyanide, ineffective.

Good bronze deposits were obtained by mixing two solutions, the first containing 50 grams of copper sulphate, 104 grams of potassium cyanide, and 70 grams of caustic potash, the second containing 82 grams of tin-potassium chloride and 37 grams of potassium oxalate, the whole diluted with water to make up two liters. These baths gave a reddish bronze deposit on cylindrical cathodes of platinum rotated at 1,000 revolutions per minute; the anode was a cylinder of platinum gauze, and the bath was kept at 40 degrees.

Another bath yielded a golden bronze. This bath was prepared by dissolving tin in caustic potash (or potassium carbonate) and sodium sulphide, and suspending cast anodes of bronze (80 parts of copper, 20 parts of tin) in the solution. On prolonged electrolysis the deposit became reddish in color, because the tin turned passive, so that relatively more copper was dissolved from the anodes, unless the tin solution was replenished. The two bronzes adhered well to platinum, copper, nickel, iron, steel, and even cast iron; they looked homogeneous at a magnification of 500 diameters, and free from pores; at some spots, however, a concentric texture was noticed, due apparently to hydrogen bubbles. The cathodes had always to be rotated.

Topeka to Have Electric Show.

The first electrical show ever staged in Topeka, Kans., will be put on January 17 to 29, 1916. The show will be held in conjunction with the Mid-Winter Exposition in the Auditorium.

The Mid-Winter Exposition has been an annual show of the manufacturers and local merchants for the last ten years and has always enjoyed a very fine attendance. The addition of the electrical feature is going to be a great attraction, it being the first show of the kind ever held in Topeka. Detailed information can be secured by addressing R. B. Basham, general contract agent of the Topeka Edison Company.

Extension of Louisville City Limits.

Electrical contractors, the Louisville Gas & Electric Company and other interests which would be affected have been much interested in definite projects which have been published in Louisville for a comprehensive city annexation ordinance, which would extend the boundaries of the city about a mile in all directions from river bank to river bank. This would call for elaborate extension of the electric lighting systems, would extend the area over which the city building code applies and would call also for extension of the lines of the Louisville Railway Company. That an annexation ordinance will be pushed in the near future is assured, although it is doubtful whether as ambitious a program as that supported by the real-estate men will be attempted. It is probable that a considerable area will be added to the city, there being a number of thickly settled sections lying just outside the limits.

Chicago Electric Club.

At the meeting of the Electric Club-Jovian League of Chicago on December 2, W. T. Brown delivered an interesting address on New Mexico. The talk was illustrated by stereopticon views.

The Jovians assembled at this meeting elected E. W. Donoho first Tribune and J. C. Manley, second Tribune, for the ensuing year. The election of officers of the club was held December 9.

Program for Meeting of Western Inspectors.

The eleventh annual meeting of the Western Association of Electrical Inspectors will be held at the Hotel Sherman, Chicago, Ill., January 25, 26 and 27, 1916. The opening session will be held on Tuesday at 10 a. m., when reports will be made and the presidential address delivered. At the afternoon session the following addresses will be made: "The Legal and Ethical Responsibility of the Electrical Inspector," by Leon Hornstein, assistant corporation counsel of Chicago; "The Electrical Safety Code," by E. B. Rosa, of the Bureau of Standards; "Fuses, the Electrical Safety Valves," by H. E. Clifford, professor in Harvard University.

At the session on Wednesday morning, grounded fixtures and concentric wiring will be discussed. The latter subject will be treated from the standpoint of the central station by R. S. Hale, chairman of the N. E. L. A. Committee on Wiring. Other speakers will be selected to represent the contractors' and the manufacturers' views. In the afternoon there will be a discussion of selected inspectors' problems.

Thursday will be devoted to committee reports and Friday to inspection trips. On Tuesday evening there will be an informal dinner, on Wednesday evening a theater party and on Thursday evening a banquet.

Radio League Organized.

The Radio League of America has been organized with H. Gernsback as manager, 233 Fulton Street, New York City. Its purpose is to promote wireless telegraphy and telephony among amateurs. There is no membership fee or dues, but members must be citizens of the United States and own sending or receiving stations. They must pledge observance of the Wireless Act of 1912, and willingness to place their equipment at the service of the Government.

W. H. G. Bullard, Reginald A. Fessenden, Lee de Forest and Nikola Tesla are honorary members. The League has adopted an official button and issues certificates of membership without charge.

Nobel Prizes.

Earlier reports of the award of the Nobel prize in physics for 1915 have been contradicted by more recent dispatches stating that this honor has been bestowed upon W. H. Bragg and his son, W. L. Bragg, of England, for their work in investigating the formation of crystals by the use of X-rays. The importance of this work was pointed out in an editorial in the issue of December 5, 1914.

Digitized by Google

Industrial Power Series—Article No. 147

ELECTRICITY IN PUMP MANUFACTURE.

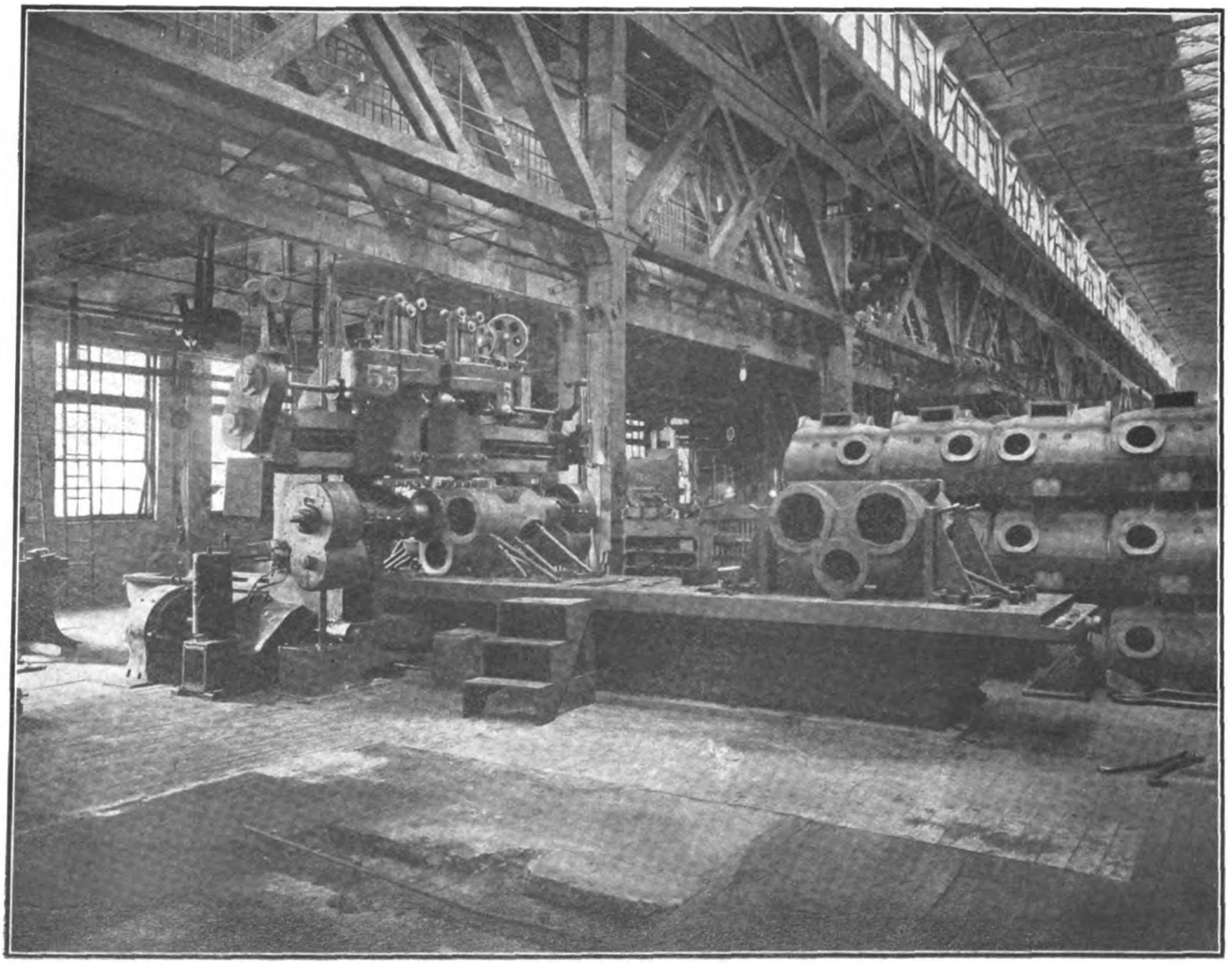
This article presents data on the use of electric motors in pump manufacture, specific information being given on two typical installations, one at Seneca Falls, N. Y., and one at Cambridge, Mass.

Within the last few years electric power in manufacturing establishments has become the rule rather than the exception, as it is realized that there is no problem of more vital interest to the manufacturer than that of obtaining a cheap, reliable, simple, and continuous source of energy. This question is often the dominating factor in determining the location of a manufacturing plant.

There are many well-lighted, well-ventilated and easily accessible locations for shops and factories which would serve admirably for manufacturing purposes if power facilities were at hand. The electric motor sets aside the limiting features entirely and affords 24-hour service.

With the electric motor deriving its energy from a central station, there is a great deal of flexibility in the matter of power. All of the customers are never using the maximum at the same time and pay only for the actual energy used. Take the case of a circular saw the power demand of which, under maximum working conditions, is five horsepower. If the manufacturing is of such a nature that the saw is used but intermittently, then where electric motor drive is used, electric energy would be charged for only in proportion to the work the saw performed. This argument applies to machinery of all classes. It is immaterial whether the manufacturing is carried on in the basement, first, second or third floors, one place is as acceptable as another for electric power. Where mechanical power is used, the manufacturer is dependent on the operation of an engine with the attendant shafts and belts. If any of these elements give out work must be suspended until repairs are made.

In the case of motor-driven machinery the problem is entirely different, as central-station service insures continuity of service. Another feature to consider is that the preparation of raw material in many industries occurs only through a part of the working day, and where mechanical drive is employed, long shafts and belts must be operated uselessly for the other portions of the day. When such conditions exist it is difficult to de-



Ingersoll Four-Head Milling Machine Driven By 35-Horsepower Motor—Blake & Knowles Pump Works.

Digitized by Google

termine whether the machinery is working at its best advantage or not, and whether there are any undue friction loads developing. With motor drive it is easy to determine from time to time the amount of power consumed when the machines are running light, and if this amount shows a perceptable increase at any time it indicates at once that there is undue friction which can be easily located and the necessary alterations or repairs made. This in itself is a valuable feature of electric drive, as it is often the means of discovering the abuse of the machines by the operatives.

The flexibility of motor drive is of great advantage as there is hardly a shop where frequent changes are not made by installing new machinery or changing the location of existing machinery. When such machinery is motor driven the change is easily made. The practicability of motor drive is now so well established that a great many concerns formerly tied down to disadvantageous and unhealthful conditions are adopting electric power, thereby enabling them to enjoy light, air and locations easily accessable to their customers.

Motor Driving Group of Machines in Rumsey Plant.

Rumsey Pump Factory.

An excellent example of an electrically-driven manufacturing plant is that of Rumsey & Company, Limited, of Seneca Falls, N. Y. Although not as extensive as some plants, the buildings and equipment are new. There are six buildings devoted to the manufacture of hand and power pumps for all purposes, lift and force pumps, hydraulic rams, rotary and centrifugal pumps, triplex water pumps, etc. The main machine shop is 100 by 310 feet in dimensions with the other buildings somewhat smaller. Service is furnished by the Empire Gas & Electric Company from its three-phase, 60-cycle, transmission lines and all motors operate at 220 volts. The motors, eleven in number, are the squirrel-cage type and are all mounted on the floor with the starting devices on a panel adjacent.

In the foundry there is a 35-horsepower motor driving a Sturtevant No. 7 blower for the cupola, and a 6-by-6-inch air compressor. The compressor furnishes air to pneumatic hoists in the foundry proper.

From the foundry the castings are transferred to the grinding department where they are tumbled to remove the sand, and the burrs and irregularities ground off. The machinery equipment consists of three tumblers, three emery grinders, two pipe-threading machines and a 36-inch exhaust fan for removing the dust from the tumblers and the grinders. These machines are group driven by a 25-horsepower motor with an eight-inch pulley which operates at 1,200 revolutions per minute. The machine shop building is divided into several departments for work on different types of pumps, while other parts of the machine shop are used for general work for all classes of products. The work carried on is of a general machine character employing planers, drill presses, shapers, lathes, etc. One department is devoted to testing power pumps and is equipped with a line shaft and pulleys driven by a 35-horsepower motor operating at 1,200 revolutions per minute and equipped with an eight-inch pulley. With this arrangement several pumps can be tested simultaneously.

In the brass department all brass work is machined and it has an equipment of nine brass-finishing lathes, one metal saw, a tool grinder and a drill press. The machines are group driven by a 15-horsepower, 1,200-revolution-per-minute motor with a 10-inch pulley. The carpenter shop is principally used for the manufacture of export packing cases. As the works are entirely new it was possible to lay out the buildings to the best advantage for electric drive.

Several of the accompanying illustrations show views in this plant.

Blake & Knowles Pump Factory.

Another interesting plant is that of the Blake & Knowles Steam Pump Works, at Cambridge, Mass., which is a division of the International Steam Pump Company of New York, perhaps the largest concern in this line of business. The Cambridge factory covers more than a block, and between 1,000 and 1,500 men are employed.

The original motive power used in operating the machinery was derived from an isolated steam plant. Energy was ex-

Motor-Driven Brass-Finishing Machines at Rumsey Plant.

Digitized by Google

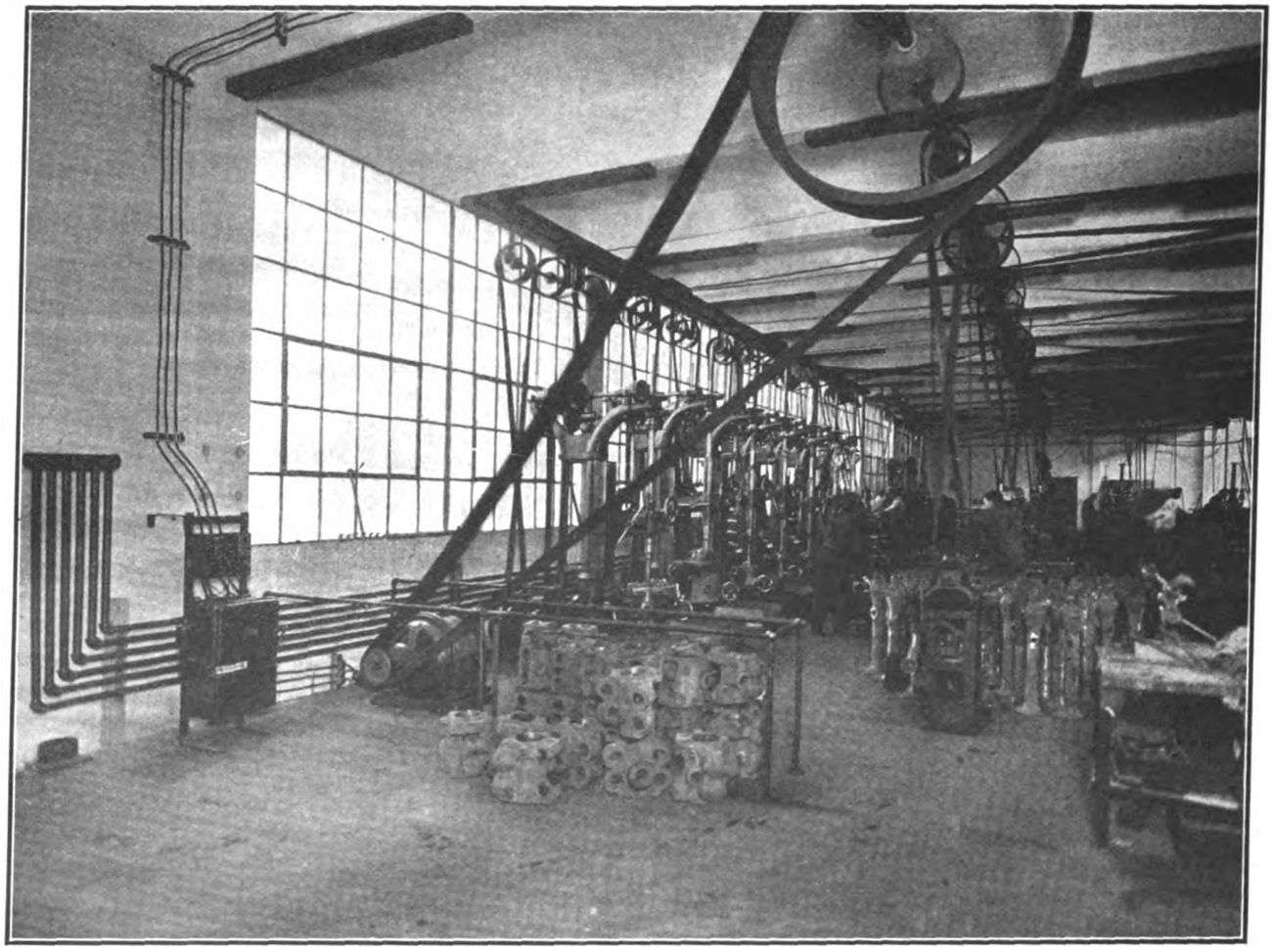
erted by means of four shafts which ran the length of the main machine shop, which is 500 feet long and 100 feet wide. Though the shafts were in several sections joined by couplings, this type of drive involved great waste of power, as whole lines of shafting often had to be kept running to operate a few machines which were in use in performing some minor repair work which required overtime operation. The friction load, of shafts, belts and pulleys alone, consumed more than 100 horsepower, and the shafts, belts, etc., caused the loss of much valuable space.

A step in the direction of efficiency of power application was made when the company installed a generating plant for a part of the works. This was one of the earliest electrical installations for power purposes in New England. A Thomson-Houston generator, of 82-horsepower capacity, which originally furnished direct-current energy sufficient for the operation of a whole shop, is now operated as a motor for driving the machines in the buffing and cleaning rooms. Though the machine is about 25 years old, it still gives efficient service in its altered duty.

The company still retains a direct-current generating equipment for a part of the works. There are 1,000 horsepower in boilers, for all uses, and generators of 350-kilowatts capacity installed in the power plant on the works. On this service are operated about 350 horsepower in direct-current motors, mainly on machine tools, cranes and hoists. One of the cranes, said to be the earliest built in New England, is still running with its orignal motors. There are in all 14 Sprague hand-operated hoists with motored carriage, each equipped with a two-horsepower or five-horsepower direct-current motor and used for transferring iron molds from the jarring machines to the foundry floor, and vice versa.

The main machines shop is on central-station power service. Four 100-kilowatt transformers and cutouts belonging to the Cambridge Electric Light Company, the company supplying the works, are located on a framework structure just outside the building. Lines enter through a double rubber cable in conduit to a fuse block, passing thence to a 1,000-ampere oil switch, thence to two panels, whence the circuits lead off in conduit as far as the space between the girders of the second floor or gallery level. The wiring from this point is open weatherproof construction.

Fuse boxes are located at gallery level, each one behind a small door in the wooden fence surrounding the gallery. Each door is numbered corresponding with that of the motor to which the line runs. The boxes contain starting fuses, which call for about three times the capacity of the running fuses at the starting compensators, with which each motor is provided. Later installations are, however, equipped with overload relays. In case of a fuse blowing, when the motor is started, the trouble is quickly traced and the fuse renewed without the attendant having to climb to any place that is difficult of access.



Battery of Boring Mills Driven by 35-Horsepower Motor.

The problem, on changing over from mechanical drive about four years ago, was how to apply the motors to best advantage to existing machines. In the case of the smaller metal-working machines, such as lathes, automatics, etc., the plan adopted was to group several units which would give as good a load-factor as possible and still be in convenient locations in relation to one another. Each group was connected to a counter shaft driven by a motor installed in an inverted position from the beams of the gallery, or over the gallery, or wall columns. All the motors operated on alternating current are of 550 volts, three-phase.

The motors which operate the lathes, etc., by group drive are of 3 to 20 horsepower each. The larger machines, such

Digitized by Google

as boring mills, lathes, etc., are located on the ground floor. There are four boring mills, one of 8-foot capacity. A characteristic of these machines is that they require a much larger amount of power to start with their load than would be necessary or practicable for continued operation, once started.

There being not sufficient starting torque in the motor, a double-length pulley was applied to each of the motors, and on the counter shaft the loose pulley and the tight pulley of the steam-drive days was utilized, the practice being to start the motor free on loose pulley, and after it has come up to speed, to throw the load on. In this manner, a motor perhaps one-third smaller than could be used to advantage otherwise is made practicable.

Another device to economize power and gain efficiency is the location of a 36-inch heavy flywheel on the counter shaft of a 54-inch Pond planer, between the motor pulley and that for the machine. By this means the reversing motion of the planer is taken up and the motor relieved of strain at the moment of reversal of the planer bed. This involves a power exertion of about three times the normal power requirement for running the machine itself. The flywheel in this case permits of a smaller motor.

Other large machines in the shop that are individually motored are a Blanchard grinder, which is driven by a 25-horsepower motor, and an Ingersoll four-head milling machine, which is direct-geared to a 35-horsepower variable-speed motor with drum control. In the foundry is a 75-horsepower induction motor which operates a Root cupola blower which furnishes air to the blast furnaces. In order to give variation to the air supply, necessary to proper furnace operation, the motor was specially built to give two speeds by means of a pole-changing switch mounted on the motor frame. In the foundry are also two motor-operated jarring machines, others being operated by compressed air.

The jarring machine is a table on which the casting box is set, filled with foundry sand with the mold in the bottom of the box in an inverted position. The sand must be compacted closely around the mold, and to do this the table is violently shaken up and down by a mechanism consisting of gears located underneath. The electrically motored tables are each equipped with a 10-horsepower alternating-current motor installed in a concrete pit about 6 by 4 by 2 feet deep. A reducing gear is located in a metal chamber between the motor and a friction clutch which is connected to a lever protruding through the floor beside the table and with which the operator controls the speed of motion of the machine.

As a means of protection to the brushes of the motors located on the floor, in the machine shop, the company had them constructed with a guard having slotted openings sufficiently close to prevent a wrench or a 1-inch bolt falling through onto the mechanism.

Three cranes operate over the whole area of the main machine shop floor. One, a Toledo five-ton crane, was designed for specially rapid transference of castings and parts to and from the boring mill, planers, etc. Its carriage travels 400 feet per minute and its hoist 75 feet per minute. The bridge motor is of 22 horsepower and the hoisting motor is of 37 horsepower.

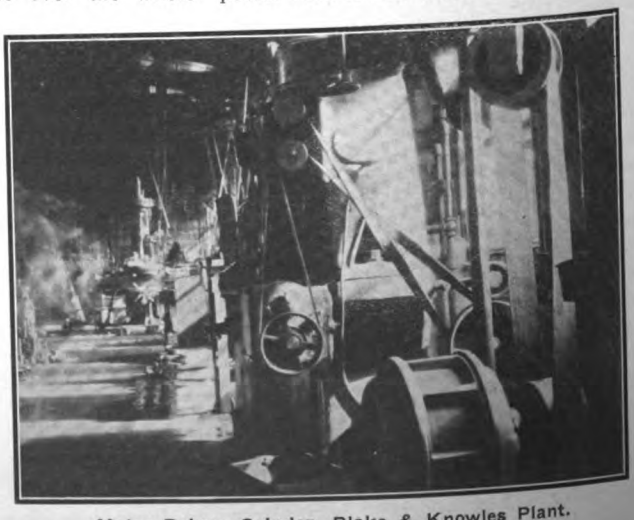
Three traveling cranes are operated in the main foundry—two 10-ton and a 20-ton Morgan with an independent hoist of 5-tons capacity. In the store house is a 10-ton Case crane and in the erecting shop a 25-ton Shaw crane with auxiliary hoist.

The company builds air compressors, and vacuum and power pumps, in many cases with electric motor drive attached to the frame.

There are in all about 600 horsepower in alternating-current motors on Cambridge Electric Light Company service, in the Blake & Knowles works. The maximum power load is about 300 kilowatts.

Woodworking Department at Rumsey Plant.

Motor-Driven Jarring Machine, Blake & Knowles Plant.



Motor-Driven Grinder, Blake & Knowles Plant.

Digitized by Google

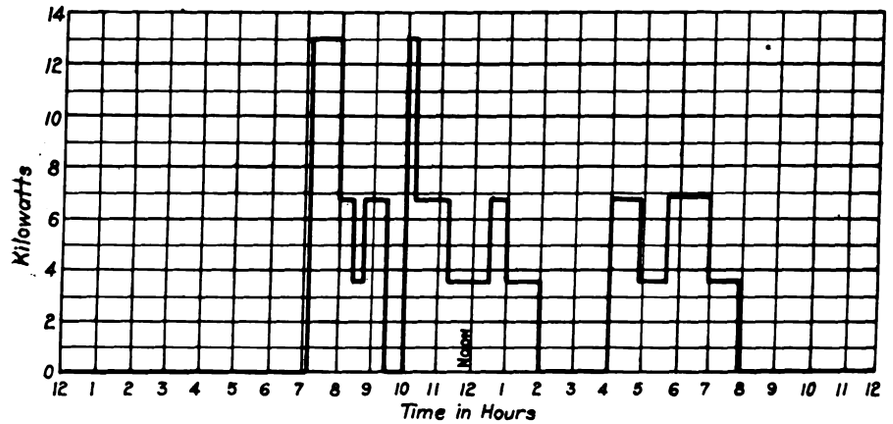
Commercial Practice
Management, Rates, New Business

ELECTRIC BAKING DEMONSTRATION AT SALT LAKE CITY RESULTS IN 12 INSTALLATIONS.

Data on Operation Indicate Economy of Electric Method.

Several months ago the Salt Lake office of the Utah Power & Light Company became convinced that there was an excellent field in its territory for electric bake ovens. Accordingly a 36-loaf oven was secured from the Hughes Electric Heating Company of Chicago, with the intention of trying it out and learning what merits, if any, electric baking had over the ordinary method. Early in April the central station succeeded in having this oven installed for a demonstration on the sales floor of the United Grocery Company, who were making at that time a special demonstration of flour, cake and other baked products. While the oven was installed there, several of the bakers and restaurant operators were taken to witness its operation. Mrs. Walden, in charge of the delicatessen department of the United Grocery, who had charge of the demonstration, spoke in the highest terms of the work done by this oven. C. A. Shay, proprietor of Shay's Cafeteria, on the strength of these demonstrations, ordered a 72-loaf oven for use at his cafeteria. This installation has been perfectly satisfactory, Mr. Shay stating that the electric oven had cost him 20 per cent less to operate than the gas oven, which it replaced, and that he is able to turn out more products with his electric oven. The power company recently installed a recording watt meter on this installation and kept a record of the maximum demand and consumption daily. The accompanying illustration shows a reproduction of the load chart of an average day for this installation. The following is a summary of the results secured between October 7 and 24 while the recording instrument was in use:

Connected load, rated.....12 kilowatts
Maximum demand during period .....13.4 kilowatts
Average maximum demand .....13.2 kilowatts
Average daily consumption .....65.67 kilowatt-hours



Daily Load Curve of Electric Oven.

Load-factor for period....20.40 per cent
Load-factor for the 13 hours in use.....38 per cent

The average weekly output of materials during the period covered by this test is as follows:

700 pies.
40 loaves nut bread.
200 loaves white bread.
36 loaves rasin bread.
38 cakes, 1-layer, 10-inch diameter.
37 cakes, 1-layer, 8-inch diameter.
270 pounds chicken.
100 pounds veal.
160 pounds pork.
10 dozen cream puffs.
10 dozen patties.
52.5 dozen rolls.
17.5 dozen biscuits.
14 pans bread.
16 meat pies.

The results of the demonstration also convinced George Mueller, of the Royal Baking Company, of the superiority of electric baking and he ordered a 60-loaf oven for use in his pastry department, which was installed in June. This oven has been so satisfactory that he has ordered another 36-loaf oven for use in the cafeteria kitchen for roasting meats and another 120-loaf oven, to be used in the pastry department. He states that if this latter oven proves to be what he wants, as to size and arrangement, he will order a duplicate of it which will make four ovens, aggregating a connected load of 42.5 kilowatts when the installation as now contemplated is completed.

Several other ovens were sold shortly after as a result of the success of the first installation, including a 60-loaf capacity for Hart's Lunch Room, one for Spary & Mehse, one for the Package Grocery, one for the Palace Market and one for the Consolidated Grocery Company.

Since the demonstration was made, the United Grocery Company has purchased two 36-loaf Hughes ovens and is preparing to make an installation which will be the finest advertisement for electric cooking and baking which it could possibily receive. These ovens will be located in a special department on the sales floor of its store and all of the pastry, cake and other products sold in the delicatessen department will be prepared and baked in the electric ovens in full view of the patrons to the store. The company intends to make a special feature of the fact that its products are better because they are baked electrically. The store is now being remodeled to accommodate this department. Herewith is a tabulation of the consumption by months of the bake ovens now installed in Salt Lake City.

It will be seen that these ovens afford a highly desirable character of load and produce a most satisfactory revenue. Four installations now being made are not included.

Name	Capacity in Loaves	Maximum Demand, Kilowatts	Average Daily Hours	Kilowatt-Hours Consumed May	June	July	Aug.	Sept.	Oct.
Royal Cafe	60	9	9	.....	257*	742	813	1139	1215
Royal Baking Company	36	4.5	9	.....	.....	.....	.....	.....	*197
Shays Cafeteria	72	12	13	1072*	2056	2058	1846	2039	2101
Harts Lunch Room	60	9	13	.....	.....	†1770	1759	1713	1402
Sparey & Mehse	60	9	11	.....	.....	375	1533	2105	2006
Package Groceries	60	9	9	.....	.....	.....	.....	*401	1512
Palace Market	60	9	9	.....	.....	.....	.....	.....	1625
Consolidated Groceries	60	9	—	.....	.....	—	.....	.....	1180

*15 days. †9 days. ‡25 days.

Digitized by Google

Value of Domestic-Appliance Load to the Central Station.

In a paper which W. M. Stearns, of Pittsfield, Mass., presented before a recent convention of Southern central-station men on "Electric Heating Devices," considerable interesting data were given on the value of the domestic-appliance load to the central-station company and many valuable suggestions were made relative to increasing the revenue from this source.

Tables I and II show the energy consumption and income from household appliances which was obtained by means of graphic meter charts in two residences at Rochester, N. Y. These cases are not special but simply show how a load can be built up by interesting people in these devices.

This is the kind of business that is available on every lighting circuit in the country and can be readily capitalized by the aggressive central station to a larger extent than heretofore. The revenue derived from heating appliances has even provided the means of offsetting a reduction in rates which meant a decrease of $50,000 a year income to the company.

While other household devices are not used as much nor for as many hours as the flatiron, nevertheless, many of them are in service every day of the week and thus provide additional commercial value to the distributor of electrical energy. By the extensive use of heating appliances, the central station can gradually approach the ideal condition of minimum peak and valley loads.

It has been truly stated that, "it is well to remember in this connection that there is no lighting circuit appliance on the market of too small current consumption to be handled and pushed, so long as it can be relied upon to give satisfactory service to the user."

Sales Factors and Methods.

There are three fundamental factors involved in all appliance sales which receive the consideration of all companies, viz.: (1) selling profit, (2) current consumption and (3) service. The average central station usually considers only the first two factors of these important essentials and the prevailing tendency is to overlook the excellent opportunity to render complete and satisfactory service to the customer regardless of initial profit or load effect. A no-profit appliance which would not appreciably alter the station output often provides the means of furnishing complete satisfaction to the consumers, helps to make electric service indispensable, demonstrates the inherent advantages and encourages the demand for other electrical appliances which will be more profitable from both a merchandising and operating standpoint. This introductory outlet should not be overlooked in favor of those appliances which insure immediate returns.

Many of the sales methods which have been found successful for other kinds of merchandise continue to be used with good results to promote the sales of heating appliances. The most popular methods include special reduced prices for limited time, group sales whereby several appliances are sold for less than the aggregate value of the individual devices, rebate coupons, premium offers, free-trial propositions with time or installment payments and the sale of a new appliance in consideration of the return of an old device plus a nominal cash payment.

When special campaigns are conducted whereby appliances are sold at reduced prices the co-operation of the local contractors and supply dealers should always be secured. The dealers depend upon retail sales throughout the year whereas a special campaign lasts for a limited time only and a satisfactory sales policy should be adopted which will ensure harmony and result in mutual benefit to all. In some instances it is advantageous to have a special campaign handled exclusively by the dealers. Also, it is sometimes necessary to give the dealers the benefit of the purchasing power of the central station.

Reduced-Price Campaign.

One central station reports that very satisfactory results have been obtained by selling all current-consuming devices at list prices except when special campaigns are being conducted. The special reduced prices obtain for a limited time only and no difficulty is experienced in increasing prices after the special sale. Such campaigns invariably stimulate business so that subsequent sales are very much greater than those made prior to the special reduction.

Arrangements are made with the local dealers to sell at the same prices during the campaign by reimbursing them for the difference between the list and reduced prices on sales made to customers of the operating company.

Free Renewals of Flatirons.

Consistent with the policy of greater service to the customer, the central station referred to above has adopted a system of free renewals of flatirons which has greatly stimulated sales. A customer who brings in a defective flatiron is immediately given another iron which need not necessarily be a new one but in operative condition. This pleases the customer, not only because he is spared the expense of repairs but also because there is no delay, and the central station incurs no loss of revenue.

Appliance-Repair Department.

Obviously, central stations obtain more profitable results from the daily current consumption of heating appliances than from their initial sale. Realizing that an appliance load cannot be maintained at its maximum value if the devices which have been sold are allowed to become inoperative some companies now conduct a department which furnishes repairs and renewals free of charge to the appliance customer.

Many devices which might be left unused are again made revenue producers. Another advantage of this practice is that customers are convinced that they will be well repaid for investments in electrical apparatus as their devices will not be allowed to become useless. This method of handling repairs works to the advantage of the customer, the dealer and the manufacturer.

In connection with the repair of electrical appliances by central stations, a very interesting letter was received from a customer of one of the large public service corporations. He writes as follows:

"I have in my house one household utility motor, one vacuum cleaner, four electric flatirons, five electric heating pads, two electric stoves and one electric toaster.

"Of all these appliances, the only one in use at the present time is one small

TABLE I.

	Percolator, 550 Watts, Hours and Minutes	Washing Machine, 220 Watts, Hours and Minutes	Vacuum Cleaner, 325 Watts, Hours and Minutes	Flatiron, 625 Watts, Hours and Minutes
Sunday	0 22		0 58	
Monday	0 25	4 16	1 8	
Tuesday	0 16			3 43
Wednesday	0 17			
Thursday	0 22			0 47
Friday	0 30			
Saturday	0 20			
Saturday night	0 23			
Summary—				
Hours per week	2.75	4.250	2.10	2.50
Kw.-hr. per week	1.51	0.935	0.68	2.81
Cost per week*	$0.121	$0.075	$0.054	$0.225
Cost per month*	$0.540	$0.300	$0.220	$0.900

Total bill, lighting and appliances $2.96
Income for lighting 1.00
Income for appliances (66.2 per cent of total) $1.96

*At 8 cents per kilowatt-hour.

Digitized by Google

electric flatiron which is used in the sewing room at the top of the house.

"I am interested in this subject not only because of the investment I have in these electric appliances, but also because I am a considerable holder of securities of electric light and power companies and have something to do with directing the policy of a number of companies. I am wondering if the companies in which I own stock have as large a percentage of unused appliances as is shown in my own house.

"I think that one reason that electric appliances are not used in my house is that the servants are afraid of electricity, are afraid to use appliances when they are not working properly and in such cases simply turn off the switch and put the appliance in a closet from which it may not emerge.

to operate the car to obtain the best results, etc.

"It seems to me that the companies that are engaged in the manufacture of electric appliances and the companies that have electric current to sell, should cooperate in the matter of making the use of electric appliances more generally understood. I believe that the electric appliances have real utility conveniences. Especially in homes where the mistress of the house does much of her own work. In such homes they cannot afford large repair bills and if the appliances are to be used they must be a real convenience and not too expensive.

"I would suggest that all electric companies should put on a repair man with a motorcycle and repair outfit who shall promptly respond to all calls for repair work on electric appliances, making a

TABLE II.

	Percolator, 400 Watts, Hours and Minutes	Toaster, 500 Watts, Hours and Minutes	Washing Machine, 200 Watts, Hours and Minutes	Vacuum Cleaner, 110 Watts, Hours and Minutes	Flatiron, 550 Watts, Hours and Minutes
Sunday	0 54	0 13			
Monday	0 25	0 9			0 51
Tuesday	0 37	0 28	0 79		0 14
Wednesday	0 46	0 30		0 6	
Thursday	0 33	0 19			0 21
Friday	0 51	0 24	2 10	0 24	
Saturday	0 17			0 39	0 60
Summary—					
Hours per week	4.38	2.05	3.48	1.15	2.43
Kw.-hr. per week	1.71	1.19	0.80	0.13	1.34
Cost per week*	$0.137	$0.095	$0.064	$0.01	$0.107
Cost per month*	$0.550	$0.380	$0.260	$0.04	$0.430

Total bill, lighting and appliances	$3.36
Income for lighting	1.53
Income for appliances (34.5 per cent of total)	$1.83

*At 8 cents per kilowatt-hour.

"My housekeeper expresses the opinion that electrical appliances are not convenient unless they work properly and if one has to be boxing them up and sending them off for repairs there is no advantage in using them.

"As to the inconvenience or difficulty in getting repairs, we took the heating pad to headquarters of the operating company in this section from whence it was sent to the factory. We had to pay express charges both ways and repair charges and wait sometime before we got it back. Since it was returned to us last winter it has been used only twice, because on the first and second point of the switch no heat is given out while on the third point it is too hot for use.

"The manager of the local company was very polite to us and he explained his company could not make repairs, etc.

"Contrast this situation with my situation as an owner of a well known automobile. Regularly, once a month, I received a mimeograph letter from the head office of the automobile company which contains suggestions as to the care of my motor car, how it should be oiled, how it should be looked after, and how nominal charge for his time. Also that the meter readers gather the material for a card index as to the number of electric appliances owned by each customer, which are in use, and if all those in use are giving satisfactory service."

The above letter may represent a strange condition, but some of the suggestions contained in it are worthy of serious consideration. As the greatest value to central stations comes from the continual use of heating appliances it seems very essential that the central station should see that these appliances are kept in operating condition, and that the small amount of expense involved to pay for this information would be more than overcome by the increase in revenue which would be produced by the continual use of the appliance. The manufacturer must also endeavor to make his appliances more able to withstand the ordinary wear and tear of household use, but this is going to be more difficult, owing to the fact that the central stations are demanding from the manufacturers appliances which can be retailed at lower prices.

The introduction of heating appliances is, of course, greatly limited in some localities due to the small proportion of residences which are wired for electricity. People living in unwired houses are not usually considered as prospective customers and have therefore been consistently avoided when special campaigns are being conducted. It has been demonstrated by experience, however, that even this class affords an opportunity for appreciable sales. During one special campaign which was conducted just previous to the Christmas holidays the solicitors were instructed to leave appliances on trial even though the house was not wired. Many sales were effected by this means, the appliances being purchased for gifts to friends whose houses were wired for electricity. A few were sold to others contemplating house-wiring.

Importance of Industrial Electric Heating Shown by Detroit Convention.

That there is a need for specialized activity in the field of industrial electric heating is strongly indicated by the tenor of the papers presented at the convention of the Industrial Electric Heating Association at Detroit, Michigan, on November 26 and 27. This association was formed about a year ago, the aims and objects being explained as follows:

"Recognizing the opening of a new and heretofore undeveloped field in the electrical industry, the importance of which, and the possibilities for the development of which are so great, and the present knowledge so small, it seems imperative that an organization should be perfected to study and gather together all the available information on this great subject for the benefit of its members and of the industry at large and for the exchange of ideas and data."

It was recognized that in developing what is practically a new branch of the industry, the experience of each is of the greatest value to all. An unsuccessful installation not only affects locally the company responsible for it, but rebounds to the discredit of industrial heating everywhere: while the experience and "good will" of a successful installation is of practical value to central-station men in general. The magnitude of this branch of activity is well known and appreciated by the progressive representatives of the new association. Statistics were quoted which showed that a much greater load might be expected from this business than from the motor business. It was stated that the industrial electric heating business already on circuit amounts to the total power output of the three largest central stations in America. The enamelling oven installation of the Willys-Overland Company, was quoted as an indication of the tremendous pos-

Digitized by Google

sibilities of the future. By changing over only one of its heating operations the heating load now exceeds the demand for both light and power.

A. K. Young, of Toledo, one of the founders of the association, and president, stated at the opening session that since the first meeting about a year ago, members of the association had closed contracts for industrial electric heating aggregating 100,000 horsepower.

Several interesting papers were presented and a general informal discussion ensued which brought out much valuable information. It was pointed out that industrial heating salesmen have an important talking point, when it is realized that electricity at one cent per kilowatt-hour would compare favorably with artificial gas at 25 cents per 1,000 cubic feet.

Relative to electric melting furnaces it was shown that while the cost of producing ordinary crucible steel varies from $45 to $60 a ton, electric steel of like quality is being made in Detroit for prices ranging from $25 to $27 a ton. Ordinary converter steel costs range from $35 to $40 a ton, but with the electric furnace a like steel is being produced for $20 to $23 a ton. Ordinary open-hearth and a comparable electric steel can both be made for $19 to $25 a ton. It has been found at Detroit that the heating cost in steel-melting furnaces is higher for electricity than for gas, but the lower raw-material cost and lower labor cost incident to the electric process make it less expensive in the long run.

Papers were presented by C. F. Hirshfield, of the Detroit Edison Company on "Power Requirements of Japanning Ovens," by H. J. Kunz of the Toledo Railways and Light Company on "The Willys-Overland Company's Installation", by E. S. Zuck on "Electric Welding," by F. W. Dygert on "Origin of Electrically Heated Japanning Ovens" and a paper entitled "Japans and Enamels" by Mr. Donahue.

Ratio of Coal Consumption to Energy Generated.

Kilowatt-hours generated per ton of coal, by ten of the principal central stations in Massachusetts, show a wide range of results. The following were the comparative totals of energy generated, tons of coal consumed, and its cost, for year ended June 30, 1915:

Company	Kilowatt-Hours Made	Tons Coal Consumed	Kw.-Hrs. per Ton	Cost of Coal
Edison of Brockton	16,285,691	15,625	1042.28	$4.77
Cambridge Electric Light Company	15,205,260	15,251	997	4.02
Fall River Electric Light Company	14,008,335	14,871	942	3.67
Worcester Electric Light Company	32,359,570	37,462	863.26	4.14
New Bedford Company	8,356,375	10,470	798.1	3.60
Lynn Gas & Electric Company	12,755,920	16,589	768.9	3.54
Lowell Electric Light Company	13,097,151	17,299	757	4.69
Salem Electric Lighting Company	6,648,280	8,973	740.9	4.07
Haverhill Electric Company	6,992,650	9,600	728.4	4.66
Pittsfield Electric Company	5,992,160	11,758	509.6	3.92

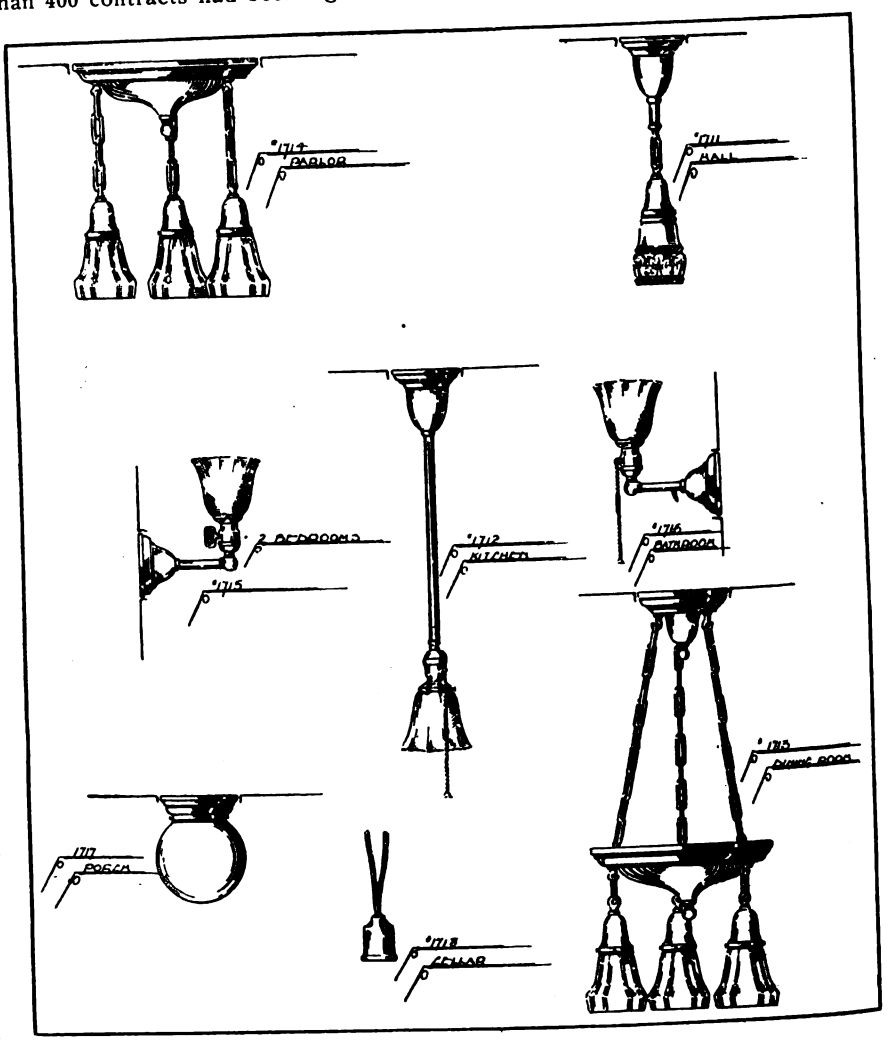
OVER 400 HOUSES WIRED IN TWO MONTHS.

Results in Providence House-Wiring Campaign.

The Narragansett Electric Lighting Company, Providence, R. I., inaugurated a house-wiring campaign about October 1. Up to December 1, more than 400 contracts had been signed up, mostly for the standard proposition of 11 outlets, 13 lights and fixtures including a six-pound iron, for $79.50, payable 10 per cent down and monthly installments of $2.98 running over a period of two years.

The agreement between the company and the house-owner prescribes that the company agrees to have installed by some reputable contractor selected by the customer the wiring and outlets with fixtures, as set forth in the contract as follows:

Dining room, living room, three lights each; two bedrooms, kitchen, bath room, cellar, hall and porch, one outlet and one light each. Kitchen and bath room fixtures to be equipped with pull-chain sockets, porch and cellar lights controlled by flush wall switches (single pole). Lamps to be: Four 25-watt, eight 40-watt and one 60-watt Mazdas. The following additions may be made to the offer:



Fixtures Furnished in Campaign.

Extra ceiling and wall outlets, each $3.75.

Extra outlets for single-pole flush switches, $4.25.

Extra outlets for 3-way flush switches, $4.75.

Extra outlets for 2-point electrolier switches, $4.75.

Extra outlets for baseboard, floor or wall receptacles, $4.25.

Extra outlets with porcelain key receptacle for basement, $4.25.

Separate circuit for heating devices, $8.25.

Pull-chain sockets, 25 cents.

Deductions:

Porch light, complete equipment, $4.95.

Cellar light, complete equipment, $4.65.

Electric iron, $1.50.

Fixture set, if personal selection is desired, $10.00.

The agreement covers old house work only.

Digitized by Google

Electrical Construction

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Using Up Slack Time.

A successful dealer-contractor believes in making work for everybody connected with his organization, if there isn't anything to be done that requires immediate attention. Just as he will give the construction men inside jobs, if nothing is available in their regular line, he sees to it that the office people have work of a sort that can be done when the regular routine slacks up somewhat.

This dealer, by the way, has developed quite a little jobbing business with small concerns in the interior of his state by means of form letters, individually typewritten, however, which are sent out exploiting different lines for which the house has the agency. These letters are not written in the regular course of business, but whenever the stenographers have leisure, they refer to the list which is used in connection with this work, and write a few letters covering the proposition which is being worked up at that time.

"I was in the office of another electrical concern recently," said this dealer, "and I saw one of the girls reading a novel. In another place, an office employee was embroidering because there was nothing else for her to do. I have stock jobs, like circular work and new-business development, to take up whatever leisure develops in my place, and the girls are always busy."

This doesn't mean that this dealer is a slave-driver, or that he wants to get work for every second of time he is paying for; he is simply a business man, and it hurts his ideas of efficiency to have loafing in the office, just as much as when the journeymen are killing time. And it's dollars to doughnuts that the girls would just as soon do the work he sets for them as twiddle their thumbs.

Watch Your Step!

General contractors, as a class, are probably higher up in the scale than they were a few years ago, and the agitation of electrical contractors and others in the mechanical end of building construction may be responsible for a good deal of the improvement. But the situation is not what it should be even yet, and the contractor who can get a job directly instead of through a general contractor is justified in doing it every time.

To show how the canny "general" works the game, an electrical concern was called up not long ago in connection with its bid of $600 on the wiring for a newspaper office.

"I want to give you that job," the contractor said, "but you're $52 out of line."

"What do you want me to do?" asked the electrical man.

"Why, reduce your bid $52," said the contractor. "You don't want me to give you that much money, do you?"

The electrical expert thought a moment, and finally said, "All right." He was told to go ahead, and did so, keeping tab on the cost of the work and finding that he was lucky to break even.

In the meantime, however, he had been comparing notes with some of the others who had figured on the job, and found that his original bid of $600 was $100 low! In other words, the general contractor had simply bluffed him into cutting off another $52 on the work, and adding that much to his own profits—which was pretty fair pay for a few minutes' telephone talk.

Of course, the contractor who took the work said, "Never again!" And now, when he is asked to shade his price so as to get down on the level with the rest, he declines to do so, politely but firmly. And most of the time when general contractors make a suggestion of that sort, they finally come back and give him the business at the full price.

"The right way to bid is to quote the rock-bottom price first," said this electrical contractor. "If you've figured right the first time, you can't afford to change your estimate later on. And if you've figured too high, you can gamble that somebody else would have got the work, and that you wouldn't have been telephoned to by the contractor."

Letter Signs in the Store.

The display of electrical merchandise is not complete without an explanatory sign of some kind, carrying the price and a little selling talk about the work that the article will do, and why it should be used in the home.

If the dealer were to go to a professional sign-painter and have these signs made up for every piece of goods he is showing, it would take more money than he would care to spend for this purpose. The result is that many dealers show the goods without signs of any kind, and it takes a person of an unusually curious turn of mind to find out much about them.

The signs are necessary, but it is not a case of going to the commercial sign man or doing without. Some youngster in the store can be taught to letter, and many a boy has a knack for this sort of work or can pick it up with a little practice. Besides, most of the Y. M. C. A.'s have night schools where lettering is taught, and it would be worth the while of the store to pay the tuition of some employee, so that the latter could attend to the work that needed to be done.

Effort of this kind will make itself felt in increased sales.

Cutting Out Waste Effort.

While the contractor who makes an effort to get every job that shows itself is to be commended for his enthusiasm, there is no getting away from the fact that in a great many cases it is bad business to spend time—which means money—trying for work which, if judgment were used, the contractor would know he had no chance to land. The wise member of the trade conserves his effort, and when he sees that the chances are against him, for one reason or another, he promptly turns to something else, without wasting mental or physical energy at a futile prospect.

For instance, there are some architects who are always figuring the cost of work which never eventuates. A good many members of this profession endeavor, legitimately, of course, to interest capitalists in the erection of buildings of a certain kind at a certain location; and as a rule, carrying out the project depends on its being done for a limited amount of money. The result is that these architects are constantly asking for bids on proposed buildings which never get beyond the blueprint stage, and the contractor who makes a point of marking such offices off his list will be the gainer. Of course, one of these "long shots" may go over, but after a little experience it is possible to determine whether the chances favor it or not.

Digitized by Google

Then, again, the contractor is likely to have calls from concerns which he knows have been dealing regularly with other firms. A sudden switch of this kind should not be productive of too much jubilation, but rather the question should be asked, "Why?" And sometimes the solution of the problem will furnish a good reason for staying off the work.

In one case a contractor who was told to submit figures on a piece of work for a concern which had never before indicated that he was *persona grata,* promptly made a few inquiries of the other houses which had been handling its business, and was told that it had proved to be unduly hard to collect accounts under five or six months. That was a sufficient tip to the contractor not to take a chance.

There are scores of other instances that every contractor can call to mind where the general line-up made it a difficult if not an impossible task to get the business. Too many good opportunities to land profitable work without excessive effort are available to warrant the good business man in going after a job where he knows that the odds are against him.

Enter Sales in Detail.

No matter whether a sale is made for cash or to be charged, it is a good plan to enter the full details of the transaction, if for no other reason than to be able to fill "repeat orders" without having to do much investigating.

For instance, a customer may buy a lamp for an automobile without knowing just what the description of the bulb is. This is almost certain to be true if the car is brought to the store and the dealer or his salesman allowed to make the change. Later on, a telephone call may be made for a couple of additional lamps of the same voltage and candlepower as those that were purchased "last time." Of course, the customer might be asked to name the model of his car, and reference then made to the lamp manufacturer's catalog to determine the correct specifications; but it is not always convenient to get this information, and the record of the previous sale is a check on the work, in any event.

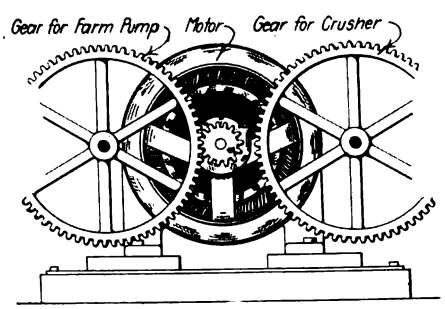
Experience has shown that many mistakes are made in connection with supplying lamps for automobiles. Sometimes the clerk finds that the lamp called for is not in stock, and attempts to make a substitution. If a lamp of lower voltage rating is used, it will promptly burn out, and the customer will insist on remembering the poor service that was given him. A lamp of higher voltage than necessary will take care of the current, but it should be explained that it is larger than necessary, and a change to the correct lamp made at the earliest opportunity.

Simple Direct Motor Drive for Two Machines.

The following method of driving either of two machines is perhaps not original nor unique, but it is a very simple and inexpensive way of accomplishing this result, which may prove of interest to electricians confronted with a similar problem.

A friend of mine had a 2.5-horsepower, single-phase motor connected to a farm water pump. He was desirous of also driving a corn crusher but did not feel like laying out the money either for a new motor or a larger one, neither did he wish a shaft, pulley and belt drive, so he asked whether he could do anything to eliminate the extra expense. He said that he could stop the pump to run the crusher, if necessary. But the pump gear was direct-connected to the pump and it seemed to require putting in a clutch of some sort.

I therefore devised the scheme as shown in the accompanying diagram. The gear of the corn crusher



Arrangement for Driving Either One of Two Machines.

was set in line and as near to the motor gear as possible without touching it when the pump was running. When the crusher was to be run, the motor was slid on its base out of mesh with the pump gear and into mesh with the crusher gear, and the crusher was driven instead of the pump. When the pump was needed, it was only necessary to slide the motor back into its original place. It could be slid on the base and controlled by the end screws, being fastened down wherever wanted, which took only five minutes but eliminated the extra cost otherwise necessary. In case it were required to run the motor in the opposite direction for the crusher, a double-throw switch could be used.

William T. Estlick.

Contractors' Convention.

The next annual convention of the National Electrical Contractors' Association will be held at Hotel McAlpin, New York City, July 18 to 22, 1916. The Entertainment Committee consists of George Weiderman, chairman; W. C. Peet, L. Freed, Lewis L. Brown, C. A. Christesen, E. J. H. Thiemer, Louis Kalischer.

The chairman of the Convention Committee is James R. Strong.

The Executive Committee of the association will hold a meeting at Richmond, Va., on February 7 and 8.

The Cost of Liability Insurance.

Lynton T. Block, attorney and manager of the Utilities Indemnity Exchange, which is operating so successfully among electrical contractors and public utilities, saving them a large part of their insurance premium, has drawn some conclusions from the report of the examination of one of the largest and best known liability insurance companies by two of the leading insurance departments in the United States, which go to demonstrate how it is that insurance through the medium of reciprocal insurance exchanges is obtained at such a great reduction in cost.

It is frequently difficult for persons not familiar with the conduct of the insurance business to understand how it is that reciprocal insurance organizations are able to effect the great savings in the cost of insurance which their experience has demonstrated results from that form of insurance.

The question is easily answered when the facts are gone into. The principles of insurance are simple and they only become difficult of comprehension when surrounded by the maze of technical terms.

Insurance companies are prone to refer to their underwriting profits as a given percentage of their total premium income, instead of figuring it upon their capital stock. Thus they will refer to an underwriting profit of five or six per cent, when in point of fact their underwriting profit when compared to their capital invested is exceedingly large.

Some interesting figures appear in the recent examination of one of the largest and best known foreign liability companies with a United States branch office, by the New York and Massachusetts Insurance Departments —the report covering the operations of the company up to December 31, 1914.

The following interesting figures are found:

Total cash deposit capital in the United States	$ 250,000.00
Total profit remitted to the Home Office in 28 years, covering entire period of its business	3,829,140.09
Average dividend per year	136,755.00
Percentage profit	54.7
Present assets over liabilities	2,632,907.97
Undivided profits, termed surplus	2,382,907.97

From the above it will be seen at a glance that the company starting 28 years ago with $250,000 deposit capital in the United States, none of which has ever been used for losses, made a profit to its stockholders, which they

Digitized by Google

have received in cash, of more than $3,800,000 and the company now has in the shape of undivided profits nearly $2,400,000, so the total operations of the company for the 28 years have resulted in a profit of $6,212,048.06, which reduced to annual percentage amounts to a net profit of 88.75 per cent of its capital each year.

It is frequently said that while insurance companies made money in years past, yet in recent years they have suffered a reaction and with difficulty keep their heads above the surface. It is interesting to note that the underwriting profit (the profit obtained from premiums collected) of the Employers' Liability Assurance Corporation for the year 1914, amounted to $436,605 or 175 per cent of its capital in this country.

It is surprising to note that well informed, keen business men are so often misled into paying high prices for insurance in the large companies, simply because those companies possess tremendous surpluses. Were they to stop and consider that these surpluses are themselves the outgrowth of excessive premium rates and that in point of fact losses are invariably paid out of premiums and not paid out of capital or surplus, they would undoubtedly avail themselves of the more economical systems of insurance.

Look down through the financial statements of the large insurance companies and it will be seen that the surplus account of all these, increases year by year except occasionally when the surplus is transferred to the capital account. There is probably no other business enterprise which bases its plea for high charges on its past accumulated profit.

Reciprocal insurance escapes many of the legitimate expenses necessary to the conduct of stock insurance companies, and this large element of profit is returned to the policy-holders of reciprocal exchanges instead of going into the pockets of the stockholders of the stock insurance companies.

Utilities Indemnity Exchange, St. Louis, Mo., devotes its time and attention to the insuring of public utilities and electrical contractors and is in a position to save them a very large proportion of their insurance premiums.

National Code Final Authority in Massachusetts.

The following order has been adopted by the Gas and Electric Light Commission of Massachusetts with respect to rules for electrical installations:

"Voted, pursuant to the provisions of Section 4 of Chapter 296 of the General Acts of the year 1915, to adopt the following rules and requirements for the business of installing wires, conduits, apparatus, fixtures or other appliances for carrying or using electricity for light, heat or power purposes in this Commonwealth, viz.: All persons, firms or corporations entering into, engaging in or working at said business, either as master or employing electrician or as a journeyman electrician, shall be governed by all the general and special laws, and municipal ordinances, by-laws and regulations, now or hereafter in force, applicable thereto, and in respect to all matters not therein expressly provided shall be governed by the regulations of the National Electrical Code, edition of 1915, as published by the National Board of Fire Underwriters on recommendation of the National Fire Protection Association, copies whereof duly attested by the secretary of said association are on file with the state examiners and with this board."

Among the Contractors.

Baltimore contractors are extremely busy and the last month indicated that most of the live wires will finish up the year ahead of their best expectations. There seems to be quite a bit of work in the small towns surrounding Baltimore and quite a few of the contractors are equipping themselves to handle this business at a minimum cost. One of the largest electrical contracts awarded there in years has been given to the Johnson-Livingston Company, of New York, for the electrical installation in the United States Industrial Alcohol Buildings, now in the course of erection at Curtis Bay. There are fifteen buildings in all.

The Blumenthal-Kahn Electric Company has also been coming in for its share of the big business that was distributed during recent weeks. This firm was awarded the electrical installation of the garage building of the International Motor Truck Company. The firm is also wiring one of the largest residences in the state. It is the home of Martin H. Smith, at Hilsmere. This job is all conduit work and included a full system of burglar alarms. The Blumenthal-Kahn Company finished the Standard Oil Company job in Cumberland recently. It took about two months to complete this piece of work, which included the wiring of the new station for tank cars. This included five buildings and all of the work between the buildings was in lead cables.

The Kingsbury-Samuels Electric Company secured the contract for wiring the new concrete building, which is now in the course of construction at Holliday and Fayette Streets, and which will be occupied by the C. J. Youse Company.

Brice and Springham were awarded the contract for installing a new generator in the Equitable Building. The contract includes the wiring and circuit-breakers, all lead-covered cables to be used.

Electrical concerns of Columbus, O., have lately closed a considerable amount of new business. The most important contract is that secured by the Erner & Hopkins Company, from the Hayes Wheel Company, of Jackson, Mich. Equipment in this plant is to be duplicated in a new plant at Anderson, Ind., the main building being 1,000 feet in length. Between 100 and 150 motors are to be installed, which will be in unit groups. The same company is replacing steam power at the Nelson lumber yards and gas at the Sowers-Leach lumber yards with 15 motors each, and is installing individual motors at the works of the Bryan Foundry Company, manufacturer of electric light standards. A 50-horsepower gas engine will be supplanted here. The three plants last mentioned are in Columbus.

The Sacket Mine Supply Company has the contract for wiring the village of Darbeyville, O., and supplying generators, switchboard and other equipment. Another piece of work for this company is a new motion-picture theater at Delaware, O.

The Avery-Loeb Electric Company will install a number of motors in the plant of the Lancaster Glass Company, Lancaster, O., and provide electric power equipment for an extension to the plant of the Preston Lumber Company, Columbus.

The business of George Kaelberer, of Mattoon, Ill., will be carried on after January 1 under the firm name of Kaelberer Brothers. The new member of the firm will be William Kaelberer. The bicycle and motorcycle department will be closed out and the Kaelberer Brothers will devote themselves exclusively to handling "everything electrical."

1915 Edition of National Electrical Code Issued.

The 1915 edition of the National Electrical Code has just been issued. In it are incorporated the revisions made last spring. The construction and installation rules up to No. 48 are printed in full. Rules 49 to 99, inclusive, covering the requirements of fittings, materials and details of construction of apparatus, are printed in condensed form, giving only a partial outline of requirements. This makes the booklet more compact, the total number of pages being 224, than would be the case if all of the detailed specifications were given in full.

The Massachusetts Electrical Contractors' Association has appointed J. E. Wilson as a special representative to travel in that state and build up the organization.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

NEW JERSEY.

Newton Gas and Electric Company. The receiver of the Newton Gas and Electric Company applied for authority to put in effect a new schedule of rates with a maximum rate of 20 cents per kilowatt-hour. The present schedule of the company provides a maximum rate of 15 cents per kilowatt-hour.

The Board bases its estimate of the cost of reproduction new of the property upon comparisons, using data from appraisals which have been made from time to time by the Board's engineers.

A number of tables are included in the decision comparing the company's statistics with those of other companies, where the conditions are somewhat similar. Such comparison shows that the operating ratio of ten companies averages 66.79 per cent, while the operating ratio of the electric department of the Newton Company is 61.24 per cent. The gross revenue of the Newton Company per kilowatt-hour sold is lower than with a large number of companies, and the operating expense is about midway. Analysis of the relations between peak load and capacity of plant for fourteen companies shows an average rated capacity of 190 per cent or a 90 per cent overload capacity. The Newton plant is found to have a rated capacity of 265 per cent of the peak load. Newton has 55.6 customers per thousand, while a simple average of four towns of about the same population gives 68.3 customers per thousand.

No dividends have ever been paid on the company's stock, but interest has been paid on the outstanding bonds up to the time of the receivership. The Commission finds that the property has been overcapitalized since a consolidation in 1901, to such an extent that the inability to pay dividends on stock is no indication of the lack of earning power under the existing rates.

The Commission also finds that investments have been ill advised and that the service has not been adequate and satisfactory.

The decision says: "The Board is satisfied that the lack of revenue is not to be attributed to insufficiency in the rates charged per unit of energy. An increase in rates does not always bring a greater revenue. On the contrary, greater revenues are frequently obtained by a reduction in rates. The allegations of the citizens of Newton with regard to poor service are borne out by the facts, and the claimed insufficiency in revenue is largely attributable to inefficiency in service. Improvement in character of service may reasonably be expected to result in an increase in revenue without increase in the rates. . . .

"The insufficiency of return does not indicate under the circumstances here, that the existing rates are unjustly and unreasonably low, but rather that there is a want of a reasonable degree of development even under the existing rates, which can be accounted for by the long continued inefficient operation and service."

The receiver contends that without the proposed increase in rates, further improvement in service cannot be made.

The Board concludes, however, that the application for the increase has not been sustained. "The people are entitled to a safe, adequate and proper service at just and reasonable rates. The company is entitled for the rendition of such service to a fair return upon the reasonable value of the property devoted by it to the public use.

"Long continued and patient effort by the Board and its engineers to secure for the community the character of service to which it is entitled, has resulted in some improvement, but the service rendered falls far short of a safe, adequate and proper service. . . .

"It seems impossible, therefore, to secure for the community the service to which it is entitled at just and reasonable rates as long as operation continues with the receiver.

"In this situation, in view of the duty of the utility as to service, the financial interests of those holding the securities of the company must give way to the rights of the community.

"In the judgment of the Board, the problem admits of but one solution, and that is the sale of the property in the chancery proceeding.

"Through such sale, a purchaser may, perhaps, be found who, paying a reasonable price for the plant, and investing the added money required for its readjustment, will be able to furnish the community a satisfactory service at a reasonable rate."

In addition to finding that the proposed rates are excessive the Commission finds that the form of rates is objectionable. Certain of the rates are regressive. The minimum charge, in accordance with the proposed new schedule would vary with the connected load. The Board states that a flat minimum charge is preferable, and approves the provision in the present rates of the company of $1.00 per month.

WISCONSIN.

The St. Croix Telephone Company. The Commission ordered a readjustment of the rates of the St. Croix Telephone Company. The new rates are, $1.50 gross or $1.25 net per month for single-party telephones, $1.40 gross or $1.15 net for two-party telephones, and $1.25 gross or $1.00 net for four-party telephones.

The Village of Fennimore applied for authority to increase its electric rates. A complaint was subsequently filed with the Commission, signed by 26 citizens of the village, alleging that the rates of the municipal utility are discriminatory and its service inadequate. The two matters are considered together in the Commission's opinion and order.

The Commission determines a net revenue sufficient to cover interest of 4.5 per cent on the portion of the bonds now outstanding, depreciation and taxes.

The Commission says: "In addition to interest, it is imperative that some provision should be made for renewing the plant when it becomes worn out. In other words, some reservation should be made out of revenues to take care of the accrued depreciation. Up to the present time, this has not been done, although there is evidence that the utility will need some of the funds which should have been accumulated in the past. In the instant case, it seems that at least 4.5 per cent on $12,000 should be so provided annually.

"Taxes to an amount equal to that the utility would pay if it were operated by private persons also should be covered by the annual revenue.

"The taxpayers of the village could, as a matter of equity, demand that the rates should be high enough to yield a reasonable return on their entire investment."

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 315.—Motor-Driven Motion-Picture Machines.—About what percentage of our large cities having over 100,000 population permit the use of motor-driven motion-picture machines?—S. P. L., Topeka, Kans.

No. 320.—Distribution Losses.—I have noted the article in your November 13 issue, giving the distribution losses of the Pacific Power & Life Company. In the average town of from 5,000 to 15,000 population, with three-phase distribution at 2,200 volts primary to 220-110 volts secondary, about what distribution loss, in per cent, does good practice call for? In actual practice, what *are* the average small-town distribution losses in per cent? —F. A. G., Columbus, Neb.

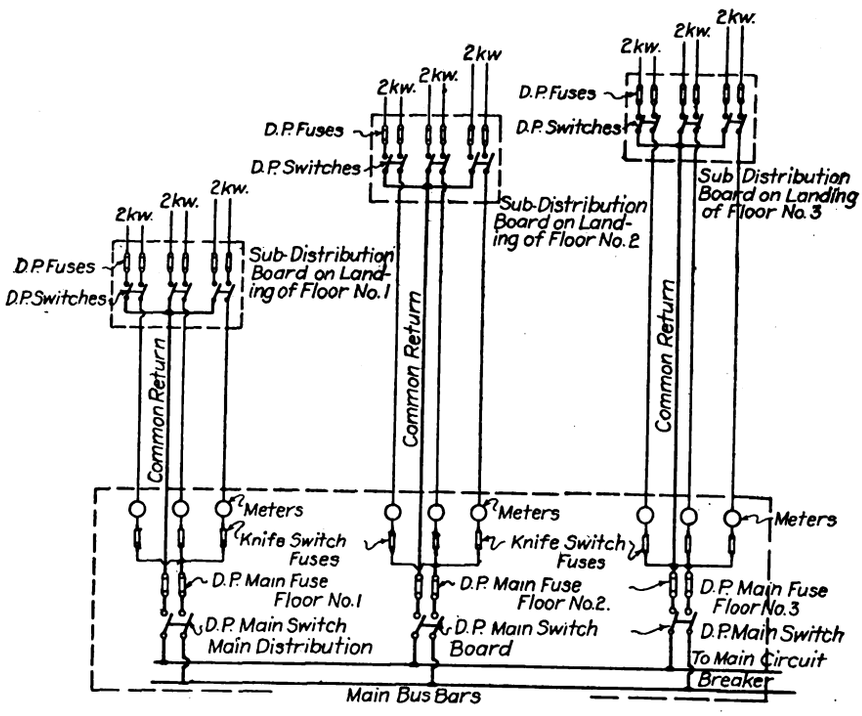
No. 321.—Co-operative Meter Reading.—In one of the large cities I have observed that both the gas company and the electric company send out their inspectors to read meters in several districts on identically the same day. Both these companies are active competitors, although there is a community of interest among them. The electric company has been proclaiming that it practically serves its residence customers at a loss, due to the high cost of meters, meter reading, billing, etc. It seems to me that by uniting the meter-reading work in a single crew the cost of meter reading would be materially reduced. Now what I would like to know is whether any state utility commissions have passed on this point, namely, allowing competing utility companies to co-operate on meter reading for the joint benefit of both the companies and of their customers, most of which are in common.—A. Z., Spokane, Wash.

Answers.

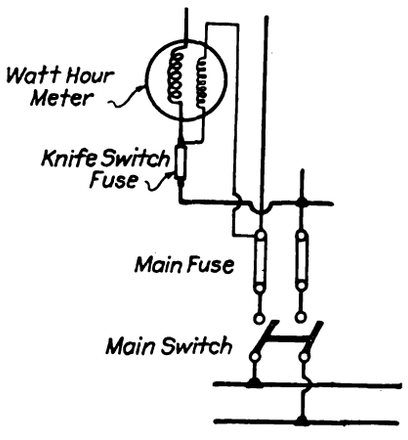
No. 317.—Wiring for Electric Ranges.—In wiring an apartment building for electric ranges, each of which has a maximum possible load of two kilowatts, what is the best arrangement of the special range circuits so as to economize wire and reduce the voltage drop to the minimum? Meters to be in the basement. —D. A. T., Chicago, Ill.

The proposed arrangement of the meters in the basement does not lend itself to the cheapest way of wiring, though no doubt the extra expense involved by the additional number of wires required will be compensated by greater convenience of meter reading, inspection, etc.

In order to save on labor and material it is proposed in the attached wiring layout to use one common return for all cooking ranges on one floor which can be conveniently controlled from one subdistribution board. As will be seen, each of these circuits is controlled by one double-pole main switch with double-pole main fuse on the main distribution board in the basement. For convenience of drawing only three cooking ranges have been combined on one subdistribution board, though this number may be increased according to the local conditions. In the main layout the connections are shown for ampere-hour meters, which should be sufficient; a small detail sketch shows the connections in case watthour meters are preferred.


2kw.
D.P. Fuses
D.P. Switches
Sub-Distribution Board on Landing of Floor No. 1
Sub-Distribution Board on Landing of Floor No. 2
Sub Distribution Board on Landing of Floor No. 3
Common Return
Meters
Knife Switch Fuses
D.P. Main Fuse Floor No. 1
D.P. Main Fuse Floor No. 2.
D.P. Main Fuse Floor No. 3
D.P. Main Switch Main Distribution
D.P. Main Switch Board
D.P. Main Switch
To Main Circuit Breaker
Main Bus Bars

No. 317.—General Wiring Diagram for Apartment-House Range Circuits.



No. 317.—Detail of Meter Connection.

The voltage regulation can easily be kept within three per cent, which is sufficient for all practical purposes. As the diversity-factor of cooking ranges in one house can easily be 100 per cent, which means that all ranges on one floor or of one circuit may have this maximum demand of two kilowatts simultaneously, the cables will have to be dimensioned for this demand. The voltage, the cable runs (distances), the number of floors, and the number of ranges have not been stated. To meet most conditions the table on next page gives required information of minimum cable sections to be used. All wires are to be stranded, the gauge numbers used are the corresponding numbers of solid wires of equal section as the stranded wires required. No cable must be smaller than equivalent of 12 B. & S. for 110 volts and 14 B. & S. for 220 volts serving one cooking range. The limit is given by the heating and not by the distance. If therefore any cooking range is only 10 yards from the main board for 110 volts or 12 yards for 220 volts the voltage will be 1.5 per cent higher than the cooking range at the far end of the circuit. This difference is too small to prove of any inconvenience.

In all other respects the wiring table in connection with the layout will give all the information asked for.—J. J. W., East Liberty, Pa.

A stove requiring two kilowatts, or approximately 20 amperes at 100 volts, could be operated successfully with No. 10 wire, if not over 50 feet from meter. Where more than 50 feet distant No. 8 wire would be necessary so as to avoid a serious voltage drop. Many electric stoves have separate circuit fuses for

Digitized by Google

WIRING TABLE FOR COOKING RANGES, EACH CONSUMING 2 KILOWATTS.

Mean distance of cooking range from main board in basement.	Cable Sections for 110 Volts. Size of single leads from main distribution board through sub. distr. board to individual range at 18 amperes.		Sizes of common return cable from main board to branch board, according to No. of cooking ranges to be served by one subdistribution board. 3 ranges, 54 amperes.		4 ranges, 72 amperes.		5 ranges, 90 amperes.	
Yards	B. & S.	Sq. in.	B. & S.	Sq. in.	B. & S.	Sq. in.	B. & S.	Sq. in.
20	12	0.00515	7	0.0162	6	0.0206	5	0.026
32	10	0.0082	5	0.026	4	0.0326	3	0.041
50	8	0.0128	3	0.041	2	0.052	1	0.0655
	Cable Sections for 220 Volts (as Above, but Only One-Half Amperage)							
Yards	B. & S.	Sq. in.	B. & S.	Sq. in.	B. & S.	Sq. in.	B. & S.	Sq. in.
24	14	0.0032	9	0.011	8	0.0128	7	0.0162
40	12	0.00515	7	0.0162	6	0.0206	5	0.026
60	10	0.0082	5	0.026	4	0.0326	3	0.041

No. 317. (First Answer.)—Table of Cable Sizes for Electric Ranges.

each element, but if this is not the case, a distribution cabinet could be placed directly back of, or near the stove and each element's leads run to a separate cutout in said cabinet. This is about as economical, as well as convenient, a method for electric stove wiring as could be installed.—B. W. C., Detroit, Mich.

No. 318.—National Electrical Code Changes.—On what date do the changes made in the National Electrical Code every two years go into effect? I have been told it is on January 1 following the year of revision; others have told me different dates and I have even been told there is no fixed date.—C. C., New Haven, Conn.

The Electrical Committee of the National Fire Protection Association, under whose supervision the National Electrical Code is revised biennially, has no authority to state at what date the provisions of the new Code shall be in force, as this is a matter entirely in the hands of the various inspection authorities. Some authorities will undoubtedly allow more time than others for contractors to familiarize themselves with the new provisions, but the date is entirely in the inspection department's hands and is not a matter which the committee may decide.—R. S., Boston, Mass.

No. 319.—Center Suspension of Street Lamps.—In what cities in this country, if any, is there used to any extent the system of suspending street lamps over the center of the street by means of cables between the opposite houses, no posts at all being used? This method is very successfully used in London and some other European cities, but to my knowledge little or not at all here. What is the objection to it?—P. N. V., Albany, N. Y.

To my knowledge this method of mounting street lamps is not standard in any American city. It is used occasionally where special conditions require the complete absence of poles, as around freight docks or railroad freight stations where poles would impede the free movement of trucks and delivery wagons. The very congested and evenly built up condition of many narrow streets in the oldest large cities of Europe accounts for the use of this system there. Aside from the complete absence of poles or posts, the advantage of this method of lamp suspension is the very excellent light distribution it permits; the lamps being hung high over the middle of the street give an exceptionally uniform illumination over the entire pavement and both sidewalks, also lighting up practically the entire building fronts, since these seldom exceed five or six stories.

In American cities the streets are usually wider than the old streets, at least, in European cities. There is no such uniformity of building construction. Even in the downtown districts of our large cities one frequently finds comparatively low buildings, one, two or three stories, among the very high ones; these would constitute irregularities in any attempt to attach supporting cables at a uniform height of 25 or more feet. Building owners would also object here very strongly to what they would claim to be "defacing" or "endangering" their structures. Such cables are really an impediment to the work of firemen. They also are not attractive. Trimming of the lamps is not so readily done as with post mounting. Except for narrow streets in which the buildings are solidly and uniformly built up close to the sidewalk, this method of mounting is impracticable. If center suspension is desired, it can be secured by stretching the cable between posts opposite each other at the curb, as is done in many American cities and towns. The most handsome effect is obtained, however, by mounting the lamps on more or less ornamental posts either at the curb or on islands or a parkway in the middle of the street.—D. O. R., Hinsdale, Ill.

Telephony on Aeroplanes.

In *La Lumière Electrique* a description is given of a new telephone outfit which has been devised for the use of the pilot and passenger in an aeroplane. The noise of the wind and the propeller renders conversation in the ordinary way impossible. The equipment consists of a head-set with two watch-type receivers, which are closely applied to the ears, and a special type of transmitter which is worn on the breast under the clothing. The apparatus is connected by flexibles and plugs to a battery of three dry cells capable of maintaining communication for 100 hours. It is stated that conversation can be carried on no matter how great the noise of the air and the propellers.

Boston Edison Company's Automobile Garaging Plan Recommended for City.

In a report of the Finance Commission, City of Boston, the present methods of garaging automobiles, and the private uses of the public cars, are severely criticised, and the plan of a central garage in charge of a responsible official is strongly urged upon the city government.

The Commission cites the practice of the Boston Edison Company as being efficient and free from the possibility of abuse. This company, it says, operates about 175 passengers and commercial cars, which are used in a territory 50 miles long and about 25 miles wide. Supervision of their maintenance, custody and use is exercised by the head of the transportation department, who purchases supplies, orders repairs and operates the cars under his direction. Accounts are kept in detail to permit of ready comparison of upkeep costs of each car.

A central garage at the Service Buildings houses 75 cars, these being for service in Boston and nearby territory. A repair and cleaning force is kept busy night and day. Every repair man is taught to drive, so as to have reserve chauffeurs if needed.

Fifteen touring cars formerly assigned to the exclusive use of officials are now garaged at the Service Station. The rules provide that whenever an official wishes to use a car he takes it from the company's garage and is charged a fixed rate per hour and per mile. The cost of each trip is charged to his department. Car dispatchers are in charge of the garage, and alternate on duty day and night. During business hours a starter is stationed at the main Head Place office, to which each morning four or five cars are sent.

Wireless Relay Invented.

An instrument which is capable of relaying or automatically recording wireless messages has been invented by Ray E. Hall, of Portland, Ore. The wireless signals actuate a diaphragm in a current of air, and this controls a local circuit which can be used for actuating a tape recorder or for repeating the message over a telegraph line. Accurate tuning is required, after which the instrument operates automatically and selectively, eliminating static distrubances to a large degree.

Digitized by Google

ELECTRICAL PROSPERITY WEEK SCORES BIG SUCCESS.

First Returns from Every Section of the Country Assure Society for Electrical Development That the Industry Has "Cashed In" Upon This Great Achievement. Manufacturers and Dealers Enthusiastic. Central-Station Interests Endorse the Movement.

It is as yet too early to be possible to give a complete report on how the electrical interests and merchants in the various parts of the country profited by Electrical Prosperity Week which was brought to a close on December 4. The information now at hand, however, shows that the celebration not only met, but exceeded all that was expected of it.

The Hurley Machine Company, of Chicago, manufacturers of electric washers, reports sales of material to the amount of $100,000 as a direct result of the celebration.

The Edision Electric Illuminating Company, of Brooklyn, in addition to securing many contracts as a result of its special wiring campaign, made daily sales of electrical appliances during the celebration which greatly exceeded the normal business.

The following telegram received by the Society for Electrical Development from Hot Springs, Ark., under date of December 3, shows how the commercial interests of that city profited from the celebration:

"Electrical Prosperity Week in Hot Springs reached a fitting and enthusiastic climax last night when city turned out to witness electrical parade and attend festivities in honor of the Week. From both commercial and educational standpoint it has been a great success. Interest and participation in celebration has been such as to give the strongest evidence of confidence in commercial prosperity.—Business Men's League."

Lamp manufacturers encountered a record influx of orders for flood lamps, to be used for the celebration purposes, which far exceeded their stock on hand.

The Newark office of the Public Service Corporation, of New Jersey, sold out its stock of appliances before the end of the week.

The United Electric Light and Power Company of New York was taxed to the utmost to meet the unprecedented demand for appliances.

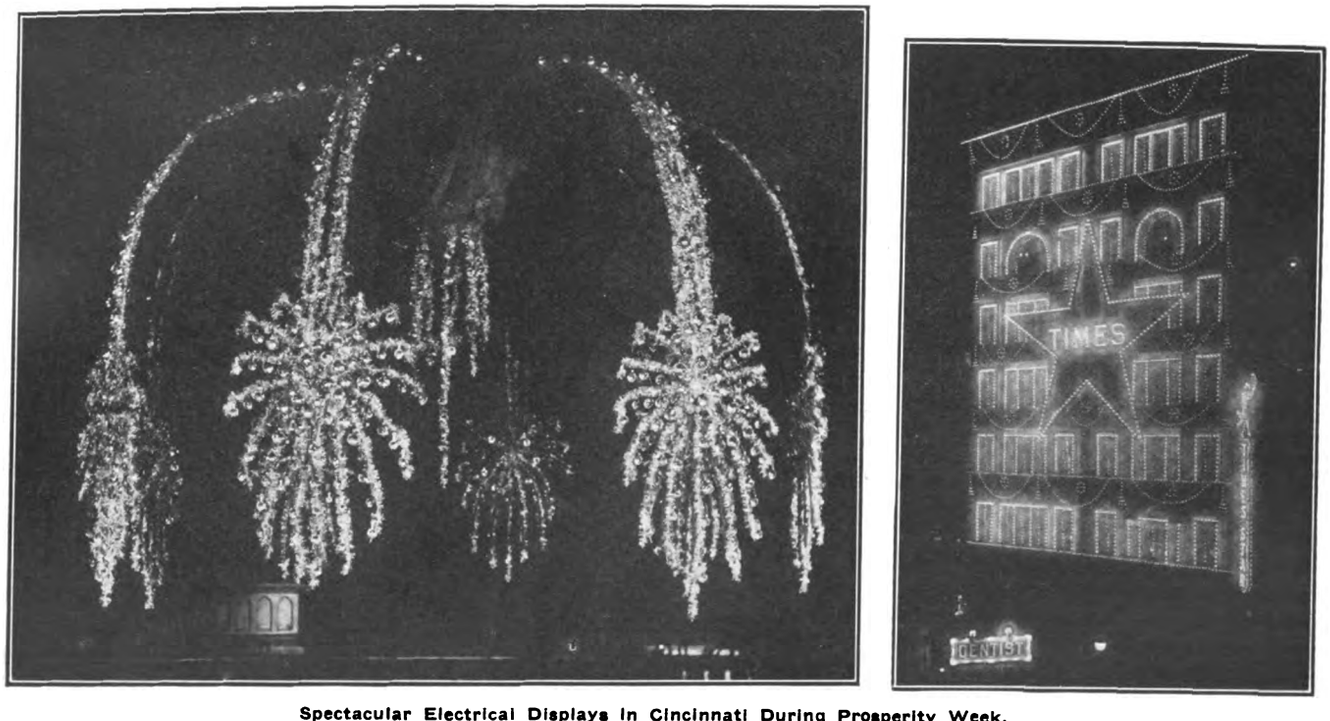
A prominent official of the Philadelphia Electric Company writes: "It will be of interest to you to know, I believe, that the Electrical Prosperity Week Celebration—during the entire period—has been so successful in Frankford that the merchants are extremely anxious to retain the special electrical displays and decorations until the first of the year. They state that their business, day by day, during the week, has been greater than that of any corresponding week in their history. We are getting the credit for most of this."

Great success attended the celebration in all parts of the country. Many merchants and electrical interests yet to be heard from have undoubtedly "cashed in" on the Week in a highly profitable manner.

Most of the features planned for the celebration were carried out in a highly entertaining and effective manner. The many electrical shows throughout the country were especially successful.

Boston, Mass.

In Boston the celebration was opened with an illumination of the front of the State House by flood lighting. Three batteries of electric lamps in powerful reflectors placed on public buildings projected their rays upon the white front of the building illuminating every nook and corner giving an extremely attractive effect, especially, when viewed from a little distance away. The illumination was repeated every night during the week. Another interesting feature of the cele-



Spectacular Electrical Displays in Cincinnati During Prosperity Week.

Digitized by Google

bration was a street parade of commercial electric floats, exemplifying the application of electric vehicles. Many other features of unusual interest made the celebration highly entertaining to the public.

Waycross, Ga.

In Waycross, Ga., among the many features of the celebration, several parades were held. The largest pageant of the Week was held Friday night, when industrial and agricultural floats participated. Mayor Beaton headed this parade. Fun and merriment were the order of the day from morning till midnight. The celebration was concluded by a Labor Day celebration in which the local unions actively participated. A final fire-works exhibition was given on Saturday night.

Pittsburgh, Pa.

Pittsburgh, Pa., was extensively illuminated for the celebration. Fifth Avenue for many blocks was ablaze with festoons of lamps, both across the street and along the buildings. These festoons were artistically arranged and carried huge shining stars suspended high above the center of the street. At intervals the blazing words Electrical Prosperity Week appeared. The merchants and other commercial interests of that city also co-operated actively towards the success of the Week by arranging highly attractive window displays and other special features.

South Bend, Ind.

The Electrical Prosperity Week Show held at South Bend, Ind., was said to have been the greatest exhibition of its kind that South Bend has ever had the opportunity of seeing. Thousands of dollars worth of electrical machinery and power devices of all kinds began to operate in the Inwood Building, at South Michigan Street, with the opening of the show. Immense crowds of people attended. Valuable articles were given away, and music, motion pictures, and other entertainments were provided in addition to many other attractive features. All conveniences that have anything to do with electric current were provided for the people at the show.

Asheville, N. C.

In Asheville, N. C., the merchants of the city gave their support to the Week by arranging attractive display windows. Passersby could see everything in the way of electrical machinery, including toy trains on diminutive railroad tracks electrically driven, electric cooking appliances, electrically driven adding machines, and electric cleaners. The windows clearly demonstrated that anything that can be done by any other power can be accomplished through the use of electricity.

The concluding event of the Week was a great electrical parade which was given on Thursday night. Heading this parade was Electra riding in her electrical chariot. Her chariot was one of the most beautiful sights of the parade. Another prominent feature of the pageant consisted of dozens of electrically driven vehicles. These were followed by floats showing the various stages in the making of electricity and electrical appliances which are used with the mysterious

Views of Electric Show Held in Cincinnati

Digitized by Google

current. The Asheville Light and Power Company held open house Friday from 6 to 10 p. m. The officials of the company were on hand to explain the manner in which electricity is conducted from dynamo to the home of the user. The Asheville Telephone Company also observed open house every afternoon from 2 to 5 o'clock, explaining how the public is served by means of the telephone.

Rock Island, Ill.

"The History of Electrical Development," presented in a masterly address by George Loring, was a feature of the meeting held on December 1, by the Rock Island Rotary Club. John T. Marrow, the well-known electrical contractor and manufacturer, and prominent member of the National Electrical Contractors' Association, presided.

Peoria, Ill.

The Peoria Electric Club held an electric show at the Coliseum, the week of November 29 to December 4, to celebrate Electrical Prosperity Week. The building was secured from the city free and the Central Illinois Light Company gave the necessary current free, so no charge for admission was made. Twenty-five thousand people visited the show during the six days and evenings it was open. There were 23 booths and all were taken by local concerns, so it was strictly a Peoria show. The show was open from 2:30 to 10:00 p. m., after which there was a half-hour's dancing. Each evening something different was on the program and this kept the people coming.

Views of Electric Show Held in Peoria, Ill.

The booths were arranged under the balcony and were of a uniform size, 10 by 16 feet. The Central Illinois Light Company took the stage and one of the illustratious shows to what advantage it was used. In the center of the hall a booth was built and a lattice roof covered with vines made an attractive booth for the club.

In front of the stage the engineering corps of the Central Illinois Light Company gave exhibitions of high-frequency discharges and on some of the evenings the X-ray apparatus was connected. In the booth in the center an electric orchestrion was installed and was run continuously.

All of the local dealers and contractors made exhibits and those who have stores showed the goods they handle, and made demonstrations. The cost to each exhibitor was small and twice during the Week the local newspapers ran electric pages or parts, which helped to create a great amount of enthusiasm among the citizens, who turned out in large numbers to visit the show.

This was the only show in the state and it was the best thing that the electric club or electric men have done to help along the electric business in Peoria. Friday noon the Rotary Club and the Association of Commerce had a meeting with the Electric Club. A box lunch was served and 250 were present. The Central Illinois Light Company served the coffee and as it was also Illinois Day it made a very enjoyable meeting.

Some of the booths, which attracted considerable attention, are shown in the accompanying views.

Digitized by Google

Cincinnati, Ohio.

Electrical Prosperity Week in Cincinnati was featured by an elaborate electrical show, held in Music Hall, one of the largest buildings of its sort in the country, and participated in by over a hundred exhibitors, including the local public service companies, and representing all of the leading manufacturers of electrical equipment and appliances. The Union Gas and Electric Company, as the Cincinnati central-station company, naturally took a leading part, with its subsidiary company, the Union Light, Heat and Power Company, serving the Kentucky towns across the Ohio; while the Cincinnati and Suburban Bell Telephone Company and the Cincinnati Traction Company were also prominent.

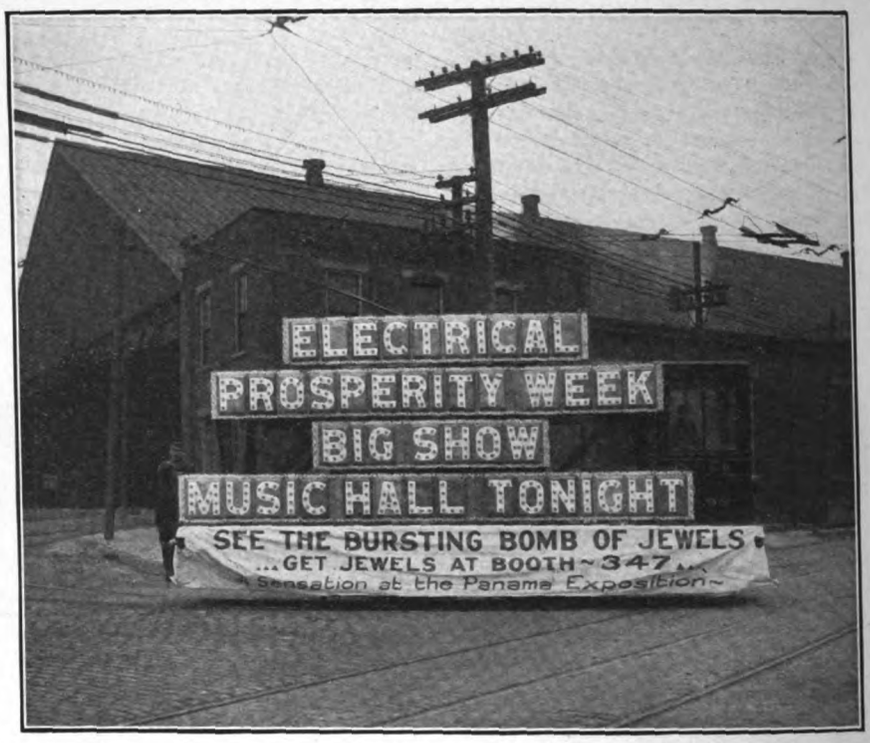
The success of the show, and the extent of public interest in it was such as to astonish the most optimistic of its promoters, and indicates that the electric era in Cincinnati has just begun. The consumption of electric current in and around the city has heretofore been relatively slight as far as the domestic user is concerned, on account of the availability of cheap natural gas; but the interest displayed in the extensive exhibit of electrical goods, and in the almost infinite uses of current in the modern home and factory, have already borne fruit in a heavily stimulated demand for electrical goods, according to exhibitors at the show.

The show was planned and conducted by the Cincinnati Electric Show Company, which was incorporated some time ago by local electrical interests for the purpose of conducting this and subsequent annual exhibits. Stock was allotted to members of the company on the basis of their space requirements, paid for, however, in cash; and while the profits expected were rather in the nature of the general benefit to the industry than in actual money, the amazing success of the show, which was attended by between 28,000 and 29,000 people who paid cash admissions, will enable the payment of handsome dividends on the investment of the exhibitors.

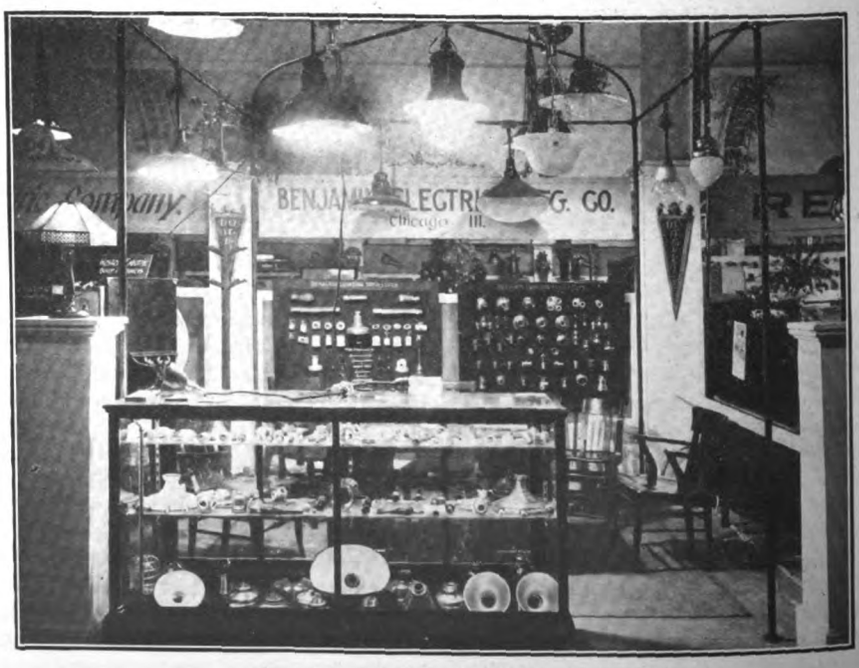
The success of the affair was no doubt largely due to the hearty cooperation of all elements interested, including the press, and the clever advance publicity campaign conducted on behalf of Electrical Prosperity Week in general and the show in particular. Advertising space was used in the street cars, in windows of electric and other shops, and on billboards, while the telephone and electric companies called the attention of their patrons to the coming event when mailing bills.

In addition to this, special illumination of Fountain Square, in the very heart of the city, was provided by the show company, in the form of four brilliant clusters of lights, suspended high above the square, and illuminating a cluster of flags hung above them, respectively. Each cluster consisted of a circle of eight 18-inch globes, containing each a 1,000-candlepower lamp. The installation was so generally admired that it will probably be retained permanently, the plan being to pay the company its actual cost and leave the clusters in place.

An electric fountain was installed on the square, also, about two weeks in advance of the show, by the Federal Sign System, which donated this to the success of the week's celebration. The fountain, which was operated by a Reynolds flasher to give the effect of constantly running water, was itself 11 feet in height, being mounted on a base 16 feet high, on both sides of which a sign constructed of porcelain enameled steel letters gave notice of the coming of Electrical Prosperity Week, and during the show, of the exhibit at Music Hall. The sign and fountain were illuminated by means of 1,000 Mazda lamps. A similar sign, mounted on a flat car, advertised the show in a novel manner during the week, being run all over the city, and going far toward justifying the proud claim of the


ELECTRICAL
PROSPERITY WEEK
BIG SHOW
MUSIC HALL TONIGHT
SEE THE BURSTING BOMB OF JEWELS
...GET JEWELS AT BOOTH ~ 347 ...
~ Sensation at the Panama Exposition ~

Electric Trolley Car Which Advertised Cincinnati Show.



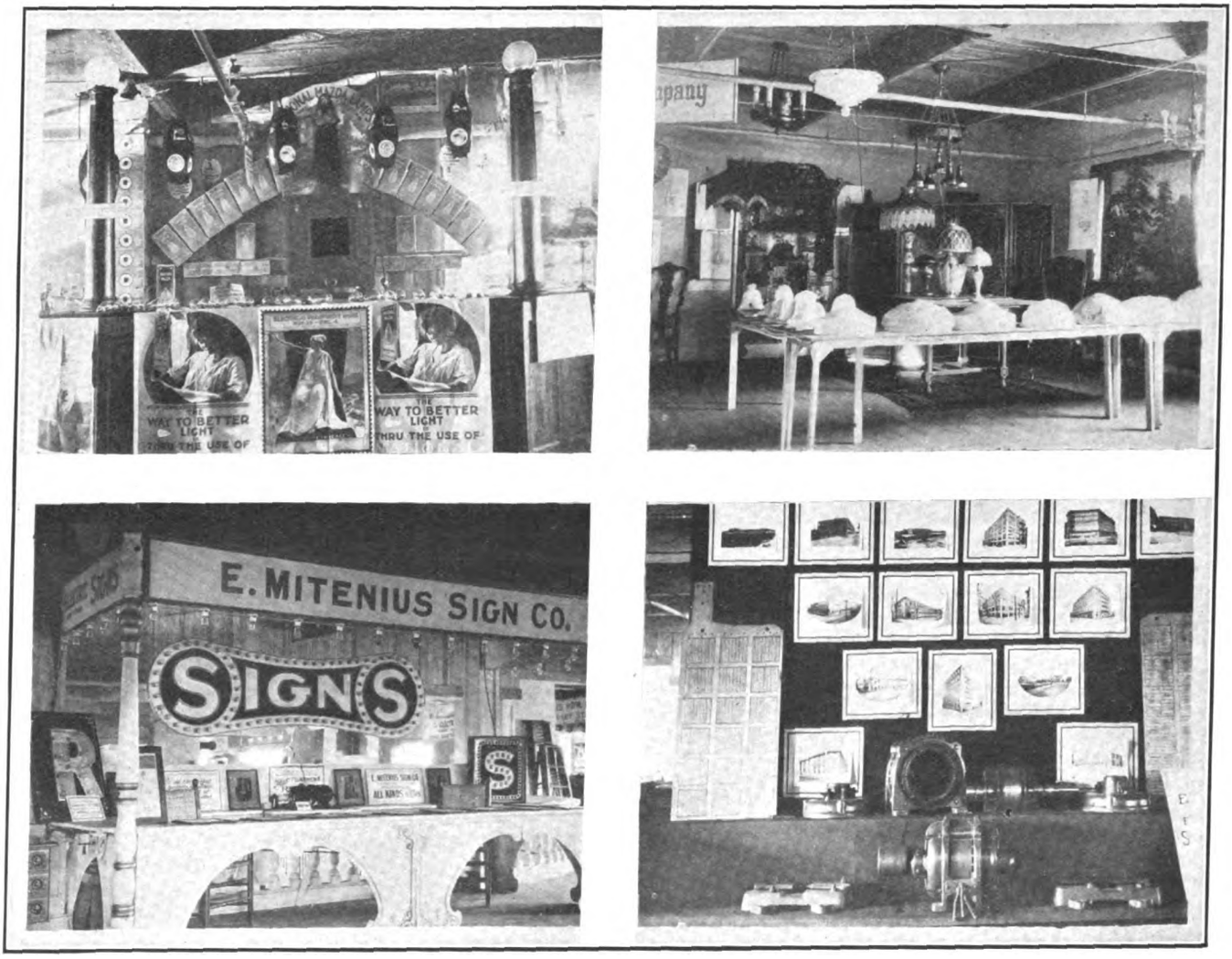
Benjamin Exhibit at Cincinnati Show.

Digitized by Google

management of the show that very few people in or around Cincinnati did not know what was going on.

The show was formally opened on the afternoon of November 29, over the transcontinental telephone line installed by the American Telephone and Telegraph Company in the main auditorium of Music Hall, by President C. C. Moore, of the San Francisco Exposition. President Moore's remarks, which were heard by 800 persons by means of individual receiver sets invoice and showing the persons of Alexander Graham Bell, Thomas A. Watson, who heard the first telephone message, and other famous personages in the history of the telephone. Interest in the telephone exhibit was perhaps greater than in any other feature of the show, and there was always a large crowd waiting to obtain entrance to the auditorium for the next series of talks and pictures.

The number of exhibitors and the infinite variety of the displays made Power Company, and the Electric Shop demonstrated continuously the wide application of electricity to everyday use in the home, was probably as interesting as any exhibit of the sort ever prepared. At considerable expense and with infinite pains, under the direction of Manager R. E. Flower, of the Electric Shop, who handles the electrical appliance business of the companies referred to, an indoor bungalow was constructed, consisting of garden, living room, dining room,



Views of Electric Show Held at Providence, R. I.

stalled by the company, the largest number ever before installed in connection with the transcontinental line for an affair of this sort, were responded to by President W. W. Freeman, head of the Electrical Show Company and of the Union Gas and Electric Company. The mayor of Cincinnati later took the line and talked with the Ohio Commissioner at the Exposition.

The local telephone company exhibited during the show, in connection with the daily demonstrations staged by means of its transcontinental lines, the famous moving pictures showing the construction of the line, with talking-pictures reproducing the was such that it is virtually impossible to give an adequate idea of the extent of the show, in any detail. As stated above, all of the leading manufacturers of electrical appliances were represented, either individually or through local handlers of their goods, including the General Electric Company, the Western Electric Company, the Allis-Chalmers Company, the Westinghouse Electric and Manufacturing Company, the Walker Vehicle Company, the Warner Elevator Company, the Otis Elevator Company, and many others.

The electric bungalow, by means of which the Union Gas and Electric Company, the Union Light, Heat and kitchen and laundry. These rooms were open to the aisle, being concealed by means of curtains whenever desired.

The "Home Electric," as it was called, was inhabited during the show by a young couple indicated as "Mr. and Mrs. Edison, Jr.," who demonstrated thoroughly to interested crowds how to keep house with electricity. They were served by a colored cook and a French maid. The former prepared in the electric kitchen, where an electric range had the place of honor, a full meal twice a day, the maid serving it in the dining room. Later, the dishes were washed in an electric dish-washing machine. The couple received their friends in the

Digitized by Google

garden under a pergola, near the pretty electric fountain, and had a chafing dish party, or popped corn in an electric popper. Dancing to the music of an electrically-operated Edison phonograph was also a popular part of the program in the electric bungalow. All of the rooms were warmed by electric heaters, and handsome fixtures and floor lamps gave light, while electric fans kept the air in circulation.

Daily a demonstration of house-wiring was conducted, serving to show not only the facility with which such work can be done, but the attractiveness of an offer now being made by the Union Gas and Electric Company, under which it wires a kitchen, with a drop-light and iron plug, and furnishes an electric iron and an ironing board, for $19, payable at the rate of $1 a month. The demonstration consisted of a visit by a salesman, who explained this offer, and was shortly followed by a man who did the wiring in a jiffy.

A money-washing outfit, consisting of electrically-operated washer and mangle, which laundered soiled currency and returned it as good as new; several exhibits of electric toys and electrically-lighted Christmas trees; a miniature kitchen outfit, operated by two misses of five and seven, respectively, with the aid of a "Western Electric, Jr.," range; the exhibits of the Navy and Marine Corps, attended by detachments of uniformed men under the command of non-commissioned officers; a wireless outfit, in charge of Cincinnati high school students, in constant communication with nearby cities; demonstration of motor-construction and of machine-tool work; "daylight" moving pictures, showing the manufacture of heavy electric machinery in the General Electric Company's plants; and other displays, may serve to indicate the comprehensive nature of the show.

It was in no sense merely an appliance exhibit, as this outline will serve to show, but a complete electrical exposition, showing every possible application of current up to date, and serving as the most complete proof possible of the indispensability and daily usefulness of electricity. This fact, coupled with the heavy attendance and undoubted public interest, indicate the certainty of a very considerable expansion of electrical consumption in Cincinnati, especially by household users of current.

One of the most pleasing features of the week's celebration, from the standpoint of members of the electrical industry, was the great Jovian rejuvenation held at Music Hall on December 1, with Thomas Wynne, of Indianapolis, Jupiter of the National Order, as the guest of honor and principal speaker. Prof. A. M. Wilson, of the University of Cincinnati, who is now Cincinnati Statesman, was toastmaster on this occasion, while B. M. Downs, Statesman-at-large, was another guest. More than fifty initiates were taken into the Order, which has taken a new lease on life in Cincinnati, and is to have a future of unusual activity, due largely to the interest awakened by the success of the week's celebration. About 200 members and guests participated in the rejuvenation and were seated at the dinner in the Music Hall restaurant.

The show was open from 11 o'clock in the morning to 11 o'clock in the evening, every day from November 29 to December 4, the closing day. As stated above, there were over 28,000 paid admissions, with some thousands of others. The admission charge was 50 cents, but the exhibitors were permitted to distribute to friends and customers coupons which reduced the charge to 25 cents, and these were extensively used, especially after news of the attractiveness of the show had spread and public interest was at its height. The charging of this relatively high fee for admission served the purpose of keeping the size of the crowds within reasonable bounds—jamming the building regularly, however—and of giving it a much higher character than would have been seen at a free display. This factor in itself insures extensive benefit to the industry in Cincinnati from the show and the week's celebration as a whole.

Cash prizes were awarded for the best decorated retail stores in the city during the week, and the Devere Electric Company received first prize, the Shannon & Sokup Company second prize, and The Electric Shop, of the Union Gas and Electric Company third award. Decoration was quite general, and gave the city a festive air which aided largely in helping along public interest.

The most conspicuous outside illumination in Cincinnati in honor of Electrical Prosperity Week was that of the Times-Star Building, seven stories in height, which was obtained by means of the use of 3,600 lights of white, red and green, outlining the building, all of its windows, and a great star in the center to indicate the name of the paper. Unusual interest attaches to the installation from a technical working standpoint, as it is believed to be the most extensive ever placed after the construction of a building. The work was done by the Reuter Electric Company in connection with the Quehl Sign Company. Troughs of galvanized iron were used to form the outlines, these being attached to the building by means of small angle-irons through which screws were passed. Receptacles for the lamps were placed in these troughs, eight inches apart. The illustration on page 1071 gives an excellent idea of the effect obtained by the illumination, which will probably be retained permanently, for use on special occasions. The idea was that of Charles P. Taft, the owner of the newspaper.

An unusually beautiful piece of decorative work in connection with the Cincinnati Electrical Show was "the bursting bomb of jewels," which was placed in the main lobby of Music Hall. It was designed by Mr. Glossing, of the General Electric Company, of the same materials as the famous Tower of Jewels at the San Francisco Exposition, and was the first piece of this work which has been seen outside of the Exposition. Six spot-lights of different colors illuminated the beautiful object brilliantly, and brought out its peculiar and delicate grace splendidly.

Louisville, Ky.

More than 8,000 people visited the electrical demonstration and displays at the Armory in Louisville, Ky., on the first night of Electrical Prosperity Week celebration in that city and throughout the remainder of the week the exhibit hall was well patronized by Louisville people. Most of the electrical contractors of the city and all of the important dealers in electrical appliances were represented by booths, and in addition various other lines were represented. All but two of the automobile dealers in the city took space and most of the dealers in pianos and other musical instruments also were represented by displays of their wares. The "1849 California Mining Camp," a carnival proposition, which occupied a portion of the large drill hall, was liberally patronized. Various of the dealers conducted contests, the awards in which provided for free house wiring, while others took orders for well-known makes of lamps at 20 per cent discount from the regular prices. The Louisville Gas and Electric Company conducted a guessing contest; the first prize was $25 in cash to apply on a bill for wiring of the lucky contestant's house. The Harry I. Wood Company supplied toy balloons for the "kiddies" and there were many other novelties.

Other Kentucky Towns.

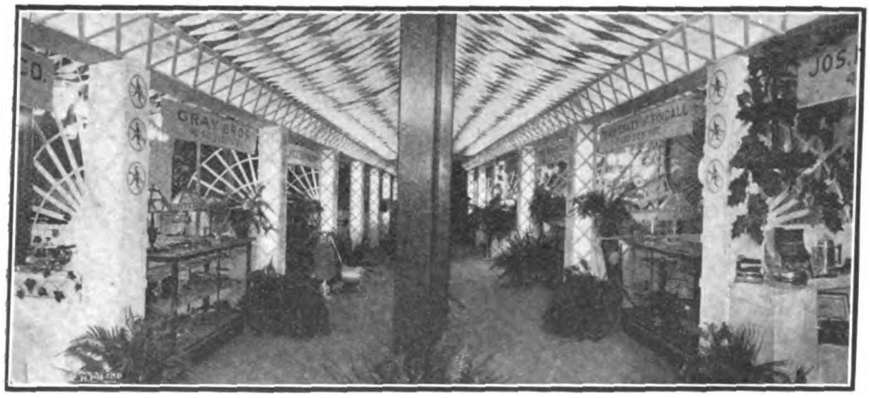
Smaller Kentucky towns were not backward in staging their Electrical Prosperity Week celebrations. Lexington Jovians in connection with the utility companies and the contractors and dealers, staged a number of elaborate displays while all the stores in the classification were specially decorated for the occasion. At Danville, the Danville Light, Power and Traction Company paid special attention to the period by offering 60-watt Mazda

Digitized by Google

lamps, not more than 10 to a customer and only then to consumers who called at the company's office, at 20 cents each. During the same period a 10-per-cent discount was offered on all electrical appliances. In Henderson the demonstration centered at the store of the Lambert-Grisham Hardware Company. The display of electrical appliances was elaborate and complete, and the exterior of the building freely decorated with festoons of lamps, while to those who called to see the display were given chances on an electric flat iron, one of which was awarded every evening.

Memphis, Tenn.

The largest celebration in Tennessee was that held at Memphis, where the Jovian Show, held in the old Cumberland Telephone Company's Building, was thronged daily. The first floor of the building was devoted to displays,



Electric Show at Memphis, Tenn.

showing every kind of electrical appliance. Booths lined the walls in which contractors and dealers had displays. On this floor was also shown a miniature Niagara Falls, designed and built by Carl K. Chapin, president of the Memphis Jovian League. A small electric pump handled 4,000 gallons of water a minute. Near the door was a large Ferris wheel carrying appliances. The second floor was devoted to educational exhibits. Moving pictures of progress in the electrical industry were shown and attracted both children and adults. The Cumberland Telephone Company had a switchboard exhibit and the Memphis Street Car Company showed some large motors. The third floor was transformed into an electric house.

Concealed lighting was used, with sunlight globes. The power for the exhibit was furnished from two stations, in order to reduce the danger of break downs.

Two visitors at the opening were W. N. Matthews, Past Jupiter, and Ell C. Bennett, reigning Mercury, of the Jovian Order, both of St. Louis.

Nashville, Tenn.

At Nashville, the celebration was of a "cash in" nature, as described by a member. The Nashville Railway and Lighting Company co-operated with 13 contractors in pushing a house-wiring campaign, featured by bargains in installation, a $1-a-month system of payment and free lighting to February 15. The contracts were turned over to the contractors in rotation. The company carries the account and the reduction is split between the contractor and the company. The company also placed stocks of appliances with 30 drug stores and dealers on consignment. All of these were required to have window displays. Between 400 and 500 houses were wired and a large business was done by all dealers in appliances.

Providence, R. I.

An electric show, under the auspices of the Narragansett Electric Lighting Company, was the feature of Electrical Prosperity Week, at Providence, R. I. This was held at the Rhodes Pavilion, on the Pawtucket River. Dancing was a feature, and $150 in electrical prizes were awarded to the three most proficient couples each evening.

Moving pictures were given between dances, with the following films, all bearing on electrical subjects: "Back To The Farm," "A Twentieth Century Courtship," "The Electrical Education of Mr. and Mrs. Thrifty," "Schenectady Works of the General Electric Company." During intermissions electric coupes were run about the floor by young ladies.

New England Cities.

The Manchester (N. H.) Traction, Light and Power Company offered a reduction of 20 per cent on the price of standard Edison Mazda lamps, and one of 10 per cent on all electrical merchandise. In a full-page advertisement, the company called attention to the fact that it embraces about all the electrical industry of the city, except for the telephone company. It has under construction $800,000 worth of plant extensions, which includes a 10,000-horsepower generating station at Kelley's Falls, a steel-tower transmission line about 10 miles long, three substations, and a large amount of underground work in the city.

Portsmouth, N. H., inaugurated a white way enterprise by which the Rockingham Light and Power Company will furnish energy to 24 additional three-lamp groups, each having 100-watt Mazda units, at the same total price as under the past contract, $11,500 per year. The city buys the posts, which will cost about $21 each, and the company installs them.

The Brockton (Mass.) Edison Company offered four combination sets of domestic appliances, each set including a coffee percolator, at about $11 each, $2.50 down and the balance in three monthly payments. A $3 Thermax flatiron was given as a souvenir free.

The Haverhill (Mass.) Electric Company exhibited many of the latest electrical devices at its store.

The Lowell (Mass.) Electric Light Corporation featured electric vacuum cleaners.

The Cumberland County Power and Light Company, Portland, Me., held a special demonstration of domestic appliances, offering toasters, etc., at reduced prices. Music was provided at the salesroom.

The Cambridge Electric Light Company featured an easy-payment house-wiring plan, by which the company will finance the installation of ten lights complete with fixtures and glass at $57.50, additional lights with switches, to be $5 each. Five Cambridge contrators are given the contracts to execute.

The Worcester Electric Light Company united with other electrical interests in the city in special lighting, advertising and wiring activities.

Prosperity Week at Lynn, Mass., was celebrated with the flood lighting of the City Hall, Public Library and other buildings and by an exposition at the Alfred Cross Company store, in which the Lynn Gas and Electric Company, the General Electric Company and local electrical dealers participated. The central station had an extensive demonstration of domestic apparatus, and the General Electric Company exhibited testing, measuring and standardizing devices used in its Lynn factory, which is one of the largest branch factories of the company. One exhibit was a sphere spark gap rated at 180,000 volts.

The Rutland (Vt.) Railway, Light and Power Company featured its house-wiring campaign and the A. S. Reed Electric Company and Marsden Electric Company had fine window exhibits.

Pittsfield, Mass.

Electrical Prosperity Week was observed at Pittsfield, Mass., by an ex-

Digitized by Google

position in charge of the Jovian Order. The following were the exhibitors: General Electric Company, Pittsfield Electric Company, J. & B. Company, New England Telephone and Telegraph Company; J. Cooney, Jr., dictaphones; G. D. Meserue, thermostats; Pittsfield Radio Club, demonstration of wireless telegraphy; Rice & Kelly, bed room appliances; M. D. MacDonald, electrical appliances.

The exposition building was flood lighted and England Brothers' block was decorated with 1,400 colored incandescent lamps.

Boston Vehicle Interests Take Advantage of Prosperity Week.

Boston's most successful electric truck parade occurred November 30, in connection with Prosperity Week. Ninety-six vehicles, representing about 40 industries of Greater Boston, were in line, the parade being over a mile in length. The route was through the business district.

A five-ton truck of the Boston Edison Company containing the First Corps Cadet Band led, and C. A. White, of the Edison Company was chief marshal, with C. H. Miles, E. S. Mansfield and Day Baker as assistants. The Edison Company had 12 trucks in the parade; the General Electric Company, three; Cambridge Electric Light Company, five; American Express Company, four; Malden Electric Company, two; Suburban Gas and Electric Company, two; Lawrence Gas Company and Worcester Electric Light Company, one each; other industries represented were dry goods, lumber, ice, coal, publishing, spring water and dairy companies. A vehicle of particular public interest was an electric ambulance for disabled horses, owned by the Massachusetts Society for the Prevention of Cruelty of Animals.

In the evening a dinner and meeting of the New England Section, E. V. A., was held at the Thorndike Hotel, with 40 men present. J. T. Day, of the Malden Electric Company, presided. E. S. Mansfield gave a résumé of the work of the association during the past year; Day Baker, of the General Vehicle Company, New York, read an interesting report of the Cleveland convention, and S. G. Thompson, of the Public Service Electric Company, Newark, N. J., spoke on the growth of the electric-vehicle industry since its inception and showed that the field is now developing more rapidly than the electric power business. Interesting figures, indicating the remarkable accomplisments of commercial vehicles in various forms of activity were presented. Others who spoke were F. J. Stone, Electric Storage Battery Company; Day Baker; W. E. Eldridge, and W. E. Holmes, of the Cambridge Electric Light Company.

H. H. Skinner, of the Narragansett Electric Lighting Company, Providence, R. I., said that his company was furnishing free current to electric car owners attending the electric show in that city.

Kansas City, Mo.

Electrical Prosperity Week was celebrated in Kansas City by the decoration of many windows of merchants, as well as of electrical contractors and supply dealers, with designs of which the poster of the Society was the central feature. The use of electricity in ultra-modern ways was particularly emphasized. One music company, for instance, showed the electrical operation of a player piano. A physicians' supply company exploited a new form of ear trumpet which is operated by a small battery, the device being first shown in Kansas City on November 29, and met a remarkable early sale, chiefly because it was introduced in conjunction with the emphasis on electricity that day. The Kansas City Electric Light Company helped materially to the success of the week, sending pamphlets to nearly every citizen and all users of current, displaying the streamers on its trucks, and securing the display of posters on all street cars of the Metropolitan Street Railway Company. The central station and several contractors and jobbers took a page display in the newspapers.

A rejuvenation was held the evening of December 3, at the Coates House, at which 21 candidates were received. The ceremonies were conducted by A. Penn Denton, First Tribune; J. D. Todd, Second Tribune, and P. Lloyd Lewis, Statesman. More than 20 Jovians from out of town participated, some of whom were present in Kansas City for the convention of the Western Ice Manufacturers' Association.

The first event of Prosperity Week was a meeting of the Kansas City Association of Credit Men, devoted to that subject, at which an address was made by F. B. Uhrig, manager at Kansas City, of the Western Electric Company. Mr. Uhrig outlined the growth of the industry; and, for the benefit of the profession present, mentioned the wide range of credits which a credit man of an electrical supply company or contractor must be familiar with, ranging from small, new contractors to the United States Government.

In Topeka, besides the decoration of establishments offering electrical service, there was a session of the Topeka Rotary Club, devoted to the subject, the meeting being at the club rooms of the Topeka Railway Company, and Albert M. Patten, A. H. Purdy and E. L. Overton being hosts. Mr. Purdy, manager of the Topeka Edison Company, gave an address on "Electricity and Prosperity," calling attention to the use of electricity by 70 per cent of the people of the nation, and suggesting the hiatus in prosperity without electricity.

In Springfield, Mo., the Young Men's Business Club offered prizes for the best window displays featuring uses of electricity, contractors in electrical work being barred; there was a fare refund offer by merchants to increase business and visiting to the town, and very important support for the idea of the week by the local newspapers. The Springfield Gas and Electric Company entertained a large number of visitors at its power plant, who came on special permits issued for the week.

In St. Joseph, Mo., there was pronounced co-operation in the work of the week by the Commercial Club, of which H. C. Porter, commercial manager of the light and power company, is vice-president. There was hardly a window in St. Joseph's business district that did not exploit electricity.

Salt Lake City, Utah.

Electrical Prosperity Week in Salt Lake City was voted as a complete success. Many lessons were learned from this first year, which will be of value in subsequent campaigns. Of course, so far as the public is concerned, the effect will be accumulative. This year an excellent foundation has been laid. The public have gotten the idea of what Electrical Prosperity Week means and another year they will grasp it with much more enthusiasm.

Early in the campaign, the proposition to carry a double-page spread was put up to each of the newspapers, and this whetted their appetite for news. Considerable advance publicity was obtained on the meetings of the committees covering their plans for the week. On Sunday, November 28, the double-page spread was run in three of the daily papers, the fourth scattering their advertisements through the issue. The Utah Power and Light Company, four jobbers and several electrical dealers and hardware stores, were represented on the page. Most of the department stores who carry electrical specialties made a feature of their electrical line in their regular pages.

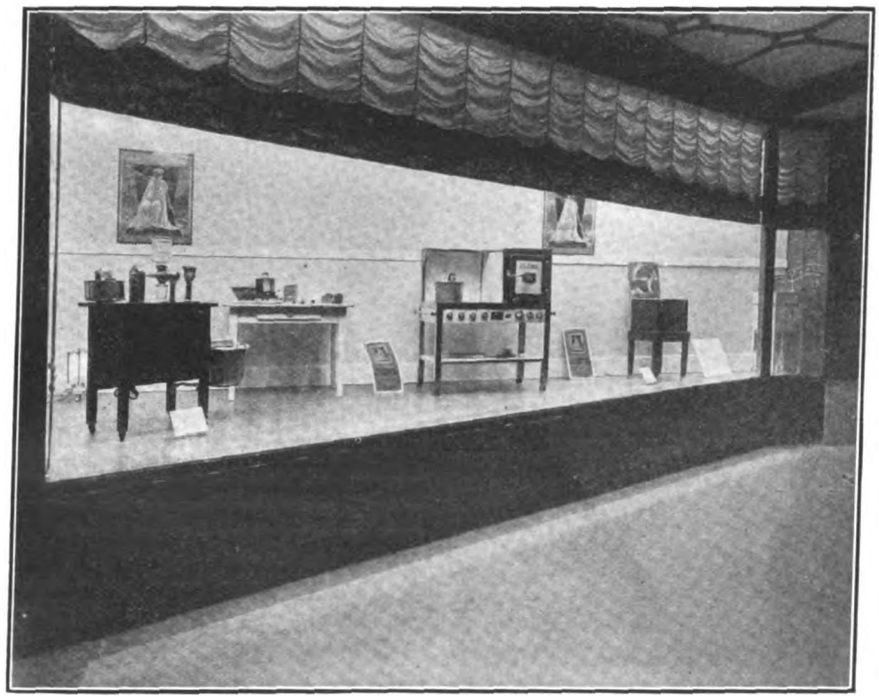
The principal merchandising feature of the week was the 10 per cent discount offered by all dealers in electrical supplies on their entire lines, except lamps. This especial discount was featured in all of the advertising; special cards were run in the street cars during the week announcing it, and the regular banner furnished by the Society for Electrical Development was carried on the fenders of the street cars.

Digitized by Google

The Utah Power and Light Company erected a rustic booth on its sales floor and an attractive young lady presided at this booth during the week serving electric delicacies. Special demonstrations were also maintained by several of the dealers.

The regular luncheon of the Rotary Club was devoted to a review of electrical progress. W. C. Orem, who is president of the club, is president of the Orem Lines, an electric interurban system operating in Salt Lake and Utah counties. Being a member of the clan, therefore, he introduced the speakers in a frank and outspoken manner, throwing some side lights on their previous history, which had not hitherto been generally known. D. C. Green, manager of the Salt Lake Division of the Utah Power and Light Company, told of the rapid strides which electricity had made during the past few years in the field of power generation, transmission and distribution. C. B. Hawley, vice-president and manager of the Inter-Mountain Electric Company, told of the progress in electrical apparatus for the utilization of electricity, particularly with reference to electrical appliances and lighting systems for the home, office and factory. Electricity in the field of transportation, was discussed by H. L. Beach, general manager of the Utah Light and Traction Company. He reviewed briefly the history of electric transportation and compared the earliest electric cars with the latest passenger and freight motors. A. H. DeNike, manager of the Utah Division of the Mountain States Telephone and Telegraph Company, told of the remarkable strides made in the field of telephony, during the past year, commenting particularly on the part which the company's inter-mountain division played in the transcontinental telegraph line recently put into commission.

The regular weekly luncheon of the Utah Electric Club was given over to a celebration of Electrical Prosperity Week. Not to be outdone by the enthusiasts for Utah products, who had an "All Utah Products" luncheon the week before in celebration of Utah Products Week, the electrical men had an "All Electrical" luncheon in celebration of Electrical Prosperity Week. Several electrical delicacies, not commonly found on bills-of-fare were served.



Cooking and Kitchen Appliances in Commonwealth Edison Company's Show Window.

R. E. Richardson, of the Electric Bond and Share Company, of New York City, spoke on electric rates and their influence on load building. He laid special emphasis on the fact that the public should be educated to understand that by far the larger part of the charge made to them for electric service covers interest and depreciation on an investment in equipment, which the company has bought and loaned to them for their use, thereby relieving them of the necessity of making the investment for themselves and for a service rendered in looking after that investment and that only a small part of the charge is for the kilowatt-hour which they use.

Seattle, Wash.

The Puget Sound Traction, Light and Power Company, of the Stone & Webster interests of Boston, and the municipal lighting plant of Seattle, were the moving spirits in the celebration. However, the electrical supply houses and department stores of Seattle did everything in their power to make the celebration a memorable one and a decided success.

The Puget Sound Traction Company was ably represented by H. J. Gille, acting for President A. W. Leonard and the municipal lighting plant by J. D. Ross, superintendent of lighting. The electrical supply houses were represented by their managers or superintendents.

The main exhibition of electrical appliances was held in the Stuart Building, where the various firms exhibited and demonstrated the latest electrical equipment before large throngs which congested the display rooms throughout the week. The quarters were open from 2 o'clock in the afternoon until 10 o'clock in the evening each day of the week. Every supply house in the city of Seattle maintained a booth at the exhibit, as well as splendid window displays at their various places of business. In connection with the exhibition and storeroom displays, a general educational campaign was conducted by means of newspaper publicity, billboards, banners and every available method of advertising.

Chicago.

In Chicago the principal aim was to popularize electrical domestic appliances. The Commonwealth Edison Company supplemented its regular newspaper advertising by special announcements offering a discount of 10 per cent from the regular price on any appliance purchased during the week. Special inducements were also made to secure house-wiring contracts, a premium being given to each new customer who signed during the week. The established policy of the company of allowing two years to pay was not changed during this period. In all display rooms and stores special signs and posters were used.

An event of the Week was a prize essay contest, open to high-school students, with three prizes offered to the three best essays on Electricity. Over 500 manuscripts were submitted during the Week. The prizes which were offered by the Edison company were gold pieces and electrical merchandise.

Several of the local dealers and department stores conducted special sales during the Week and many show windows were devoted to electrical displays.

The *Chicago Evening Post* on Monday, November 29, published a four-page electrical section containing a number of interesting articles dealing with electricity and its uses in the home, store, office and factory. Electrical Prosperity Week was described and its objects clearly set forth with the view to gaining the co-operation of the public in recognizing electricity and things electrical.

Digitized by Google

Chicago Electrification Report.

The complete electrification of the Chicago railroad terminals as a means of reducing smoke, according to the report of the Chicago Association of Commerce Committee of Investigation on Smoke Abatement and Electrification of Railway Terminals, which, after four years of work, was formally delivered to the Association last week, is technically practicable, but financially impracticable. The finding upholds the railroads in their contention that complete electrification would create an impossible operating deficit, but disproves the assertion that electrification is impossible because of physical obstacles to the installation of, and operation by, either the third-rail or overhead-trolley systems. Moreover, in delivering the report, members of the Committee, which includes four representatives of the city, four of the railroads and nine from the Association of Commerce, assert that while complete electrification of all roads is financially impracticable, there is nothing in the report to indicate that the electrification of certain roads is not feasible and financially warranted.

The report of the Committee was completed a year ago and has now been printed as a volume of 1,177 pages. It is made up of six parts, dealing respectively with the necessity for electrification of Chicago's railroad terminals, technical feasibility and cost, results to be anticipated, financial practicability, summary of conclusions on electrification and summary on atmospheric pollution. An appendix occupies over 100 pages. There are 505 tables and 719 illustrations, including maps. The chief engineer was W. F. M. Goss, dean of the engineering school of the University of Illinois. The chairman of the committee was Judge Jesse Holdom.

The report was formally presented to the Association of Commerce on December 1, at a dinner at the Congress Hotel. Addresses were made by President C. L. Dering, Harry A. Wheeler, Harrison B. Riley and Judge Holdom.

Action on the subject of electrification by the City Council of Chicago was agitated some years ago but was deferred until the completion of the Committee's labors. At the session on December 6, however, the Council by unanimous vote directed the Committee on Railway Terminals to prepare ordinances at once for the purpose of compelling the railroads to electrify.

The Committee of the Association of Commerce finds that the minimum cost of an electrification to bring about smoke abatement would be $178,127,230. This would provide for the joint electrification of all trackage within the city limits and such extensions beyond as are unavoidable because of operating conditions. This investment would entail an increased annual expense, including interest and depreciation, of $14,609,743. Moreover, the Committee sets forth the fact that the roads would have to add $96,313,409 to the minimum total to provide for betterments and rearrangements of yards and other properties to meet the new operating conditions. This would bring the total cost up to $274,440,630.

WHY CHICAGO RAILROADS CANNOT ELECTRIFY.

Electrification would ultimately cost		$274,440,630
The 600-Volt Direct-Current (Third-Rail) System, minimum plan, would cost		197,908,000
The 2,400-Volt Direct-Current (Trolley) System, minimum plan would cost		191,666,808
The 11,000-Volt Alternating-Current (Trolley) System, minimum plan, chosen as the least expensive, would cost, in detail:		
Power station	10,302,104	
Transmission system	1,618,693	
Substations	2,024,736	
Switching stations	573,073	
Contact system	28,141,188	
Bridge warnings	1,071,989	
Return circuit	4,446,033	
Elimination of inductive effects and electrolysis	996,727	
Telephone system	272,052	
Electric locomotives, multiple-unit equipment, work and inspection equipment	91,703,557	
Spare parts	485,343	
Changes in overhead structures	834,261	
Changes in wire lines	2,028,007	
Changes in signal system	6,111,407	
Removal and re-establishment of locomotive terminals and new facilities	37,293,746	
		$187,902,916
Less salvage on equipment usable elsewhere		9,775,686
Net cost of Committee's minimum plan		$178,127,230
Plus added costs due to betterments, improvements and changes precipitated by electrification		96,313,409
Estimated total final cost		$274,440,620
Annual charges on investment of $187,902,916		16,946,436
Annual saving through decreased costs of operation		2,336,693
Annual deficit		14,609,743

The report of the Committee, contrary to the opinion held by most of its members at the time the investigation began, finds the steam locomotive guilty of but a small fraction of the damaging smoke. Its elimination, the Committee finds, if other sources of pollution were not reduced to a minimum, would produce hardly noticeable results. Hundreds of observations, tests and analyses have demonstrated to the members, according to their report, that high-pressure steam plants are the greatest producers of air pollution, that metallurgical and other similar manufacturing furnaces come second and that the steam locomotive is third in summer and fourth in winter, dropping then below domestic fires. The report also points out that visibility of smoke, which heretofore has been the sole object of complaint and regulation, is a matter of secondary importance, injury to animal and vegetable life and to property being due almost wholly to the invisble gases and the solids emitted. This being the fact, some of the worst offenders proved to be stacks that never send up visible smoke.

High-pressure steam plants were found to produce 44.5 per cent of all visible smoke emitted within the city limits Metallurgical and other manufacturing furnaces produce 28.6 per cent, steam locomotives 22 per cent and domestic fires 3.9 per cent (from 15 to 20 per cent during three winter months). Of the total solids in smoke, metallurgical and similar furnaces are guilty of contributing 64 per cent, high-pressure steam plants 19 per cent, domestic fires 8.6 per cent and steam locomotives 7.5 per cent. Of the total gaseous pollution of the air 45 per cent is due to high-pressure steam plants, 23 per cent to domestic fires, 21 per cent to metallurgical and other furnaces and 10.3 per cent to steam locomotives. Steam vessels and gas and coke plants produce negligible quantities of smoke.

The Committee finds that domestic fires, including furnaces in apartment buildings, produce 57 per cent of all the soot or tarry products of combustion discharged into the atmosphere of Chicago and, for this reason, constitute the most objectionable source of atmospheric pollution in the city. Soot is shown to be damaging to clothing, property and vegetation.

The Committee finds that electrification would reduce the total amount of visible smoke in the city and its immediate environs only 20 per cent, the total gaseous pollution only 5 per cent and the total solid pollution less than 4 per cent. This is due to two facts:

(1) Of the total pollution of the air only two-thirds is due to combustion. The other third is dust from the general activities of the city.

(2) Electrification would do away with locomotive smoke but the power house built to furnish the electricity would offset some of the gain. It is shown, for instance, that this power house would produce nearly half as much gaseous pollution as locomotives do now. The final net reduction from the 22,400,000 tons of fuel consumed would be only 1,290,000 tons.

The significance of even the small gain to be expected from electrification is lessened, according to the report, by the fact that industrial pollution is growing rapidly whereas steam locomotives are yearly producing relatively less smoke.

As a result of its study of Chicago air pollution the Committee recommends, as the only means of bringing about genuine improvement, a permanent municipal pure-air commission. This commission should be authorized to employ experts, should have ample funds for carrying on scientific investigations and have authority over every source of air pollution. The Committee believes that air purification is what the

Digitized by Google

people want, not electrification, if that electrification will not bring the result demanded.

When this Committee began its investigations some of its members had an idea that by electrifying two or three of the lines that were most conspicuous by reason of their suburban service, the air would be pretty well freed from soot and cinders. So they tackled the steam suburban service, but found that all the suburban trains in Chicago contribute only 1.54 per cent of the total visible smoke, 1.97 per cent of the total dust and cinders of smoke and 0.74 per cent of the total polluting gases.

Chicago burns more coal per capita than any other large city, the figure being 8.3 tons as compared with five tons for Cleveland, four each for Manchester and Leeds, England, three for Hamburg, Germany, two for Paris, France, and 1.5 for Berlin Germany. The loop is the smokiest part of the city, burning in 1912, 397,167 tons of coal per square mile. The stock yards district followed with 245,919 tons and South Chicago was next with 224,991 tons.

The three most injurious elements in smoke were adjudged to be sulphurous gas, mineral dust and soot. Chicago's coal is high in sulphur, so that large quantities of sulphur gas must always be liberated, improvements in methods of combustion having little if any influence on the volume of gas produced. Steel mills, foundries and similar plants were found guilty of producing the large part of the mineral dust, 41 per cent of their contribution being from the matter treated and not originating in the fuel. Chicago air, it was found, is annually polluted by 304,391 tons of solid matter from chimneys, 179,511 tons of which is of fuel origin.

When compared with the air of London, Berlin, Manchester, Glasgow, Cleveland and other large cities, Chicago air was found to be the best. High average wind velocity and heavy, well-distributed rainfall contribute to this. Chicago enjoys an annual average of sunshine of 57.4 per cent, which is better than Philadelphia, Pittsburgh, Scranton, Washington, Cleveland, Detroit, Toledo and Buffalo, and almost as good as Boston, New York and Omaha.

In regard to electrifications in other cities and countries it was found that none had ever been undertaken for the purpose of reducing air pollution where terminals were otherwise satisfactory. Of the fifteen American installations, nine were found to have been undertaken because of operation in subways and tunnels, one as an experiment to test out economy in long-distance service, two to hold suburban business, one because of charter requirements and two to utilize cheap water power. Of foreign electrifications practically all were found to be confined to light passenger business, much of it interurban in character.

The members of the Committee, at the beginning of their work, had been impressed by the electrification of the New York Central, the Pennsylvania and the New Haven in New York City. It was felt that the roads there had shown electrification to be practical and within their means by voluntarily undertaking the improvement. But a study of the New York electifications has shown the Committee, according to its report, that the cases are not parallel. In the first place, it is pointed out, the New York work was not undertaken as an electrification. Electrification was a necessary factor in a great new terminal plan. The Pennsylvania road wanted a great passenger station in the heart of New York City. The only way was to go through miles of tunnel under the North River across Manhattan and under the East River. Electric operation was the only solution. The other two roads had been compelled to electrify on account of their tunnel approach to the terminal.

The situation in Chicago, on the other hand, it is pointed out, is very different. The roads have no reason to incur the expense of electrification because their terminals are already established and there are no tunnels.

But the thing which complicates the situation in Chicago, as the Committee explains, is the vast amount of switching and freight work to be done. In New York the electrified roads are clean, direct tracks for passenger service, uninterrupted and unincumbered by a clutter of freight and transfer business. In fact, the Committee finds that switching and freight handling have never been attempted electrically on any large scale. The Giovi road in Italy is the only foreign road to try anything of the kind. The New Haven road in this country operates three freight yards in part by electricity, but largely, so far, as an experiment. This experimental freight handling requires about 90,000 electric locomotive-hours a year and amounts to about 2,500,000 car-miles. The freight traffic of the Chicago terminals aggregates approximately 3,430,000 locomotive-hours per annum and approximately 164,400,000 car-miles.

Of the total locomotive-mileage within Chicago, freight and passenger switching, or transfer, accounts for 59 per cent. Yard freight-switching service, on the basis of car-miles, it has been ascertained, is more than sixty-five times as great as that on all existing electrified steam roads in America. The Chicago mileage involved by complete electrification would be nearly twice that of all other electrically operated steam mileage in America and, exclusive of foreign light lines resembling interurbans, about 15 per cent greater than all existing electrifications in the whole world. The number of electric locomotives that would be required would be four times all those now in service in America and 2.5 times those in all countries. Thirty-eight roads would have to electrify here, whereas in the world outside Chicago only 37 roads have electrified mileage. Some of the Chicago roads are solely freight roads, having all their mileage within the district and would have to be practically rebuilt.

Notwithstanding the physical difficulties, the Committee, contrary to the opinion of many railway engineers, holds that electrification on its technical side could be accomplished. The third-rail system was found impossible of application because of the very large number of gaps in the conductor necessitated by complicated trackage and by street crossings and other obstructions. The trouble with the overhead-contact, or trolley system, was found to be the number of low structures over tracks. The clearance, where men are to be allowed on tops of cars, is figured at 25 feet, as room must be left for the tallest man on the highest car to swing a lantern. Where employees are not allowed on cars, trolley operation is reported to be possible with a 16.5-foot clearance. The Committee found several hundred obstructions that would prevent men riding on cars. Only a part of these can be raised. A group of railway officials held that the Chicago terminals could not be operated if brakemen were excluded from the tops of cars, but the Committee rules that some new system of freight handling could be devised.

The Committee's cost estimate is a smoke-abatement estimate. If the idea had been merely to plan an efficient electrification, it is pointed out, the estimate of cost would have been different. Much of the most expensive and least remunerative trackage could be left under steam operation. But when the one object of electrification is smoke abatement, it was held necessary to electrify every mile of line within the city. It is held, by railway practice, to be impossible to operate suburban trains while in the city by electricity and over the rest of their run by steam. The total mileage, therefore, involved in the Committee's plan, is 3,476 of which 1,476 is main track. Of the total, 37 miles cannot be electrified by any system and would have to be operated by some type of self-propelling motor. The Committee reports that many of the roads, if required to electrify, would feel it necessary to far exceed the above estimated mileage.

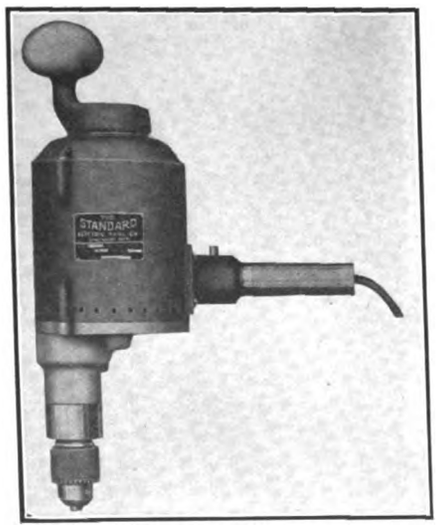
Digitized by Google

New Electrical and Mechanical Appliances

Small and Light-Weight Electric Drill.

The Standard Electric Tool Company, Cincinnati, O., has developed and is now placing on the market the "Midget" drill shown in illustration. This tool is very light in weight and made in three sizes. The three-sixteenth-inch size weighs 6 pounds, the one-fourth-inch size weighs 7 pounds and the five-sixteenth-inch size weighs 8 pounds.

The armature runs in ball bearings which are incased in grease in dust-proof chambers and the motors are impregnated in Bakelite. The chuck spindle is fitted with thrust bearings. A quick-make-and-break switch of the plunger type is located in the side handle. This places the drill under the operator's control at all times. The motor is force ventilated by means of a high-power fan.



New "Midget" Electric Drill.

This tool is designed and constructed on the unit plan consisting of only five simple units. All electric wires, connections and brush-holders are contained in the frame. Both end caps can be taken off and the tool easily dismembered without disturbing any electrical connections whatever. All gears are generated from a special steel.

Although this tool is very light in weight it is very rigid in its design and construction and its manufacturer states that it will stand the most rigorous continuous service.

The "Fire Fly" Electric Battery Lamp.

The "Fire Fly Light," manufactured by George K. Burleigh, Penacook, N. H., has many new features as well as being very attractive. The case, which contains an ordinary dry cell, is enameled red, the fiber disk which covers the battery is white, the handle blue. The two tungsten lamps are operated from one switch, and by mirror reflection, more light than any single light is obtained. It gives a diffused and not a concentrated light so that by placing it in any corner of a small room, one can read in any part of the room. Other new features are that if anything happens to one of the lamps, one always has the other in use, and the U-clip shown in the cut, which slides up between battery and battery case can be screwed to the floor of an automobile or carriage in any safe place, and the light can be pulled off the clip instantly to measure gasoline, read signboards, make repairs around motor, etc.

New Battery Lamp.

The second illustration shows in use the strap furnished with each light for hanging it around the neck with battery buttoned inside the coat, when putting on tires, or at any time to give the free use of both hands. In this way it is especially useful in looking after the furnace, by the farmer pitching down hay or milking cows, by firemen rushing from one room to another and carrying occupants overcome by smoke, etc., in each case always giving free use of the arms. It is excellent for use as a lantern by children and elderly people. Each outfit is furnished complete with a battery, and packed in a strong wooden box, the whole weighing about four pounds.

High-Voltage Direct-Current Generator.

The Physikalisch-Technische Reichsanstalt, Berlin, Germany, has had built a 10,000-volt, 10-kilowatt, direct-current generating set to be used for experimental and testing purposes. Two units are driven by a common motor, and may be connected in series or parallel. The insulation is such that either terminal may be connected to the frame when in series. The set was built by the Allgemeine Elektricitäts Gesellschaft.

Each machine has a double commutator and two sets of brushes. There are 212 commutator segments, giving about 24 volts between segments.

"Fire Fly" Lamp Hung About Neck of User.

Except for a 22,000-volt testing machine built for the Thury installation in Switzerland, this is said to be the highest voltage for which a direct-current generator has yet been constructed. It is designed along the same lines as ordinary generators, but with higher insulation.

Stow Motor-Driven Flexible Grinder.

In foundries and other shops of the iron and steel industry, where large

Digitized by Google

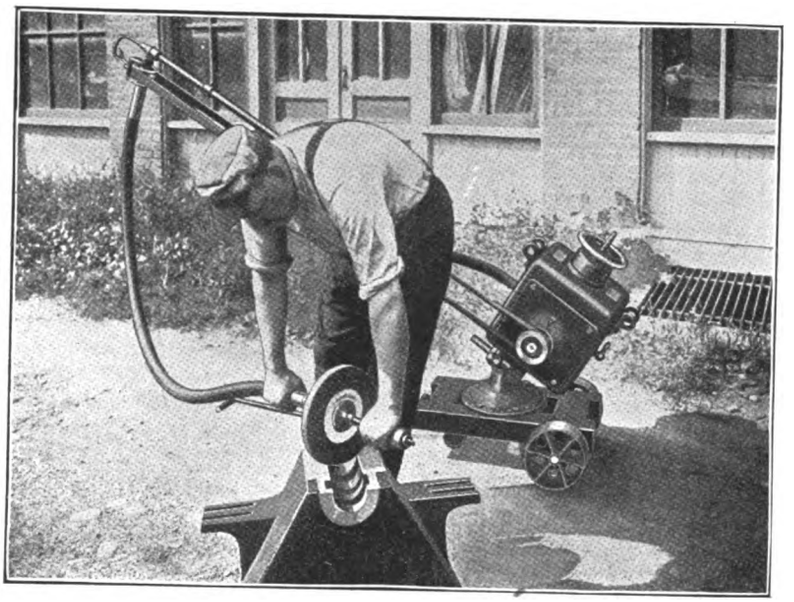


Fig. 1.—Motor-Driven Flexible Grinder in Use.

and heavy castings, machine parts, furnace equipment, etc., has to be worked upon, the use of electrically driven portable tools has been found a great convenience as well as economy in time and labor. The cost and trouble involved in hauling the bulky parts to stationary machines is eliminated by bringing the compact and readily portable motor-driven tool to the work. Such portable tools also save a great deal of hand work on castings, etc., since it is now possible to use electrically driven scratch brushes and emery wheels instead of hand brushes and chipping tools.

A new grinder of this type specially designed for use in large foundries and for various branches of the steel industry is shown in Fig. 1. The driving motor is mounted on a strongly built two-wheel truck that can be readily hauled about by means of the detachable shaft. The motor can be tilted back to any angle and clamped at that point. The motor drives the grinding disk through a belt and flexible shaft, the connection to the latter being made at an elevated point in order to relieve the workman of the weight of the flexible shaft. This makes it easier to guide the emery wheel properly. Through the flexibility of the shaft a considerable surface can be worked over with one setting of the motor.

The driving motor shown in Fig. 1 is one of the Stow multi-speed direct-current motors that has for many years found favor for variable-speed work. A plunger in each field core movable by means of the handwheel changes the magnetic reluctance of the field and permits an easy and smooth setting to any desired speed at practically constant efficiency. The motor is very rugged and capable of withstanding sudden overloads. For alternating-current circuits constant-speed motors are furnished to suit the frequency and phase.

This tool is built in several sizes to meet different requirements. It can be used not only for grinding, but by removing the emery wheel a rotary scratch brush may be substituted.

A modified form of this tool is shown in Fig. 2. This is provided with direct-connected flexible shaft, shown equipped with rotary scratch brush. An emery wheel may be used in place of the brush. The driving motor shown in this case is of the constant-speed type and cannot be tilted. It may be swiveled on a vertical axis, however. A cable reel is provided at the front end of the truck.

These tools are recent additions to the very complete line of portable and flexible-shaft tools made by the Stow Manufacturing Company, Binghamton, N. Y. Their large sale shows that they have filled an urgent demand for just such equipment.

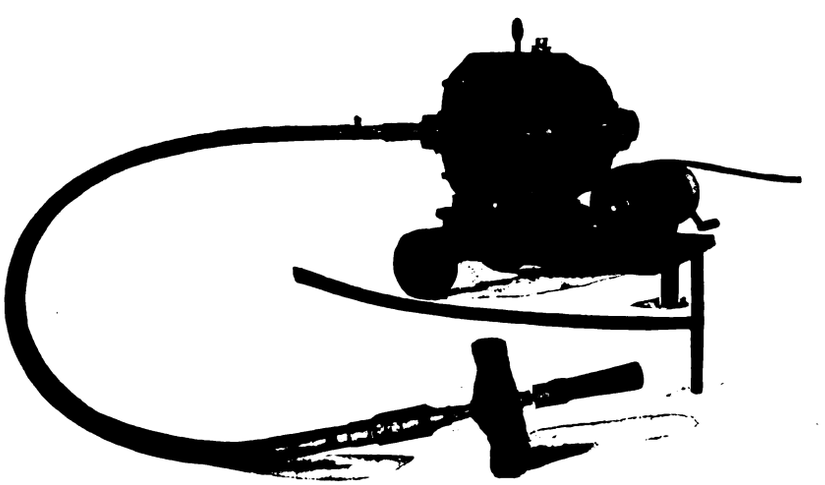


Fig. 2.—Electrically Driven Flexible-Shaft Tool, Direct Drive.

Burr Lighting Equipment for High-Efficiency Lamps.

For industrial establishments and other places where efficiency is almost the primary consideration in a lighting installation, there has arisen a demand for fixtures, reflectors and similar lighting equipment of correct design and construction to permit the effective use of the most efficient incandescent lamps. The equipment must be of durable build and so designed as to be easily installed; it should also preferably be of such design as to involve a relatively small number of parts which are interchangeable and readily adapted for various requirements.

Fig. 1.—Small Reflector Unit.

In line with this demand, the Burr Manufacturing Company has placed on the market a line of lighting equipment known as "Burr Efficiency Units." This equipment includes but a small number of parts which can be interchangeably assembled to secure fixtures for sizes of lamp from 10 to 1,000 watts. This equipment is made in two general types, the small type suitable for lamps up to 100 watts and the large type for lamps from 60 to 1,000 watts. Included in this line is a top holder to which the receptacle is secured and by means of which the fixture is hung; there are also three different types of holders for reflectors and diffusing globes. The reflectors are of three general types, the shallow dome, the bowl and the angle type. Diffusing balls are provided with some of these fixtures where low suspension prevails. The top

Digitized by Google

holders for the larger lamps are provided with a simple positioning device, by means of which any size of lamp may be used with any size of reflector so as to secure maximum efficiency. The lamp can thus be readily moved up or down to give it the best position with the reflector used. All of these fixtures are very easily wired on account of the simple construction and accessibility of the receptacle terminals. Reflectors and glassware are held in place by a simple latch holder which permits very quick securing or removal of the reflector or globe. All of the fixtures are well ventilated so as to permit the use of even the largest gas-filled tungsten lamps. The fixtures are finished either in heat-treated paint or porcelain fire enamel.

Of the accompanying illustrations, Fig. 1 shows a bowl-reflector outfit in the small type. In this case the reflector is arranged to be mounted to any standard brass or weatherproof socket by means of a screw-clamp holder as shown, or by means of ordinary 2.25-inch shade-holders. Fig. 2 shows a typical one of the larger units, which in this case is suitable for lamps of 400 to 1,000 watts. The unit shown has a 15-inch bowl-type reflector secured to the top holder by means of the latch adjustment referred to above. This reflector can also be replaced by a shallow-dome reflector or an angle reflector to meet the requirements. Fig. 3 shows a unit in which a diffusing ball is used instead of a reflector. This unit can be used for lamps from 60 to 1,000 watts, several sizes of the unit being provided for various lamps. If desired, a unit similar to that shown in Fig. 3 can be provided with both reflector and diffusing ball. In this case the diffusing ball is held by an extension holder that is easily secured to the ends of the positioning device referred to above.

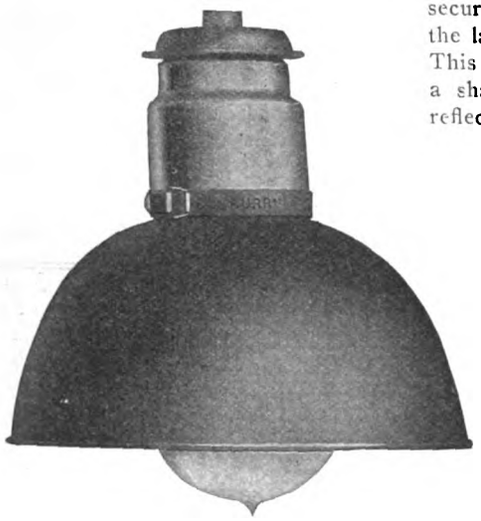


Fig. 2.—Large-Size Burr Reflector Unit.

Fig. 3.—Burr Diffusing Unit.

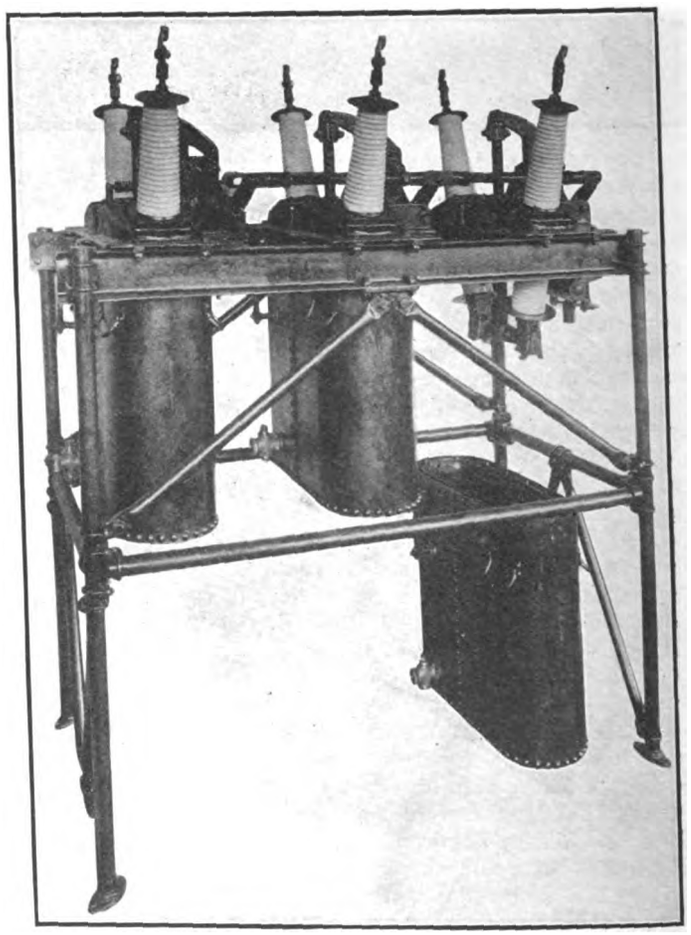
These units are sold through A. B. Wilson, Leader Building, Cleveland, O.

The telephone system of Seville, Spain, is being extended to 22 adjoining towns.

Framework-Mounted Oil Switch for Moderately High Voltages.

The oil switch shown herewith is built for operation at 300 amperes at 35,000 volts, and 300, 500 and 800 amperes at 15,000 or 22,000 volts. It is made up of single-pole self-contained units for hand or solenoid operation.

This switch can be automatically tripped under the usual conditions by instrument-type current transformers, also on overload by high-voltage series coils mounted on insulators above the switch, or in the 15,000 and 22,000-volt sizes by bushing-type current transformers. A series trip can be added to all switches or bushing-transformer trip to the sizes noted at any time. Calibration of the series-trip mechanism is effected at the switch and not at the coil mounted on the high-voltage insulator. Each bushing transformer is mounted inside the oil tank on an iron support supplied with the transformer. The support is bolted to the under side of the switch cover.



Triple-Pole, 35,000-Volt Oil Switch with Series Overload Trip.

The switch is constructed of interchangeable parts. The bushings are single-piece units extending in the oil vessel downward to the contacts below the oil level. The oil tanks are lined with pressboard and are of heavy steel, acetylene-welded. The contacts are of the usual sliding-wedge con-

Digitized by Google

struction, and consequently have the well known advantages often described for this form of manufacture. The switch opens by gravity assisted by a tension spring. The parting movement of the contacts is rapid when the switch is opened.

Tank lifters for raising the tank the entire distance between the station floor and the switch frame can be furnished. One lifter only is needed for each station. The lifter consists of a simple detachable frame which carries a handle, worm gear, shaft and two drums for winding and unwinding the drums to raise or lower a tank, respectively. The lifter can be operated, removed and replaced on another similar switch by one man without difficulty. This switch is manufactured by the General Electric Company, Schenectady, N. Y.

An Inexpensive Emergency Transformer Outfit.

An ingenious use of material which at first glance would seem to be valueless is shown in the accompanying illustrations of a portable transformer outfit belonging to the municipal lighting plant of Crawfordsville, Ind.

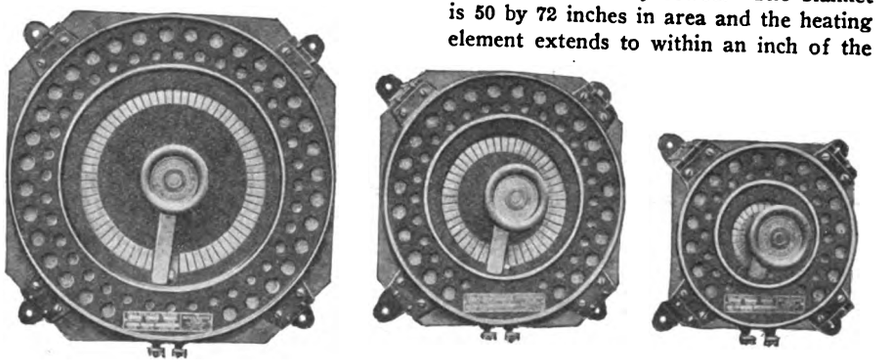
This emergency outfit proved itself of great utility for testing trial power installations, breakdown service, for temporary installations at the county fair, and similar services.

The running gear was originally part of one of the fire engines owned by the city. When the engine was scrapped to be replaced by more modern equipment, the wheels and frame were secured by the superintendent of the electric light plant.

The electrical equipment consists of two Westinghouse single-phase distributing transformers, each of 25-kilowatt capacity. Leads are brought out to the rack so that either single-phase or polyphase current can be obtained at potentials of 110 and 220 volts.

Square-Type Field Rhesotats Replace Circular-Plate Type.

The well known circular-plate type of field rheostats made in several sizes by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has recently been superseded by a new line of 6, 9, 12 and 15-inch square plates, which are claimed to be more economical of space. They may be used singly or mounted in tandem, provided with a common operating shaft. Each plate is a complete rheostat with radial lever, contacts and resistance. The resistance wire is reflexed to provide for expansion and to cover the surface adequately. It is fastened to the soapstone base and covered with a special fireproof cement.



Three Sizes of Square-Plate Field Rheostats.

These rheostats are of the "convertible" type provided with a substantial insulated knob on the front of the rheostat and with a clutch member at the rear and may therefore be mounted either on the front or back of the switchboard. If the rheostat is to be mounted on the back of the switchboard a separate handwheel and dial plate must, of course, be employed.

Robinson Electric Blanket.

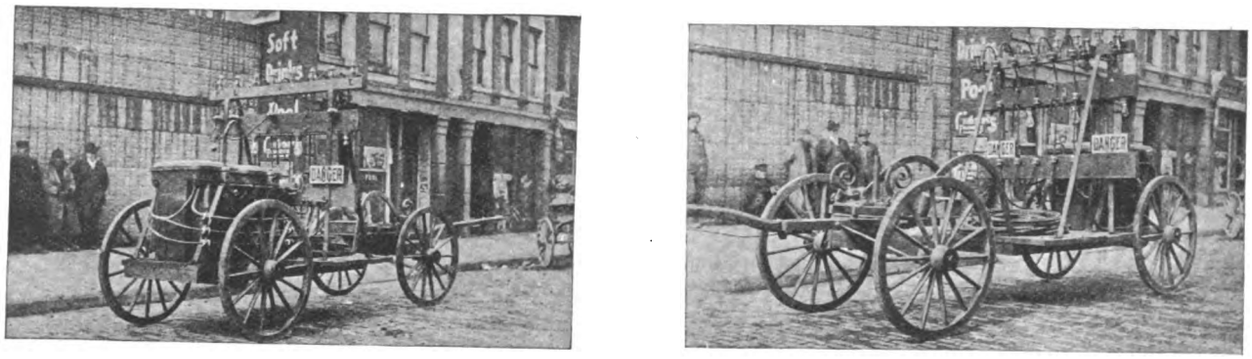
All the prominent health authorities are agreed on the value of sleeping outdoors, or at least in rooms with wide-open windows and an abundance of fresh air. Anyone who has cultivated the practice of sleeping in fresh air under proper conditions realizes the great improvement resulting in general health and in efficiency resulting from its invigorating effects. Except during the few warm months of the year the greatest difficulty experienced with fresh-air sleeping is in keeping sufficiently warm and it is only this inability on the part of most people that prevents this healthful practice from becoming general.

This problem has been attacked by an enterprising central-station man of the Northwest, who felt that electricity could conveniently and economically solve it. The solution was found in the new electric blanket invented by E. G. Robinson, president of the Northwest Electric Light and Power Association. This blanket is made of substantial textile fabrics between which a well protected electric heating element is carefully sewed. The blanket is 50 by 72 inches in area and the heating element extends to within an inch of the edge. A three-heat switch that can be manipulated even in the dark is provided for obtaining three different temperatures, about 112, 102 and 82 degrees Fahrenheit. Each of these temperatures is maintained constantly as long as the corresponding current is on and the blanket is provided with means for preventing excess or dangerous temperatures. With simple precautions it is entirely safe from burns, fire, shock or short-circuit.

Its application is recommended not only for sleeping outdoors or in unheated bedrooms, but for invalids and elderly people and anyone with impaired blood circulation. The blanket is made for connection to 110-volt lighting circuits by means of nine-foot cord and plug provided with the blanket.

The power consumption at the three heats is respectively 170, 110 and 60 watts. High heat is used only when profuse sweating is desired.

This blanket is made by the E. G. Robinson Electric Company, Arlington, Wash.



Two Views of Emergency Transformer Outfit Mounted on Old Fire-Engine Truck for Crawfordsville Municipal Plant.

Digitized by Google

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

FIXTURES.—Electro Dental Manufacturing Company, Thirty-third and Arch Streets, Philadelphia, Pa.

Rhein Adjustable Electric Light Fixture for dentist's offices, consisting of a fixture supported by a special cable passing over pulleys on a frame, with counterweight, junction box, switch and supply cord. The special cable consists of four N. E. Code flexible conductors, a steel runner for support of fixture, and outer tape and braided coverings.

Listed November 9, 1915.

FIXTURE PARTS.—Inland Electric Company, 14 North Franklin Street, Chicago, Ill.

Steelite. Protected flexible portable fixtures, made up complete with standard wire and fittings.

Listed November 16, 1915.

FUSELESS ATTACHMENT PLUG.—Peerless Light Company, 800 Adams Street, Chicago, Ill.

Non-separable attachment plug.

Peerless. 660 watts, 250 volts.

Listed October 22, 1915.

HEATERS, Electric.—Majestic Electric Development Company, 428 O'Farrell Street, San Francisco, Cal.

Stationary Electric Air Heaters, consisting of two or more heat units mounted on sheet-metal reflectors and inclosed in asbestos-lined and covered metal frames, designed to be set into ordinary walls, and covered with ornamental cast-iron front pieces.

Style 15, 8.8 amperes, 110 volts; style 30, 13.2 amperes, 110 volts.

Listed November 11, 1915.

PANELBOARDS.—Buffalo Electric Contracting Company, 24 Broadway, Buffalo, N. Y.

Panelboards shown by test and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters, have labels attached.

Listed November 1, 1915.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J. Freeman porcelain-shell receptacles.

Keyless, 1,500 watts, 600 volts. Cleat type, catalog No. 224.

Listed November 4, 1915.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Freeman metal-shell receptacles.

Key, 250 watts, 250 volts.

Cleat and concealed type, catalog No. 195.

Conduit-box type, catalog Nos. 150, 152.

Keyless, 660 watts, 250 volts. Conduit-box type, catalog Nos. 151, 153.

Pull, 250 watts, 250 volts. Cleat and concealed type, catalog No. 22.

Listed November 3, 1915.

RECEPTACLES, Standard. — The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H" brass-shell receptacles.

Push-button, 660 watts, 250 volts. Concealed, catalog No. 7550. (See cut.)

Keyless, 660 watts, 250 volts. Concealed, catalog Nos. 7551, 7561.

Listed November 3, 1915.

Push-Button Wall Receptacle. — Cutler-Hammer Manufacturing Company

SHADEHOLDERS. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Shadeholders, catalog Nos. 521-22; for use with sign receptacles, catalog Nos. 4035, 59108, 61988.

Listed November 5, 1915.

SIGN MACHINES.—Kelley & Kelley, 3193 Boulevard, Jersey City, N. J.

Thermal flashers each comprising a sheet-steel cabinet inclosing a small vacuum tube and an expansion wire. The expansion wire is intermittently shunted across supply line and by its expansion and contraction rocks the vacuum tube back and forth, making and breaking the circuit between platinum contacts and a small amount of mercury within the tube.

Universal Tic Tac Flashers, 125 volts.

One-pole, one-circuit, one-tube; 0.5-12 amperes, catalog No. 622.

One or two-pole, one-circuit, two tube, 0.5-25 amperes, catalog No. 623.

One pole, two-circuit, one-tube; 0.5-12 amperes each side, catalog No. 624.

One or two-pole, two-circuit, two-tube; 0.5-25 amperes each side, catalog No. 625.

Listed October 25, 1915.

SOCKETS, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Brass shell. Keyless, 1,500 watts, 600 volts, catalog Nos. 53, 54, 55.

Porcelain shell. Keyless, 1,500 watts, 600 volts, catalog Nos. 56-59 inclusive, 65.

Listed November 2, 1915.

SOCKETS, Standard.—Union Electric Company, Trenton, N. J.

Porcelain shell.

Keyless, 1,500 watts, 600 volts, catalog Nos. 522, 523, 524.

Listed November 1, 1915.

SOCKETS, Weatherproof.—E. H. Freeman Electric Company, Trenton, N. J.

Porcelain shell.

1,500 watts, 600 volts, catalog Nos. 60-3 inclusive, 67, 68.

Listed November 1, 1915.

SWITCH BOXES. — The Adapti Manufacturing Company, 919 West Street, Cleveland, O.

Cast-iron switch boxes for use with rigid conduit, catalog Nos. 2501, 2500-T, 2501-T, 2601, 2600-T, 2601-T. Switch-box cover, catalog No. 16.

Listed October 20, 1915.

SWITCHES, Automatic. — United Pump & Power Company, Milwaukee, Wis.

Automatic pressure-regulator switches.

Inclosed, quick-action, spring operated switches controlled by spring-opposed diaphragm and plunger. Alternating-current type, two-pole; direct-current type, single-pole with magnetic blowout in series.

Type 3D1, direct current, 0-6 amperes, 110-600 volts.

Type 3D2, direct current, 6-12 amperes, 110-220 volts.

Type 3A1, alternating current, 12 amperes, 110-220 volts, or 6 amperes, 440-550 volts.

Listed November 8, 1915.

SWITCHES, Push-Button Flush.—The Arrow Electric Company, 630 Capitol Avenue, Hartford, Conn.

Arrow E.

Four-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog No. 6803. Also with lock attachment.

Listed November 11, 1915.

WIRES, Miscellaneous.—D. & W. Fuse Company, Providence, R. I.

Deltabeston Fixture Wire.

Solid or stranded conductors, Nos. 14, 16 and 18 B. & S. gauge, having a felted asbestos insulation. This wire is furnished as single conductor with or without an outer silk braid and in twisted pair or twin wire with an outer silk braided covering.

Standard for use in fixtures within buildings, including fixtures for gas-filled incandescent lamps.

Listed November 8, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

WESTFIELD, MASS.—The Municipal light board is soon to construct a transmission line to connect the factory of the Westfield Manufacturing Company, which will have an initial installation of about 250 horsepower in motors. A new boiler and equipment will be installed at the generating plant, to take care of the growing power load. W.

ATLANTIC CITY, N. J.—It is reported that a new hotel to cost over $1,000,000 will be erected on the site of the old Windsor Hotel here. Jules E. Mastbaum, Philadelphia, Pa., is interested.

ALLENTOWN, PA.—The Bonney Vise and Tool Company will shortly erect a large addition to its already large plant here. In conformity with its present operation, all machines will be electrically driven. J. Edward Durham, Jr., is vice-president and secretary.

WHEELING, W. VA.—The Wheeling Electric Company may erect a new electric power plant at Tiltonville. Address general manager.

NORTH CENTRAL STATES.

PERRYVILLE, O.—Electric light bonds in the sum of $6,000 will be offered for sale December 27. Address L. W. Truman, village clerk.

URBANA, O.—The Urbana Light Company will run a line to the county hospital and equip the building for the use of electricity, under a contract recently entered into with the county commissioners. L.

ALEDO, ILL.—The condition of the lighting system is unsatisfactory. Address R. E. Ayers, of the Dixon Utilities Company, at Dixon, Illinois.

BELLEVILLE, ILL.—City officials and citizens are conferring on the advisability of establishing a municipal electric light plant. Z.

JACKSONVILLE, ILL.—Plans for a boulevard lighting system on South Main Street are being discussed. Z.

OLNEY, ILL.—The council is considering ways and means to secure electric lights. Address town clerk.

TAMMS, ILL.—The Tamms Ice, Light and Fuel Company has been incorporated. The company has a capital stock of $2,500, and is to generate electricity and manufacture ice for the general public. E. J. Hodges Sr., E. J. Hodges, Jr., and Mildred Hodges are the incorporators. Z.

GRAND RAPIDS, MICH.—The American Public Utilities Company will let a contract of about $1,000,000 soon for hydroelectric generator equipment for a power plant and dam at Wissota, Wis., on the Chippewa River, an improvement costing about $1,400,000. Address Charles B. Kelsey, 401 Michigan Trust Building, manager of company.

MAZEPPA, MINN.—It is proposed to expend $10,000 in purchasing a power site and establishing an electric plant. Address city clerk.

PLUMMER, MINN.—The proposition for the installation of an electric lighting plant carried. Address town clerk.

GUTTENBURG, IOWA.—The town has voted for municipally-owned electric lights. Address town clerk.

OSKALOOSA, IOWA.—South Market Street is agitating the installation of "great white way" electroliers. Address town clerk.

SHARON SPRINGS, KAN.—Electric light bonds amounting to $10,000 have been authorized by vote. Address Harry C. Wheeler, city clerk.

SOUTH CENTRAL STATES.

GEORGIANA, ALA.—The McGowin-Bennett Milling Company will establish an electric light plant. Address W. M. McGowin, president.

WESSON, MISS.—M. L. Culley, of Jackson, Miss., is supervising engineer of an electric light and waterworks plant which is to be constructed here at a cost of $18,000. G.

PAMPA, TEXAS.—The Pampa Water, Light and Power Company has been incorporated with a capital of $5,000, by A. E. Davis, M. E. Davis and others.

PLAINVIEW, TEX.—Charles A. Malone, manager and principal stockholder of the Malone Light and Ice Company, and Judge H. C. Randolph have returned from St. Louis, where they completed the sale and delivery of the properties of the Malone Light and Power Company, including the plants at Plainview, Lubbock and Lockney, to the Texas Utilities Company, a new corporation recently organized in St. Louis, under Texas laws, with the principal offices in Plainview. It is understood that about $230,000 was paid for the properties of the Malone Light and Ice Company, which includes all the transmission lines and other properties of that company in Floyd, Hale and Lubbock Counties. One of the main purposes of the new company will be to develop all kinds of business along electrical lines, such as extensions to the rural districts, to furnish power for feed mills, pumps, for irrigation, as well as for lighting purposes. At present the company is chartered for $250,000, but the plan is to increase the capital stock as the development of the system progresses, and ultimately to make a million-dollar institution. The following are the officers of the Texas Utilities Company: H. Wurdack, St. Louis, president; H. C. Randolph, Plainview, vice-president; E. M. Kurtz, St. Louis, secretary and treasurer; Charles A. Malone, Plainview, general manager.

WICHITA FALLS, TEX.—The property of the Citizens' Light and Power Company has been sold to the Wichita Falls Electric Company.

WESTERN STATES.

CULBERTSON, MONT.—It is reported Donaldson Brothers, of Culbertson, owners of the Culbertson electric lighting plant, will immediately make needed improvements and extensions to the local plant, to care for increasing business. Among the equipment to be purchased are large storage batteries, a new engine, and considerable electrical equipment. O.

WHEATLAND, WYO.—Improvements are contemplated to the municipal electric lighting plant, involving an expenditure of from $6,000 to $10,000. They will include the purchase of a new steam engine and two boilers, bids for which will be called for at once. The installation of a new generator is contemplated in the near future.

ROSWELL, N. M.—The Roswell Gas and Electric Company will install a large steam turbine and make other improvements to its plant, at a total cost of about $20,000. D.

SANTA FE, N. M.—Articles of incorporation have been filed of the Rio Grande Light, Heat and Power Company, a Philadelphia concern, capitalized at $1,000,000. The company proposes to build a dam 112 feet high in White Rock Canyon, and to furnish electric power for lighting and industrial purposes to Albuquerque, Santa Fe, Las Vegas and other cities.

POCATELLO, UTAH.—The new street-lighting district, which will shortly be installed in this city, will cost approximately $52,000. Address city clerk.

KELSO, B. C.—It is understood that the North Coast Power Company is planning the construction of a power line from Woodland to Vancouver. The power line to Kalama is also to be rebuilt.

OLYMPIA, WASH.—Articles of incorporation have been filed with the Secretary of State for the Pacific Power and Development Company, of Mobridge, S. D. The company is capitalized at $1,000,000. O.

SEATTLE, WASH.—A bill has been passed by the city council authorizing the expenditure of $29,750 for extensions to be made during the month of December by the municipal lighting department. Adress H. W. Carroll, city clerk. O.

SPOKANE, WASH.—New contracts for street lighting will be let within a few months. Address Mayor Fassett.

VANCOUVER, WASH.—The North Coast Power Company, which recently took over the southwest Washington properties of the Washington-Oregon Corporation, it is reported, is making arrangements to erect an electric transmission line from Woodland to Vancouver, Wash. The proposed line, according to report, will pass through Ridgefield and

Digitized by Google

La Center, and will necessitate the rebuilding of the transmission line from Kalma to Woodland. The new line will connect the company's plant at Vancouver with other plants north of Woodland.

EUGENE, ORE.—The city council has under consideration a plant for the installation of an ornamental street lighting system to cost about $1,920.

SUBLIMITY, ORE.—The city of Sublimity has granted C. E. Taylor, of the Stayton Electric Light Company, Stayton, a franchise to install and operate an electric light and power system here for a period of 25 years. The company has also secured a five-year contract for lighting the streets of the town.

LOS ANGELES, CAL.—The Public Service Commission has authorized F. L. Roehrig, architect, to prepare plans and specifications for the central power substation to be erected in Los Angeles, at a cost of $50,000. This station will be situated on city property on the west side of the Los Angeles River, south of Main Street bridge; it will receive electrical energy from the aqueduct power plant and will be the main distributing station in the city.

PARADISE, CAL.—A representative of the Pacific Gas and Electric Company has interviewed the people in regard to furnishing electricity for light and power purposes. Nearly all local residents have signed up for lights, and the work of erecting poles and stringing wires will soon begin.

SAN MATEO, CAL.—W. B. Lawrence, superintendent of the Spring Valley Water Company, has submitted a proposal to the Board of Supervisors offering to supply electricity to the County Farm and Hospital. The company is contemplating the erection of an electric transmission line from San Mateo to its plant at Crystal Springs Lakes. The cost of the proposed line is estimated at $2,700.

PROPOSALS.

POWER HOUSE.—Sealed proposals will be received at the office of the United States Engineer, Wheeling District, Wheeling, W. Va., until January 6, 1916, for building a fireproof power house at Dam No. 14, Ohio River. Further information may be had on application to the above-named office.

ELECTRICAL EQUIPMENT.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until December 30 for construction complete, including mechanical equipment and approaches, of the United States post office at St. Petersburg, Fla.

ELECTRIC WIRING.—Bids will be received until December 21 for construction of high and grade school building, including general construction, steam heating, electric wiring, plumbing, temperature regulation, etc., in Alton, Iowa, to cost about $35,000. Plans are being prepared by Beuttler & Arnold, architects.

REFRIGERATING EQUIPMENT.—Bids will be received at the office of the Port Commission of Seattle, Bell Street Warehouse, Seattle, Wash., until December 15, for construction of refrigerating and electrical equipment for east waterway terminal improvement of the port of Seattle. Plans and specifications are on file in the above office. C. E. Remsberg is secretary.

INCANDESCENT LAMPS.—The Commonwealth of Massachusetts has asked for sealed bids for about 50,000 incandescent electric lamps, all proposals to be on forms obtainable from Room 6, State House, Boston. Each bid must be accompanied by a check for $500 payable to order of the State Treasurer, and a $5,000 bond will be required for the faithful performance of contract. Bids will be received until December 16, at 12 noon, at Room 6, State House.

ELECTRIC ELEVATORS.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 23, for the installation, complete, of an electric passenger elevator in each of the following buildings: The United States post office and courthouse at Pendleton, Ore., the United States post office and courthouse at Brattleboro, Vt., and the United States post office and courthouse at Ardmore, Okla., in accordance with drawings and specifications, copies of which may be had on application to the Washington office.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,383. ELECTRICAL MATERIAL, ETC.—An American consular officer in Spain reports that an electrical and machinery supply house desires to represent manufacturers of electrical material, such as motors, transformers, protective apparatus, centrifugal pumps, machine tools, brick-making machines, and electric automobiles. Interested firms should be prepared to negotiate along liberal lines of credit, and are requested to forward propositions and technical guarantees, together with catalogs fully describing goods and showing weights, dimensions, capacities, etc. Correspondence should be in Spanish.

NO. 19,385. ELECTRICAL SUPPLIES.—An American consular officer in China reports that a trade organization in Siberia desires to place a large order for carbons for street lamps using direct current; also switches, sockets, rosettes, plugs and meters. Samples, catalogs, price list and terms of sale are solicited.

NO. 19,412. MINING LOCOMOTIVES, ELECTRIC METERS, ETC.—A letter to the Bureau states that a business man in the Netherlands desires to be placed in touch with manufacturers of mining locomotives, electric meters, furnaces for smelting, hardening, etc., also furnaces fired by liquid fuel, boiler and engine mountings, gauges for all purposes, motor and automobile accessories, and all other articles needed in the mining industry, machine-building mills, etc.

ELECTRICAL APPARATUS AND SUPPLIES.—A prominent wholesale jobbing firm in Amsterdam, Holland, is prepared to act as agent for first-class American manufacturers of all kinds of electrical machinery, apparatus and supplies for light, power and telephone installations, who are willing to supply equipment suitable for the European market. The firm wishes catalogs, prices and full particulars. This is an exceptionally good opportunity. Address Claessen & Co., N. V., vh., Amsterdam, Netherlands.

NEW PUBLICATIONS.

DEPARTMENT OF COMMERCE.—The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued a catalog of bureau publications. These include reports of consuls and special agents.

FUELS.—The Bureau of Mines, Washington, D. C., has issued Technical Paper 123, entitled "Notes on the Use of Low-Grade Fuel in Europe," by R. H. Fernald. The fuels considered include wood refuse, tar, powdered fuel and coal high in ash.

BUREAU OF STANDARDS.—Vol. XII, No. 1, of the *Bulletin* of the Bureau of Standards, contains papers by R. L. Sanford on "Temperature Coefficient of Magnetic Permeability," and by F. Wenner, E. Weibel and F. B. Silsbee on "Methods of Measuring the Inductances of Low-Resistance Standards." No. 2 contains "Effective Resistance and Inductance of Iron and Bimetallic Wires," by John M. Miller, and "A Direct-Reading Device for Use in Computing Characteristics of Vacuum Tungsten Lamps," by J. F. Skogland.

NEW INCORPORATIONS.

LEXINGTON, KY.—The Fisher Electric Company has been incorporated with a capital of $4,000. by J. D. Susley, J. G. Fisher and others.

BOONEVILLE, ARK.—The Booneville Light and Power Company has been incorporated with a capital of $50,000. C. S. Greenway is president.

PENNINGTON GAP, VA.—The Electric Transmission Company has been incorporated with a capital of $100,000.

RICHMOND, ILL.—The Richmond Electric Company has been incorporated with a capital of $1,000, by Leslie Latimer, Phyllis L. Miller and others.

LAKE GENEVA, WIS.—The Southern Wisconsin Electric Company has been incorporated with a capital of $100,000, by John B. Sanborn, J. P. Alberg and others.

BROOKLYN, N. Y.—Primo Electrical Manufacturing Company, Inc. Capital, $5,000. Incorporators: C. P. Liotta, Rosario Morello and Sem S. Celano.

INDIANAPOLIS, IND.—Pratt Electric Company. Capital, $10,000; to buy and sell electrical fixtures. Incorporators: Henry F. Pratt, Allie T. Pratt, Edward W. Hohlt.

CHICAGO, ILL.—The Goodman Electric Construction Company has been incorporated with a capital stock of $10,000. The incoporators are: Lester E. Goodman, Ralph E. Stern and Harold J. Goldberger.

ROCHESTER, N. Y.—The Riverside Electric Company has been incorporated with a capital stock of $2,000 by N. K. Ward, Edwin L. North and Walter J. Moore.

NEW YORK, N. Y.—B. & R. Electrical Engineering and Construction Company, Inc. Electrical work of all kinds. Capital, $5,000. Incorporators: Morris Rothberg, Louis Bayer and Charles M. Glueck.

NEW YORK, N. Y.—Precision Radio Equipment Company, Inc., to manufacture electrical apparatus, etc. Capital, $5,000. Incorporators: Charles Horton, Samuel M. Levy and Simon H. Glass.

CHICAGO, ILL.—The Kantro Chandelier Company has incorporated with a capital stock of $2,500, to manufacture and deal in gas and electric fixtures and appliances. Harry W. Rosenblum, Samuel Spitzer and Mary Z. Wolf are the incorporators.

Digitized by Google

BRIDGEPORT, CONN.—A certificate of corporation has been filed in the office of the Secretary of State by the Ozark Construction Company. The concern is authorized to do a general contracting and electrical business and to distribute electricity. The authorized capital is $50,000, but business will begin with $1,000. The incorporators are James A. Byrne, C. C. Warren, Jr., and O. F. Ghrist of New York City.

FINANCIAL NOTES.

J. P. Morgan & Company have taken from the Interborough Rapid Transit Company $20,000,000 of the first and refunding-mortgage five-per-cent bonds, which is the balance of the $30,000,000 allotment. To date the bankers have taken from the company a total of $128,658,000 bonds, leaving approximately $27,000,000 to be taken. These are the bonds for the financing of the new subways and elevated lines.

Dividends.

	Term.	Rate.	Payable.
Ark. Val. Ry., Lt. & Pw., pf.	Q	1.75%	Dec. 15
Interstate Rys., pf.	S	3 %	Jan. 1
Muskogee Gas & Elec., pf.	Q	1.75%	Dec. 15
Standard Gas & Elec., pf.	Q	1 %	Dec. 15
United Lt. & Rys., first pf.	Q	1.5 %	Jan. 1

Reports of Earnings.

PUGET SOUND TRACTION, LIGHT & POWER.

	1915	1914
September gross	$ 609,782	$ 683,557
Net after taxes	222,207	283,633
Surplus after charges	39,384	105,816
Twelve months gross	7,690,015	8,623,412
Net after taxes	2,914,849	3,568,522
Surplus after charges	749,418	1,459,720

AURORA, ELGIN & CHICAGO.

	1915	1914
October gross	$ 167,521	$ 172,580
Net	65,122	56,152
Net after charges and taxes	23,844	16,669
Surplus after depreciation and amortization	19,134	13,743
Four months gross	713,318	783,790
Net	266,272	306,665
Net after charges and taxes	103,533	147,598
Surplus after depreciation and amortization	84,800	131,896

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
October gross	$ 339,599	$ 304,413
Net after taxes	133,350	113,426
Sulplus after charges	78,992	62,567
Balance, after preferred dividends	62,564	47,462
Ten months gross	3,168,960	3,032,972
Net after taxes	1,213,978	1,178,967
Surplus after charges	692,950	672,862
Balance after preferred dividends	529,465	522,325

TWIN CITY LINES.

	1915	1914
October gross	$ 806,542	$ 798,732
Net	317,810	325,389
Surplus after charges	175,882	193,977
Ten months gross	7,802,968	7,735,571
Net	2,782,844	2,945,928
Surplus after charges	1,448,242	1,647,804

MASSACHUSETTS ELECTRIC.

The Massachusetts Electric Companies issued its annual report, covering the year ended June 30, 1915. Comparison of the income account of the operating company with the previous year follows:

	1915	1914
Operating revenue	$9,538,406	$9,614,150
Operating expenses	6,897,751	6,427,863
Net operating revenue	2,640,654	3,186,289
Non-operating income	66,459	81,096
Charges	2,004,564	1,952,115
Net income	702,549	1,315,270
Dividends	677,846	1,242,069
Surplus for year	24,703	73,201
Previous surplus	213,532	212,850
Net profits and loss debentures	232,484	72,520
Surplus, June 30	5,751	213,532

MISSISSIPPI RIVER POWER.

	1915	1914
October gross	$ 139,033	$ 136,603
Net after taxes	115,529	107,059
Surplus after charges	9,306	17,088
Twelve months gross	1,630,982	.....
Net after taxes	1,289,219	.....
Surplus after charges	36,013	.....

THIRD AVENUE.

	1915	1914
October gross	$ 968,649	$ 949,430
Net after taxes	285,314	265,983
Other income	12,452	9,731
Total income	297,766	275,714
Surplus after charges	78,160	61,124
Four months gross	3,832,583	3,844,275
Net after taxes	1,227,527	1,218,875
Other income	34,062	31,436
Total income	1,261,589	1,250,311
Surplus after charges	404,175	396,674

PERSONAL MENTION.

MR. HENRY I. HARRIMAN, president of the Connecticut River Transmission Company, with headquarters in Boston, Mass., has been elected vice-president of the Boston Chamber of Commerce.

MR. ROBERT B. BASHAM, general contract agent of the Topeka (Kan.) Edison Company has been elected general manager of an electrical exhibition company which will hold an electric show in Topeka on January 17.

MR. J. J. KIRK, illuminating engineer of the Commonwealth Edison Company, Chicago, addressed the Chicago Section, Electric Vehicle Association of America, on December 7, on the subject of "The Nitrogen Lamp."

MR. H. K. LUGGER, local manager of the North Coast Power Company, Vancouver, Wash., formerly Washington-Oregon Corporation, has been made master of maintenance for the North Coast Power Company. Mr. Lugger will be succeeded by L. Clark.

MR. BENJAMIN B. LAWRENCE, a member of the class of 1878, has purchased the Pelton-Doble water wheel and the Pelton-Francis turbine, which were exhibited by the Pelton Water Wheel Company at the Panama-Pacific International Exposition, and presented these to the School of Mines, Columbia University, New York City.

MR. THOMAS J. CUSACK, for some time operator in charge of the operation of fire alarms in Brooklyn, has been appointed superintendent of operation of the fire-alarm system in all of the boroughs of New York City. Mr. Cusack has been in the telegraph service since 1877, being formerly connected with the Western Union Telegraph Company, Postal Telegraph-Cable Company, and other telegraphic organizations.

MR. PHILIP S. DODD has joined forces with the J. Walter Thompson Company, New York, N. Y., one of the largest expert advertising agencies in the country, where he will be in charge of special technical accounts. Mr. Dodd, who before entering the direct advertising field with the M. P. Gould Company, of New York, was connected for a long time with the electrical industry. For several years he was associated with the Electrical Review Publishing Company, Inc., later on holding the position of director of the Department of Publicity of the National Electric Lamp Association, Cleveland, O., and acting for over a year as secretary of the Society for Electrical Development, Inc., New York.

MR. JULIUS ANDRAE, head of the house of Julius Andrae & Sons Company, Milwaukee, Wis., celebrated his eighty-sixth birthday at his home on Beverly Road, East Milwaukee, on Thursday, December 2. Mr. Andrae was born in Meissen, Saxony, in 1829. When he had reached the age of 14 he began his apprenticeship to a locksmith. After traveling over Germany for several years he came to America and Milwaukee in 1855. On Sept. 22, 1856, he married Miss Marie Muelhauser. In 1859 he opened a little shop on West Water Street, which was the foundation of the large electrical firm which he now heads. Mr. Andrae refuses to retire from business and visits the present place of business on Michigan and Broadway twice or three times a week. The business is actively carried on by his sons.

MR. EDWARD N. LAKE, formerly in charge of the Chicago office of the Stone & Webster Engineering Corporation, has become a partner in the Krehbiel Company, engineers and constructors, with offices in the Marquette Building, Chicago. The business will be continued under the present firm name; Mr. Lake will be treasurer and manager, and Mr. Krehbiel will continue as president. Mr. Krehbiel has specialized in fuel, steam and mechanical engineering and construction. Mr. Lake has made electricity and its commercial applications his specialty. Both have been active in their respective lines for fifteen or twenty years. Both were connected with the Arnold Company and Bion J. Arnold for a number of years and are personal friends of long standing. Mr. Lake has also been connected in turn with the Western Electric Company, Chicago Edison Company and Board of Supervising Engineers. The Krehbiel Company is doing in smaller units the same kind of work that Stone & Webster, H. M. Bylesby & Company and J. G. White Companies have done in terms of millions.

OBITUARY.

MR. P. E. HUBER, founder and at one time manager of the Maschinenfabrik Oerlikon, died at Zürich, Switzerland, on October 4, at the age of 79.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 6	Nov. 29
American Tel. & Tel. (New York)	128½	128½
Commonwealth Edison (Chicago)	144	143¾
Edison Electric Illuminating (Boston)	240	241
Electric Storage Battery, common (Philadelphia)	67	67
Electric Storage Battery, preferred (Philadelphia)	67	67
General Electric (New York)	176	176
Kings County Electric (New York)	125	125
Massachusetts Electric, common (Boston)	7	7
Massachusetts Electric, preferred stamped (Boston)	40	39
National Carbon, common (Chicago)	150	150
National Carbon, preferred (Chicago)	120	119¾
New England Telephone (Boston)	131	132
Philadelphia Electric (Philadelphia)	27⅜	27½
Postal Telegraph and Cables, common (New York)	80¼	80½
Postal Telegraph and Cables, preferred (New York)	65½	65
Western Union (New York)	87⅝	88
Westinghouse, preferred (New York)	76¼	—
Westinghouse, common (New York)	68¾	69¾

Digitized by Google

MR. T. BERLINER, manager of the Bergmann Electricity Works, Berlin, Germany, died on October 30, at the age of 65.

MR. THEODOR BRUGER, physicist of the Hartmann & Braun Aktien-Gesellschaft, Frankfurt, Germany, and well known for his work in developing electrical instruments, died on October 22. Mr. Bruger was 59 years of age.

MR. JOHN P. BOUNEY, president of the Thompson-Bouney Company, electrical contractors, of Brooklyn, N. Y., died on November 7, in that city after a brief illness. He was 42 years of age and a member of the local, state and national electrical contractors' associations.

MR. H. A. FISHER, who was recently appointed an assistant in the panelboard and switchboard departments of the New York territory of the Trumbull Electric Manufacturing Company, Plainville, Conn., died suddenly on November 26. Before his appointment to the New York office he had been connected with the company for about 12 years as foreman of the panel and switchboard departments.

MR. MALCOLM HARLOW BAKER, of East Braintree, Massachusetts, died suddenly, on November 27, at the age of 43 years. He was a graduate of the class of 1894, Lawrence Scientific School of Harvard University. Soon after he was associated with Frank Ridlon in the development of arc lamps and other electrical developments. He was with the Westinghouse Electric & Manufacturing Company in 1902 and 1903, and took a prominent part in the development of the reactance regulator. More recently he had been associated for some time with the American Flaming Arc Lamp Company.

DATES AHEAD.

American Association for the Advancement of Science. Annual meeting, Columbus, O., December 27-31. Secretary, L. O. Howard, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, Wis., January 17-19, 1916. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

With the Electrical Manufacturers

The Globe Stove & Range Company, Kokomo, Ind., manufacturer of a fine line of electric stoves and ranges and other stoves, will hold its annual sales conference at the factory headquarters in Kokomo, during the week of December 13.

Wheeler Reflector Company, 156 Pearl Street, Boston, Mass., has issued Bulletin F, dealing with semi-indirect and pure indirect lighting fixtures. The reflectors for the former type are made either fluted or of the inverted hill and valley type. All reflectors are of white-porcelain-enameled steel. Several sizes and types are illustrated and briefly described.

The Terry Steam Turbine Company, Hartford, Conn., has issued Bulletin 20, dealing with the various types of Terry turbines. These are built for high,low or mixed pressures. Each type is illustrated and described, also applications, such as turbo-generator sets, turbo-pump sets and turbo-blower sets. The advantages of the Terry construction are clearly set forth. Copies of the bulletin can be had on request to the company.

The Mechanical Appliance Company, Milwaukee, Wis., has issued a booklet giving speeds and ratings of its motors for all classes of power circuits. In this are included the data for direct-current motors, two or three-phase motors for 60, 50, 40, 30 and 25 cycles, and single-phase motors for the corresponding frequencies. Data are also included on the various types of Watson ventilating fans driven by motors for various currents.

The Deane Steam Pump Company, 115 Broadway, New York, has issued Bulletin D184 on high-pressure hydraulic pumps. These are made for pumping water, oil or other liquids under pressures from 500 to 10,000 pounds per square inch and are used in many different industrial processes. Most of these pumps are multiplex; they are vertical or horizontal, and driven by motors or other prime movers. Auxiliaries, such as automatic bypass and check valves, are also described and illustrated in the bulletin.

Advance Electric Company, St. Louis, Mo., has issued Bulletin No. 12, describing and illustrating the "Advance" type WS, single-phase, constant-speed motors. These motors start as repulsion motors and, after accelerating to nearly full speed, automatically change to induction motors through the action of a very simple, rugged and reliable short-circuiting device. They are made in sizes from one-eighth to five horsepower and for 60 and 25-cycle circuits. A general description of this type motor was published in our issue of September 18, 1915.

National Metal Molding Company, Pittsburgh, Pa., manufacturer of electrical conduits and fittings, is distributing an attractive wall hanger, reproducing, in one-half actual size, the conduit charts as adopted and recommended by the National Electrical Contractors' Association. They show the sizes of conduit required by the National Electrical Code for carrying various sizes of conductors. This hanger is printed on linen-backed stock and will prove of convenience for reference in the offices of architects, engineers and electrical contractors. A copy will be furnished upon request of the company.

Western Electric Company, Incorporated, has changed its Detroit headquarters from 263 Franklin Street to the new building at Kirby and Dequindre Streets. The change has been occasioned by a steady business growth which reached proportions whereby the old location became inadequate. The new building is two stories high and has a frontage of 150 feet and a depth of 130 feet adjoining the Grand Trunk Railway in the section that forms a part of the inner belt railway of Detroit. The total floor space is 50,000 square feet, and the yard, with an area of 54,000 square feet, is large enough to accommodate stocks of crossarms, clay conduit and poles. The new building is strictly up to date, with every appliance to facilitate quick handling of merchandise.

Westinghouse Lamp Company, 1261 Broadway, New York City, has issued a booklet on store lighting that is entitled "A Simple but Important Problem." It deals with the lighting of the store interior, show case, display window and electric signs. Suggestions on proper lighting are exemplified by illustrations of good and poor installations. Incandescent lamp development is discussed and data given on Westinghouse Mazda lamps of the various types suitable for store and sign lighting. The booklet is well written and illustrated. It should prove of great interest to merchants in giving them in condensed form a knowledge of the best methods of store, window and sign lighting. Copies of the booklet can be obtained on application to the company.

Frank Adam Electric Company, 904-914 Pine Street, St. Louis, Mo., has issued Catalog No. 2, covering its line of Reflectolytes. These are semi-indirect lighting fixtures incorporating a reflecting surface above the lamp with a diffusing bowl around and below the lamp. The units are made in four sizes, ranging from 12 to 24 inches diameter of the reflecting surface. About the latter is a more or less ornamental ring. The whole unit is mounted directly at or close to the ceiling or suspended by chains to meet requirements. Quite a variety of designs is shown in the catalog, also details of construction, photometric and illumination curves. Engineering data are given on the selection of the proper units for different illumination requirements. The Frank Adam Electric Company has found that the manufacture and sale of Reflectolytes has grown to such dimensions as to make it advisable to turn

Digitized by Google

this over entirely to a subsidiary company, **The Reflectolyte Company.**

Western Electric Company announces that on November 18 all of the assets of the Western Electric Company, the old Illinois corporation, were acquired by transfer to a new company chartered under the laws of the State of New York, to be known as **Western Electric Company, Incorporated.** The stockholders of the Western Electric Company came to the conclusion that it was desirable that the company should have two classes of stock, common and non-voting preferred. As the statutes of Illinois do not provide for such classifications, it was decided that the company should change its legal domicile. No change in the policies, operations, or management of the company is involved. The same board of directors and officers still continue. Western Electric Company, Incorporated, under the laws of New York will have $15,000,000 of six-per-cent cumulative preferred stock, and 150,000 shares of common stock at no par value, but with $5 paid in, making a total of $750,000.

The Bryant Electric Company, Bridgeport, Conn., has just secured from its printers its 1916 catalog of wiring devices. This is very handsomely gotten up and consists of 168 pages, which is said to make it the largest catalog covering this type of electrical equipment ever published. A unique feature is a simple thumb index by means of which the 30 odd parts of the catalog can be readily located. The catalog covers the full range of Bryant and Perkins devices, including sockets, receptacles, attachment plugs, wall, surface and knife switches, cutout bases and fuses, rosettes, etc. Each device is illustrated and the ratio of the illustration to the actual full size is given. In the case of the several lines of sockets and receptacles the interchangeable feature is neatly shown to give a good idea of the great variety of caps and bases available for any type body. Six pages of wiring diagrams near the back of the book will be found of much value. Dimension classifications cover 10 pages. The last eight pages are devoted to a double index: the first index gives catalog numbers, page number, list prices, discount schedule, standard package and carton. The final index is a general index by the names of the devices.

Record of Electrical Patents

Issued by the United States Patent Office, November 30, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,161,837. Switch for Automatic Telephone Systems. W. M. Bruce, Jr., assignor to International Automatic Telephone Co., Springfield, O. Arrangement of contacts and wipers in automatic switch.

1,161,840. Electric-Lighting Device. C. E. Campbell, Lynn, Mass., assignor of one-half to F. R. Campbell. Combined transformer and lamp bulb.

1,161,850. Paper-Feed-Controlling System. A. F. Dixon, assignor to Western Electric Co., New York, N. Y. Electromagnetic, step-by-step feed controlled by paper.

1,161,854. Calling Device. O. F. Forsberg, assignor to Western Electric Co. Mechanism of impulse-sending call box.

1,161,856. Telephone Receiver. S. P. Grace and R. A. L. Snyder, Pittsburgh, Pa. Combination of permanent and electromagnets actuating diaphragm-operating armature.

1,161,863. House Telephone Set. R. R. Ireland and A. F. F. Gilson, assignors to Western Electric Co. Includes outlet box with cover plate for wall mounting and jack for plugging in hand set.

1,161,869. Mail-Handling Apparatus. G. E. Kerns, Archer City, Tex. For delivering mail to moving trains; automatic electric car moves alongside main track and may be releasably secured to mail car.

1,161,874. Telephone-Exchange System. W. H. Matthies, assignor to Western Electric Co. Arrangement of line-finding devices in automatic system.

1,161,884. Terminal Bank. J. N. Reynolds, assignor to Western Electric Co. Arrangement of contact terminals in telephone selector switch.

1,161,890. Permutation Alarm and Circuit-Closer for Sparking Plugs. P. Roussey, Brooklyn, N. Y. Special structure of switch.

1,161,905. Bearing for Fast-Running Wheels. F. A. Stewart, assignor of one-half to W. Ellis, Hamilton, Ont., Can. Special axle, lubrication and contacting device for trolley wheels.

1,161,929. Telegraphy. P. B. Delany, assignor to Telepost Co., New York, N. Y. Polarity system with tape sender.

1,161,932. Automatic Control of Machinery. D. Du Bois, assignor to Crocker-Wheeler Co., Ampere, N. J. Automatic control of motor current on reverse; current is shut off if speed exceeds high or low limits.

1,161,939. Submarine Lighting. B. B. Lewis, Bridgeport, Conn. Lamp fixture for attachment to ship's side.

1,161,988. Apparatus for Winding Armature Coils. J. C. Simonsen, assignor to Chalmers Motor Co., Detroit, Mich. Structure of collapsible mandrel.

1,161,989. Insulating Fabric. C. E. Skinner, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Fireproof; consists of metal foil with hard, heat-resisting, insulating coating.

1,161,993. Liquid Rheostat. H. A. Steen, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Electrode plates divided into sections which are selectively connected in circuit.

1,161,994. Over-Speed Protecting Device for Electric Motors. N. W. Storer, assignor to Westinghouse Electric & Mfg. Co. Operation of multi-voltage controller governed by motor speed.

1,162,007. Substation Message-Register. J. A. Wotton, assignor to Western Electric Co. For telephone stations.

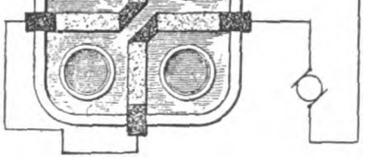
1,162,012. Receiver-Supporting Arm. W. R. Armor and L. A. Young, Denver, Colo. Telephone receiver carried on extension arm secured to pedestal.

1,162,020. Fire-Alarm. W. H. Bowman, Bridgeport, Conn. Telephone receiver hook lifted by spring plunger normally restrained by fuse.

1,162,031. Electrode-Adjusting Means. D. E. Carpenter, assignor to Westinghouse Electric & Mfg. Co. Windings and connections of electrode-actuating motor in vapor rectifier.

1,162,043. Electric Locomotive. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Spring connections between journal boxes and frame permit universal relative movement.

1,162,049. Thermoelectric Generator. E. Garretson and E. W. Schlenker, Buffalo, N. Y. Compact, unitary structure of thermopile in casing for temperature indication.



No. 1,162,179.—Electric Furnace.

1,162,056. Circuit-Controller. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Drum type; has delayed automatic return to "off" position.

1,162,069. Telephone System. K. S. Johnson, assignor to Western Electric Co. Connections of transmitter, receiver and bell in subscriber's set.

1,162,070. Means or Apparatus for Cleaning Tinned Plates. M. L. Jones, Neath, Wales, assignor of one-third each to J. M. Fells and to W. H. Patchell. Plates magnetically held to conveying rolls.

1,162,071. Automatic Temperature-Controlling System. S. N. Jordan, Lowell, Mass. Circuit arrangements for thermostatic control of valve-operating motor.

1,162,073. Current-Interrupter. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Special structure of electromagnetic vibrator for engine ignition.

1,162,076. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Pendent device has two superposed, push-button switch mechanisms.

1,162,083. Automatic Train-Controlling Device. A. F. Lacey and W. J. Clingenpeel, Des Moines, Iowa; said Clingenpeel assignor to P. Pappas. Electromagnetic mechanism for controlling air train line according to position of signal along trackway and speed of train.

1,162,106. Wiring Mechanism for Automobile Engines. I. H. Sare, Sentinel, Okla. Manner of supporting cable and distributing and connecting wires.

1,162,139. Reflector for Incandescent Lamps. M. Claussen and W. A. McKay, assignors to Wizard Electric Lamp Co., San Francisco, Cal. Hemispherical reflector attached to bulb.

1,162,149. Process of Making Wear-Withstanding Coat. E. A. Eckhardt, Philadelphia, Pa. Iron or steel phonograph needles hardened by alloying with tungsten, vapor of which is passed to needle through arc.

1,162,159. Message-Delivery System. O. W. Hart, Fall River, Mass. Telephone memorandum device at one station has the delivery of the memorandum controlled from another station.

1,162,167. Combination Plug and Pilot Light. J. A. Hunt, Pleasanton, Cal. Lamp indicating presence or absence of potential contained in casing secured to attachment plug.

1,162,174. Electromagnetic Regulator. A. Krauss, assignor to firm of Robert Bosch, Stuttgart, Germany. Unitary structure of electromagnetically controlled compression resistance.

1,162,175. Trolley Wheel. F. Leadbeater, Detroit, Mich. Lubricating provisions.

1,162,178 and 1,162,179. Electric Furnace. J. M. Lohr and H. W. Gillett, Ithaca, N. Y. First patent: heat conserved by arranging heating elements to radiate directly to crucibles and indirectly to casing. Second patent: modification. (See cut.)

1,162,196. Dynamo Mounting. W. I. Thomson, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Special structure for suspending ear-lighting dynamo.

1,162,198. Handle for Illuminating Diagnosis and Surgical Instruments. R. H. Wappler, assignor to American Cystoscope Makers, Inc., New York, N. Y. Comprises socket for receiving lamp and variable resistance.

1,162,202. Phonograph. C. Agner, Jr., Philadelphia, Pa. Opening of cover lights lamp on sound arm, illuminating needle and record.

1,162,212. Process and Apparatus for Preparing Beverages, and Products Produced Thereby. J. E. Bloom, Brooklyn, N. Y. Liquid is subjected to action of absorption material while in an electrified state.

1,162,213. Process and Apparatus for the Electrical Treatment of Liquids and Fluids, and the Products Resulting Therefrom. J. E. Bloom. Modification of above.

1,162,224. Lock for Automobiles. P. Cyr, Boston, Mass., assignor of one-half to W. J. Downey. Electric contacting device requires predetermined combination of operations similar to combination lock.

1,162,263. Circuit-Closer for Electric Clocks. O. M. Todd, Toppenish, Wash. Adapted to be intermittently opened by swinging of pendulum.

1,162,267. Apparatus for Recording and Duplicating Music-Notes. E. C. Weissmiller, Los Angeles, Cal. Perforating machine for recording piano music has punches controlled electrically by piano keys.

1,162,279. Organ Stop Mechanism. R. G. Austin, assignor to Austin Organ Co., Hartford, Conn. Electromagnetically operated.

Digitized by Google

1,162,285. Coated Phonograph-Stylus and Other Article. E. A. Eckhardt. Product of process of patent No. 1,162,149.

1,162,287. Flashlight. E. Grah, Toledo, O. Adapted for mounting directly on terminals of dry cell, throwing light endwise of cell.

1,162,288. Lantern. E. Grah. Above modified to throw light laterally of cell.

1,162,294. Wire-Supporting Pole. R. Lichtenberger, New Harmony, Ind. Built-up metal structure.

1,162,309. Electric Starting Device for Internal-Combustion Engines. L. Renault, Billancourt, France. Flywheel normally disconnected from engine is driven by starting motor and then centrifugally disconnected from motor and connected to engine.

1,162,339. Method of Making Composite Metal Bodies. W. D. Coolidge, assignor to General Electric Co., Schenectady, N. Y. Manner of uniting tungsten and copper.

1,162,340. Method of Uniting Metals. W. D. Coolidge, assignor to General Electric Co. Manner of promoting the adhesion or wetting of molten copper to the surface of a body of tungsten.

1,162,341 and 1,162,342. Composite Metal Body. W. D. Coolidge, assignor to General Electric Co. First patent: X-ray target having body of cast, homogeneous copper and a facing of wrought tungsten. Second patent: ductile tungsten having an adherent coating of an incorrodible alloy, largely gold.

1,162,354. Connecting Device. H. A. Hart, Hartford, Conn. Plug and receptacle have quartered threads and plug has two parallel threads of same pitch as receptacle thread.

1,162,355. Electric-Lamp Lock. J. O. Hebble, Lancaster, Pa., and F. H. Humphrevill, Atlantic City, N. J.; said Hebble assignor to said Humphrevill. Key-operated flexible ring with teeth, is mounted on socket to grip lamp stem.

1,162,361. Electric Switch. P. A. Huddleston, Oklahoma City, Okla. Details of multiple switch.

1,162,363. Electric Heater. H. H. Ingersoll, assignor to Ingersoll Electric Vaporizer Co., Chicago, Ill. Details of casing, coil, etc., of flexible heating pad.

1,162,370. Friction Brake. S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Electromagnet mounted in motor casing controls connection of shaft with brake.

1,162,372. Motor. J. C. Kersteter, assignor to Minneapolis Heat Regulator Co., Minneapolis, Minn. Operation of motor electromagnetically controlled by thermostat.

1,162,377. Vehicle Signaling Device. C. C. McColgan, Baltimore, Md. Tail structure has light for license plate, and has direction plate with doors for covering last, an audible signal indicating when doors are closed.

1,162,394. Adjustable Portable Electric-Light Support or Base. J. L. Power, Trenton, N. J. Socket pipe is adjustable along slot in support or transversely thereto.

1,162,397. Manufacture of Rubber Articles. R. B. Price, assignor to Rubber Regenerating Co., Mishawaka, Ind. Electrically heated apparatus for vulcanizing tires.

1,162,400. Shade-Holder. A. C. Recker, assignor to Waterbury Mfg. Co., Waterbury, Conn. Details of device for attachment to lamp socket.

1,162,405. System of Distribution. E. O. Schweitzer, Chicago, Ill. Variable and constant-voltage devices connected with a source are connected by an asymmetric connection, preventing transfer of energy from circuit of constant-voltage device to circuit of variable-voltage device.

1,162,415. Process of and Apparatus for Producing Ozone. J. Steynis, Bay Shore, N. Y. Refrigerating apparatus is provided for drying and cooling the air.

1,162,419. Motion-Picture Camera. C. Van Deventer, Chicago, Ill. Means for discharging static electricity from the film.

1,162,424. Electric-Light-Bath Apparatus. B. Wiener, Chicago, Ill. Mounting of incandescent lamps in frame extending about body of patient.

1,162,433. Combined Phonographic and Motion-Picture Apparatus for Producing Indexed Synchronous Records. E. H. Amet, Redondo Beach, Cal. Magnetic film marker and telephone receiver acting on phonograph produce signals in unison on film and record when circuit is closed.

1,162,437. Device for Protecting Structures from Lightning-Strokes. W. Bajohr, St. Louis, Mo. Details of lightning rod for chimneys, etc.

1,162,442. Vehicle Signal Apparatus. B. L. Bobroff, Milwaukke, Wis. Electromagnetically operated direction indicator.

1,162,447. Electric-Motor Device. W. H. Bristol, assignor to Bristol Co., Waterbury, Conn. Electric-motor-operated clock train.

1,162,449. Battery. C. F. Burgess, assignor to C. F. Burgess Laboratories, Madison, Wis. Dry battery has depolarizing mixture of impalpable graphite with manganese depolarizer.

1,162,458. Electric Regulator. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. Gearing for varying compression resistance.

1,162,459 and 1,162,460. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. First patent: special means for governing a voltage regulator, comprising compression resistance with means for preventing sudden changes in the regulator. Second patent: voltage control of generator in storage-battery system.

1,162,468. Magnetic Apparatus for Railways. A. H. Fox, New York, N. Y. For controlling apparatus on car from track side; magnet on car is attracted or repelled by controlling polarity of track magnet.

1,162,469. Circuit-Closer for Hot-Water Heaters. C. A. Cox, Chicago, Ill. Heating circuit opened by expansion of mercury subjected to water heated.

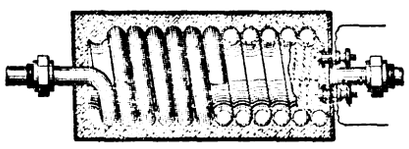
1,162,472. Reel. B. H. Gedge, Anderson, Ind., and B. H. Gedge, Jr., Cleveland, O. Winding reel is electromagnetically controlled and is magnetized to grip material supplied to it.

1,162,475. Measuring Apparatus. G. H. Gibson, Montclair, N. J. Instrument for comparing the rates of flow through two pipes has indicator acted on by two coils, respectively energized by current proportional to the fluid flow in the conduits.

1,162,482 and 1,162,483. Dynamo-Electric Machine. F. I. Hiss, Jr., assignor to Westinghouse Electric & Mfg. Co. First patent: special structure and location of series field coils. Second patent: modification.

1,162,490. Thermo-Hydrostat. E. M. Jones, Adrian, Mich. Water supply to a vaporizer associated with a heater electrically controlled by joint operation of wet and dry thermostats.

1,162,493. Rotor for Dynamo-Electric Machines. A. Kingsbury, assignor to Westinghouse Electric & Mfg. Co. Special laminated structure for rotating fields reducing the section and weight as the shaft is receded from, and equalizing stresses.



No. 1,162,537.—Electric Gas-Heater.

1,162,504. Bowl-Hanger for Electric Lights. L. G. Mitchell and G. H. Norquist, assignors of one-third to C. Lundgren, Omaha, Nebr. Special structure of chain-supported frame for indirect fixture.

1,162,506. Voltage-Regulator for Electric Generators. A. H. Olmstead, Bowdon, England. Special structure of contact arms, etc., in electromagnetic vibratory contact regulator.

1,162,514. Controlling Apparatus for Electrical Switching Systems. J. N. Reynolds, assignor to Western Electric Co. Switch device has plunger which alternately engages contact sets of a pair when repeatedly depressed.

1,162,516. Electric Time Switch. K. F. Richmond, London, Eng. Flow of fluid to one side of tilted vessel to break circuit, is retarded by porous diaphragm.

1,162,518. Centrifugal Switch. H. M. Scheibe, assignor to Westinghouse Electric & Mfg. Co. Special structure for mounting on rotor of ceiling fan motor.

1,162,521. Magneto. J. E. Sheriff, assignor to J. Takamine, New York, N. Y. Structure having permanent magnet, coil, pole pieces and vibratory armature co-operating with the last, rotating together.

1,162,537. Compressed-Gas Heater. J. J. Yeager, Sheridan, Wyo. Gas coil wound on electrically heated core. (See cut.)

1,162,541. Electrical Switch. J. L. Adams, Jr., assignor to Westinghouse Electric & Mfg. Co. Centrifugally operated.

1,162,553. Current-Distributing Apparatus. C. N. Bergmann, Pittsburgh, Pa., assignor of one-half to C. Schuster, Bellevue, Pa. Arrangement of switch interconnecting buses on switchboard.

1,162,556. Automatic Telephone-Exchange System. G. A. Betulander and N. G. Palmgren, assignors to Betulander Automatic Telephone Co., London, England. Arrangement of intermediate junction lines for connecting incoming lines with lines of outgoing groups.

1,162,571. Contact Device. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Special arrangement of spring contacts in contact-making and breaking device.

1,162,593. Gyroscopic Transmission Apparatus. J. Fieux, Harfleur, France. Gyroscopic power transmission element has flywheel electrically driven.

1,162,614. Armored, Flat, Electrical Conductor. M. Kallman, deceased; P. Kallman, Berlin, Germany, administratrix. Resilient metallic strip has nonconducting, adhesive coating in which conductor is embedded.

1,162,646. Signal Apparatus. W. K. Porter, Pittsburgh, Pa. Control of permanent or flashing multicolored signal.

1,162,656. Recording Device. W. W. Salmon and F. L. Dodgson, assignors to General Railway Signal Co., Gates, N. Y. Records when a second train enters an occupied block.

1,162,667. Transformer Pole. E. O. Schweitzer. Hollow metal pole supporting line wires contains oil-immersed transformer in its base.

1,162,659. Spark Gap. J. E. Seeley, assignor to Vulcan Coil Co., Los Angeles, Cal. Structure of terminals with special heat-radiating provision.

1,162,665. Electric Switch. A. J. Tizley, assignor to E. F. Caldwell & Co., New York, N. Y. Rotary switch mounted in tube supporting single lamp in imitation of candle.

1,162,666. Printing Camera. J. Trimbach, Rye, N. Y. Electric light mounted on wall of extensible light chamber.

1,162,695. Motor for Operating Railway Signals. W. K. Howe, assignor to General Railway Signal Co. Armature and field poles have registering slots and armature is moved or stopped by varying current.

1,162,699. Device for Indicating Liquid-Levels at a Distance. S. Q. Kline, Jr., Washington, D. C. Float-controlled electric circuit actuates indicator at a distance.

1,162,701. Check-Controlled Mechanism. L. J. LePontois, assignor to American Multinola Co., Cleveland, O. Motor circuit initially closed by check is later closed independently thereof.

1,162,719. Water Siren. H. Hecht, Kiel, Germany. Resistance of driving motor circuit is varied to maintain constant speed.

1,162,726. Magneto. A. H. Neuland, San Francisco, Cal. Structure of rotating flux valve and co-operating pole-pieces.

1,162,735. Snap Switch. H. K. Ely, Baltimore, Md. Special structure of push-button-operated, rotary snap switch.

Reissue 14023. Photographic-Printing Apparatus. A. S. Howell, assignor to Bell & Howell Company, Chicago, Ill. Original No. 1,056,794, dated March 25, 1913. Electric circuit for motor and light automatically controlled by film and light-admission gate.

Patents Expired.

The following United States electrical patents expired on December 6, 1915:

615,346. Electric Battery. O. T. Bugg, Jr., New York, N. Y.

615,265. Alternating - Current Dynamo-Electric Machine. S. Z. de Ferranti, Hollinwood, England.

615,292. Electric Battery. M. Maas, New York, N. Y.

615,344. Telephone. F. Burger and H. M. Williams, Fort Wayne, Ind.

615,347. Electric Switch. W. Ely, Providence, R. I.

615,349. Electric Cable Conductor. S. D. Field, Stockbridge, Mass.

615,351. Dynamo-Electric Machine. J. E. Fuller, New York, N. Y.

615,365. Electrical Appliance for Elevators. J. H. Roberts, Grand Rapids, Mich.

615,369. Ore Stamp. D. M. Smyth and J. E. Smyth, Pasadena, Cal.

615,388. Apparatus for Operating Electric Switches. C. Hartdegen, Newark, N. J.

615,395. Circuit-Breaker. F. A. La Roche, New York, N. Y.

615,407 and 615,408. Electric Arc Lamp. M. S. Okun, New York, N. Y.

615,418. Automatic Rheostat. E. T. Wilkinson, Philadelphia, Pa.

615,419. Rheostat. C. Wirt, Philadelphia, Pa.

615,420. Electrical Connection. W. E. Baker, Chicago, Ill.

615,471. Reflector. A. E. Boeschenstein, St. Louis, Mo.

615,539 to 615,541. Electric Battery. P. A. Emanuel, Aiken, S. C.

615,584. Block-Signal System. W. L. Stockton, Trenton, O.

615,592. Electric Locomotive. M. E. Thomas, Cassaday, Ky.

615,594. Electric Locomotive and Truck. S. M. Vauclain, Philadelphia, Pa.

615,652. High-Frequency Apparatus. T. B. Kinraide, Boston, Mass.

615,653. High-Frequency Induction Apparatus. T. B. Kinraide.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII, No. 25. CHICAGO, SATURDAY, DECEMBER 18, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.
E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER

DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Timeliness in Electric-Vehicle Sales.....1093
Convenience of Electrical Service.....1094
Improving Group Drives.....1094
Analyzing Electrical Accidents.....1095
The American Association of Engineers.....1095

DEPARTMENTS:
Commercial Practice 1097
Electrical Construction 1105
Public Service Commissions.....1109
New Electrical and Mechanical Appliances.....1126
Current Electrical News.....1129
Record of Electrical Patents.....1133

LEADING ARTICLES:
Steam-Electric Power Plant of Alaska Mine.....1097
Notes on Interior Wiring.—By Terrell Croft.....1105
Additional Prosperity Week Returns.....1111
A System of Keeping Records of Current Work in Electrical Inspection Department.—By Washington Devereux 1122

MISCELLANEOUS:
Convention of American Association of Engineers.....1096
Electric Club of Chicago Elects Officers.....1096
Philadelphia Section Activities.....1096
Hydroelectric Development on Public Domain.....1096
Expert Criticizes Municipal Operation.....1100
Seattle Sign Makes Big Impression.....1101
Lower Rates at Fall River.....1101
New Rate Schedule Adopted by New Orleans Company.....1102
New York Edison Company Adopts New School Course in Electric Appliances 1102
House-Wiring Window Display Elicits 900 Inquiries in Six Days 1103
Southern California Edison Company Opens Campaign on Electric Ranges 1104
Indianapolis Bank Adopts Flood Lighting.....1104
Among the Contractors.....1107
The Installation and Working of Lead Storage Batteries.—By R. Rankin.....1107
Reasons for Electrical Progress.....1110
Electric-Motor Control 1111
Electrical Accidents; British Government Inspector's Report 1112
Lighting with Gas.....1113
School Lighting Discussed by Chicago Illuminating Engineers 1114
National Independent Telephone Association and Independent Telephone Association of America Merge.....1120
Electrical Credit Men Hold Annual Convention in Chicago 1121

Copyright, 1915, by Electrical Review Publishing Company, Inc.

TIMELINESS IN ELECTRIC-VEHICLE SALES.

"First Blizzard of Winter Blockades Traffic," was the headline in Chicago papers on Saturday evening, December 11, as the first snow storm of the season visited the city. Weather reports indicated that other sections of the country were affected and doubtless the traffic in many other cities was as seriously crippled as in Chicago. The horse, of course, is the worst sufferer. Most of the congestion and many of the accidents recorded in the newspaper accounts were caused by horses falling on the slippery pavements or becoming exhausted because of heavy pulling. In Chicago, on Saturday morning, six horses were seen down in the course of three blocks. In two instances the fall resulted seriously to the animals and in all other cases appreciable delays were necessary before normal operation could be resumed.

It would be difficult to conceive of a situation that could better emphasize the genuine worthiness of the electric truck. And yet it is doubtful whether advantage is taken of a time like this to bring the merits of the electric before the prospective user. Prompt transportation of goods, particularly at this season of the year, is of decided importance and no more opportune time for displacing of horses could be desired than when such a delivery system is crippled and the user is confronted with daily demonstrations of the inefficiency of the horse. The ability of the electric to negotiate heavy snows and to operate efficiently regardless of severe cold is not so well known as the electric-truck salesman may believe. It is probably in accordance with sales theories to tell the prospect who is visited in July that the battery vehicle will operate perfectly satisfactorily in winter, but the actual demonstration of this fact is what will count. Why would it not be feasible to have a list of such "summer" prospects and after the first snow place an electric at their disposal for a day, or week? At least give a demonstration to prove the claims made. Or what better list of prospects could be desired than the names of the firms operating horse-drawn wagons which have experienced accidents or delays because of horses falling on slippery pavements, etc. A salesman could hardly occupy his time to better advantage than by collecting such names during the inclement weather, and while it may be pressing matters too closely to visit a prospect on the same day that some accident has incapacitated his delivery, nevertheless the visit should be made while the occurrence is still fresh in his mind.

Digitized by Google

CONVENIENCE OF ELECTRICAL SERVICE.

As civilization advances, convenience becomes more and more valuable as a factor in accomplishment. Whatever saves time and trouble pays for its development in an age like this. Every user of electricity enjoys its convenience whether he thinks about it or not. Formerly, in many electrical applications, the cost of service was as great if not greater than the expense of utilizing its competitors, but, even so, electrical methods grew in popularity, installations multiplied, and less convenient services gave way, often when their cost was somewhat less than that of electrical operation.

Today electrical service is actually cheaper in a vast number of cases than any possible substitute, but its convenience is greater than ever. We spend money today to save larger outlays, and it is economic wisdom so to do. A factory driven by steam power, belts and shafting finds that its production can be increased 10 to 15 per cent by scrapping the mechanical installation and purchasing motors. This may mean that the cost per unit of product decreases, and usually it does; but even if it means that the manufacturing cost increases slightly through the addition of something in fixed charges, or overhead expense, it may be the only wise policy to get rid of the older equipment in favor of the newer, since by the use of the latter the total volume of sales can be increased and the total profits at the end of the year swelled. Fortunately, the efficiency of the electric drive is so great when laid out according to engineering principles and studies, that an actual decrease in cost may generally be expected.

Manufacturing engineers designing electric appliances are paying more attention than ever to the factor of convenience, and they are sure to reap their due reward. Witness the provision of cord switches to enable flatirons to be cut out of service without moving from the ironing board; the application of a low-powered incandescent lamp for the front of the iron in cases where the kitchen has but a single outlet; the equipment of toasters with means for turning the bread without burning the fingers; development of the "flashlight pencil" for use in stereopticon lectures; provision of telephone sets for taxicab service; design of motor driven ink erasers for the drafting room, and so on. Almost every advance in appliance design embodies some new gain in convenience; makes the use of electricity easier, safeguards continuity of service in some way, lightens weight, or minimizes complication.

Whether one sells central-station service, telephone communication or rapid transit, the principle is the same. Important as economy is in the industrial future of this country, we have still a long way to go before the development stage settles down into the intensive and acute competitive production which exerted such pressure upon the proletariat of Europe before the beginning of the great war. Here, instead of stimulating the hoarding of funds, the opportunities are inclined to call them forth for courageous investment. We can afford to spend money to save time, in order that we may thereby produce in larger volume. Hence arises the growing practice of making appointments by telephone instead of by mail, boarding an electric car for a few blocks to save two or three minutes in the stress of mid-afternoon, and the use of the electric fan in rushing the drying of photographic negatives in the commercial studio. All of these practices cost something, but they are worth the price, enable the world to do more work in a given time, and thus are not only justified from the economic standpoint, but are neglected at the peril of the user's success. That low cost of operation goes hand-in-hand with convenience is one of the chief causes for thankfulness within the electrical industry, but even where costs are not materially lowered by the use of electrical conveniences, improvement in the quality or increase in the volume of work done almost invariably follows.

The opportunity to render electrical service of all kinds still more convenient is so great as to deserve even more attention than it is getting. The day is coming when the provision of but a single electric service outlet in a residence room will be looked upon by the modern architect as a practice of the past. No more important work lies ahead of the central-station manager than the cultivation of such relations with architects as will lead to the specification of multiplied outlets in new buildings. In publicity work emphasizing the value of small motors, in planning schedules of car service, locating telephone pay stations, and in countless other ways, a systematic effort can be made to develop the convenience of electrical applications, to the lasting good of the consumer and the industry.

IMPROVING GROUP DRIVES.

For many years to come the group driving of machinery by electric motors is likely to hold its own in successful installations, thanks to the longevity of the electrical equipment, which continues to run at good efficiency in numerous instances which illustrate from ten to twenty years of service. The strong tendency toward individual motors is not overlooked in this thought, but few equipment investments have proved to be more permanent or more satisfactory than capital outlays in well considered group drives associated with the earlier days of electric power application.

Improvement of group drives therefore deserves consideration. The mechanical maintenance of first-class shafting conditions goes without saying as essential to good modern practice and need not be discussed. A recent trip through a famous manufacturing plant driven almost entirely by the group system—and therefore of little interest as a mere example of electric application, considering the peculiarities of the local shafting arrangement—disclosed an excellent opportunity to improve the service by making a survey of the clearances between machines, walls, motors and aisles. "Safety First" has received merited attention in this installation, but conditions might be still further bettered by the simple plan of analyzing the spacing be-

Digitized by Google

tween machines, noting the opportunities for simplifying belt and shafting arrangements and looking to it that starting boxes, switches and fuse blocks are well out of the usual path of travel.

The importance of a speedy resumption of service is very great in most group-driven installations, and here extra inclosed fuses are kept on the starting boxes to minimize the delay in case of a "blow." Too many machines are involved in the stopping of a 50-horsepower or even a 15-horsepower motor, to shut down any longer than is absolutely necessary in case a fuse opens the line, and the time taken to summon one of the electrical staff with a substitute fuse is not to be permitted under many conditions. Other suggested improvements are the re-location of disconnecting switches now on ceilings and consequently rather inaccessible, the marking of switches with the motors controlled, and the training of all skilled employees to insert inclosed fuses as occasion requires, to report any unusual conditions in the operation of the drives, and to recommend any betterments in the grouping of tools assembled for operation by a single motor.

ANALYZING ELECTRICAL ACCIDENTS.

In the popular mind electricity is regarded as a dangerous agency and it is expected that accidents will be met wherever this form of energy is employed. There is consequently a general readiness to ascribe to electrical cause any fire the origin of which is unknown if there be on the premises any wires which may be assumed to have gotten crossed. There is also a popular fear of high-voltage shock.

Those familiar with electrical work realize that fires and personal accidents are not so numerous as is generally supposed and that, for instance, accidents among central-station employees are in much larger proportion due to mechanical than electrical causes. This very knowledge that electrical work is not so dangerous as is popularly supposed undoubtedly leads many electrical workers to be careless and omit proper precautions when working with high-tension lines or apparatus. Probably more electrical accidents are due to carelessness than to any one other cause.

To avoid accidents most effectively it is essential to know what accidents are happening elsewhere and what are their causes. There does not appear to be at this time any agency in the United States which collects complete data on this subject. There are various organized bodies interested in safety measures and accident prevention, but we know of none that completely covers the field of electrical accidents. Liability insurance companies keep records of accidents occurring among employees of their policy holders, but such data are of course incomplete.

In this issue there is abstracted from the report of the British electrical inspector of factories some data regarding electrical accidents in that country and such an analysis undoubtedly aids in the prevention of future accidents. It would be of great value if a similar comprehensive compilation could be made by some agency, either private or governmental, in this country.

THE AMERICAN ASSOCIATION OF ENGINEERS.

It sometimes seems as if there were already too many engineering societies, and some engineers of diversified interests have wished that activities of this kind might be more concentrated. Nevertheless new organizations keep springing up and if they survive it must be taken as evidence of their right to existence. Unless they serve some need of their members they are not likely to receive continued support.

The latest claimant to the support of engineers is the American Association of Engineers, which has been organized during the present year with headquarters in Chicago, and last week held its first convention in that city. This was naturally occupied principally with organization and routine matters, and the large attendance at the closing session on Saturday afternoon indicated an encouraging interest, at least on the part of local engineers.

It has been estimated by one of the officers of the new organization that there are at present about 40,000 engineers connected with national and local engineering societies and about 60,000 men doing work of an engineering nature who are not affiliated with any society of that kind. This would include many draftsmen, assistant engineers and men holding minor positions of a similar nature, who have grown into the work without realizing that they have a common interest with others engaged in doing work of a technical or engineering nature. Undoubtedly solidarity among the individuals composing this army would be good for the individuals, for the engineering profession and for the public. This assumes, of course, that the ideals to which the power of co-operation are to be applied are proper ones. Any such organization, to succeed, should have the public welfare, as well as individual benefit, at heart. Much may be done for both. The public little realizes what the engineer can and does do for it, and the engineer seldom receives the recognition which his work deserves. The national professional engineering societies are mainly occupied with professional problems. There is a large body of men doing engineering work who lack organization. There is an opportunity for these men to benefit themselves and to improve relations with the public.

Any new society which is able to accomplish these ends, even if it does no more, will have sufficiently justified itself. Its success must depend upon the co-operation of the men whom its leaders are endeavoring to organize. No engineer should deny them a hearing, although he should be satisfied that a new association brings promise of some real accomplishment before giving it his support.

Digitized by Google

Convention of American Association of Engineers.

The American Association of Engineers held its first convention at the La Salle Hotel, Chicago, on December 10 and 11. At the opening session on Friday morning addresses were made by H. S. Baker, President W. D. Wilcox and F. H. Newell, professor of civil engineering in the University of Illinois. Secretary Arthur Kneisel made a report of the work so far accomplished, which has included connecting a number of men with vacant positions. The present membership of the association is about 325.

At the afternoon session T. B. Lambert spoke on "Qualifications.' At the banquet in the evening addresses were made by Everett Jennings and H. B. Wild.

At the sessions on Saturday reports of committees were acted upon and organization perfected. The following addresses were made: "Relation of Patent Rights to the Engineer," by G. Willard Rich; "Selling A. A. E. Memberships to Engineers," by A. H. Krom; "The Economic Aspects of Engineering Pay," by J. H. Prior.

The headquarters of the Association are at 29 South La Salle Street, Chicago. The annual dues are $10 and the objects are stated to be "to raise the standards of ethics of the engineering profession and to promote the economic and social welfare of engineers." These aims are to be accomplished by affording means for the interchange of information; by maintaining a service clearing house; by affording patent and legal advice; by supervision of legislation, and by proper publicity.

Electric Club of Chicago Elects Officers.

The annual election of officers of the Electric Club Jovian League of Chicago took place at the regular meeting of that organization on December 9 and resulted in the following being elected:

President, Victor H. Tousley.
First vice-president, H. A. Mott.
Second vice-president, J. C. Manley.
Secretary, L. C. Spake.
Treasurer, Howard Ehrlich.

Trustees: For one year, J. N. Pierce; for two years, A. J. McGivern; for three years, R. I. Phillips. An amendment to the constitution was passed providing for paying the secretary a salary for his services.

John Z. White was the speaker of the day, delivering a very interesting address, entitled "Free Trade," in which he held that the real basis of preparedness for defense, was in being able to supply the needs of an army or navy in times of strife. This necessitates a readjustment of the present method of taxing industry and elimination of a high tariff even for revenue. Revenue, he thought, should be derived from taxing land values instead.

Philadelphia Section Activities.

"Self-advancement," a fitting sequel to President McCall's talk on "Preparedness," was the title of a splendid address made by Douglass Burnett, commercial manager of the Consolidated Gas, Electric Light and Power Company, of Baltimore, at the November meeting of the Philadelphia Electric Company, Section of the National Electric Light Association, held in the New Century Drawing Rooms on November 15. The usual entertainment concluded the evening's program.

"Sign Leads" by E. S. Pelling, and "Charging Sets and Refrigeration" by R. L. Lloyd, were the titles of papers read at the November meeting of the Commercial Department Branch. Both of these papers gave evidence of careful thought and provoked free discussion.

The announcement that a prize would be given for the best interpretation of C. J. Russell's paper of the preceding month, "Systematic Sales Effort" results in seven papers being presented. The papers were well written and it was shown that Mr. Russell's ideas on this subject have been properly grasped. Gilbert Coe was the winner of the prize, a handsome scarf pin, and George Lovett received honorable mention.

Robert J. Milligan, chief electrical draftsman of the Station Construction Department of the company, addressed the Engineering Branch at its December meeting on "The Electrical Design of Our Stations." The speaker treated the subject under three headings; namely, new design where there are no property limitations; new design where there are property limitations; and new design in an old station. The talk was illustrated by lantern slides and an interesting and lively discussion then followed.

Lynn Section Meeting.

At a special meeting of the Lynn Section, American Institute Electrical Engineers on December 7, Frank P. Cox gave an illustrated lecture on "Recent Developments in Meters and Instruments. The address was of value in showing the growth of inventive effort in perfecting mechanism for the measurement of electricity.

Mr. Cox showed some remarkable refinements of recent effort in metering. A full line of the meters and instruments described were placed on tables in the lecture room, which were inspected before the address and at its close.

Hydroelectric Development on Public Domain.

In his annual report, Secretary of the Interior Lane refers to water-power development and the desirability of making power sites available as soon as possible. Of the Ferris bill be says:

"This bill was called for by the fact that existing legislation permitted only a revocable permit to be granted for such use, and this was regarded by engineers and financiers as too tentative and hazardous a tenure where millions of money were needed for the installation of the plant.

"The Ferris bill meets this difficulty by proposing a lease of these lands for a definite term of 50 years. The objection is made that the lands should be given outright. To this there are several answers of substance: No enlightened government gives such a franchise. There is danger, very real danger, too, of a complete monopolization of such power sites if the lands go forever from the people. The value of water power is not yet fully realized, and its full value can not be known at this stage in our industrial life. The purpose of the government in transferring these lands is to secure their use, because it does not choose to use them itself, but the time may come when it may be most desirable to the full development of our life that they shall be operated by the nation or the states or the municipalities in the states, and to transfer them forever would cast a burden upon the future which would be unforgivable, and is, moreover, unnecessary.

"The fear is expressed that by the imposition of charges for the use of the land an undue and unjust burden will be cast upon the people. The basis of this fear has not been discovered. Congress may, of course, if it so desire, fix absolutely the charge that shall be made, and if this were done the charge should be so low as to make the added burden upon the consumer, if any, an infinitesimal one; perhaps first a free period when no charge would be made, and then one-tenth of a mill per kilowatt-hour for a period and two-tenths of a mill later."

Illuminating Council Meeting.

At a meeting of the Council of the Illuminating Engineering Society held on December 9, E. P. Hyde, director of the Nela Research Laboratory, was appointed chairman of the Committee on Lectures. The Society is arranging for a course of lectures in illuminating engineering to be given in the fall of 1916. The University of Pennsylvania has invited the society to give the course there.

W. A. Durgin was appointed chairman of the Membership Committee.

Digitized by Google

STEAM-ELECTRIC POWER PLANT OF ALASKA MINE.

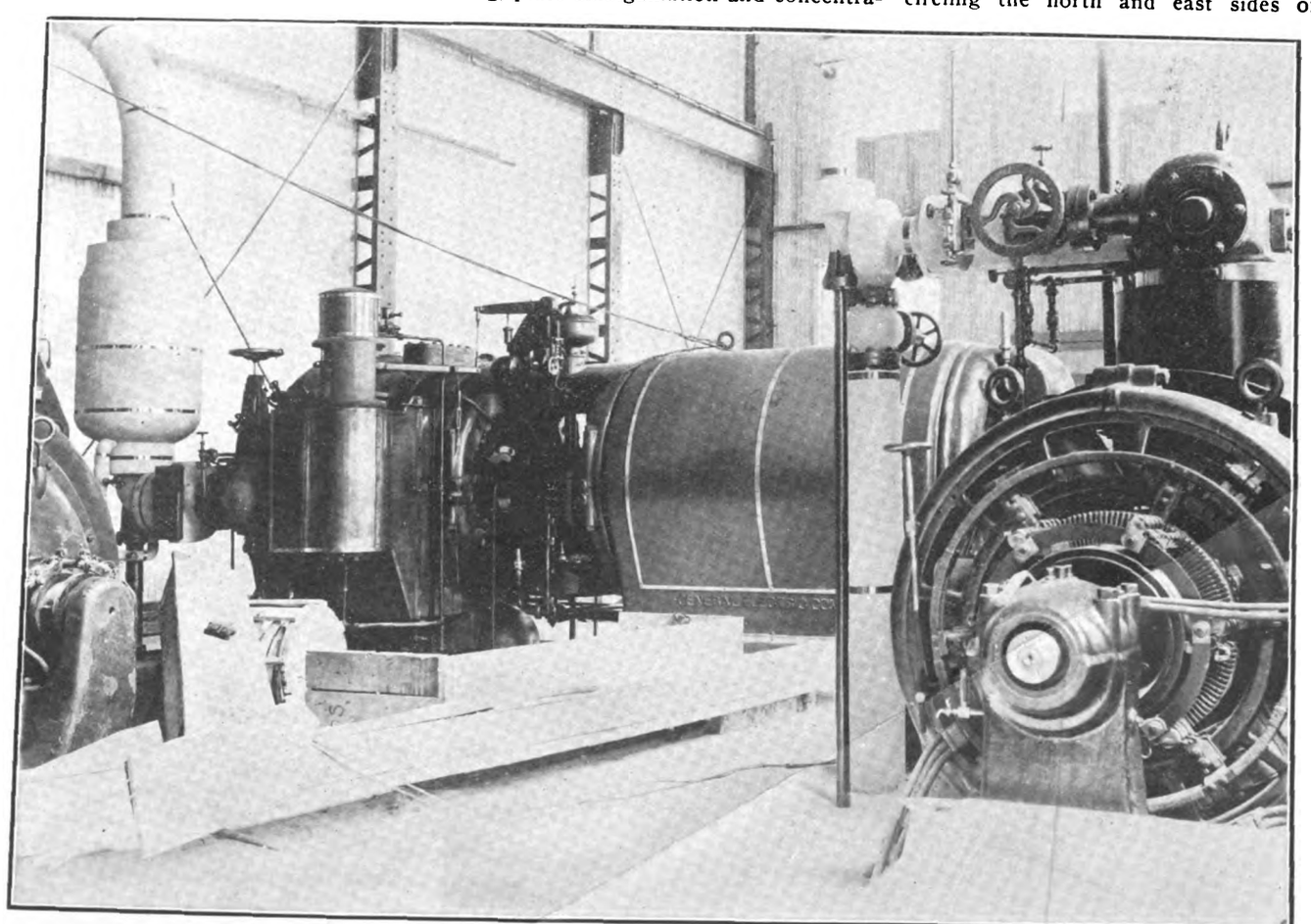
Interesting Details of Recent Installation.

In a remote district of frigid Alaska a large gold mine is being operated exclusively by means of electric power. Hydroelectric energy is supplemented by power from an oil-burning steam-electric plant which embodies many interesting features. The latter plant, recently completed, is described herewith.

In June, 1914, the Alaska Treadwell Gold Mining Company, of Treadwell, Alaska, erected a power-plant building and installed a steam-electric power plant which is a model of simplicity and, to date, has given excellent service. Its satisfactory operation reflects credit on the efficient manner in which it is being handled by the operators under the direction of P. R. Bradley, general superintendent of the Mining Company, who is in complete charge of all the company's work in Alaska.

The power plant is located at the great mines of the Alaska Treadwell Company on Douglas Island, at Treadwell. The site is at the shore end of the Treadwell wharf, on Gastineau channel. Along this waterfront are the several mills, mine shafts and many other buildings of the company. The mine workings of the company are at a depth of 1,200 to 2,200 feet and extend hundreds of feet eastward under the channel, as well as westward into the base of the mountain, which has a trend parallel to the channel. The Treadwell mining group has long been considered the largest low-grade gold mining project in the world, with the exception of some of the mines in South Africa. For more than a quarter of a century this mine has been yielding a large tonnage of low-grade gold ore, requiring milling on the ground, the reduction process being stamp-milling, plate amalgamation and concentration. Hundreds of stamps and concentrators are in use, air-compressors are required for operating power drills, tramways, conveyors, crushers, mine hoists and shop machinery are included in the operating equipment of this great industry that continually employs from 2,000 to 2,500 men. The driving of the machinery for these processes involves the important problem of continuous and uninterrupted power. As the mining and milling operations have increased in magnitude, the power facilities have been developed to meet the demands. These comprise steam power direct, water power developed through individual water wheels, available in the summer season; steam-electric and hydroelectric power for motor-driven machines.

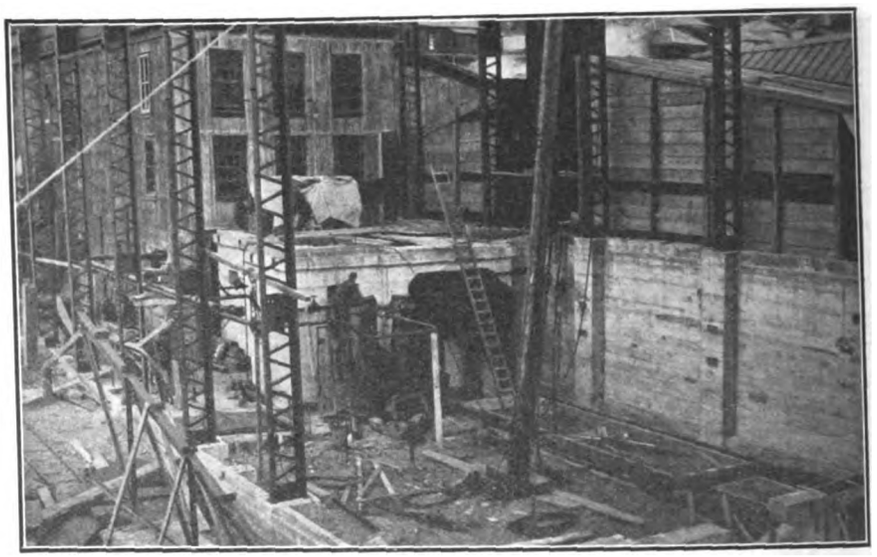
Originally the individual mills and compressors were operated during the summer season by water power secured by an expensive ditch system encircling the north and east sides of



Power Plant of Alaska Mine, Showing 2,000-Kilowatt Turbogenerator in Course of Installation.

Digitized by Google

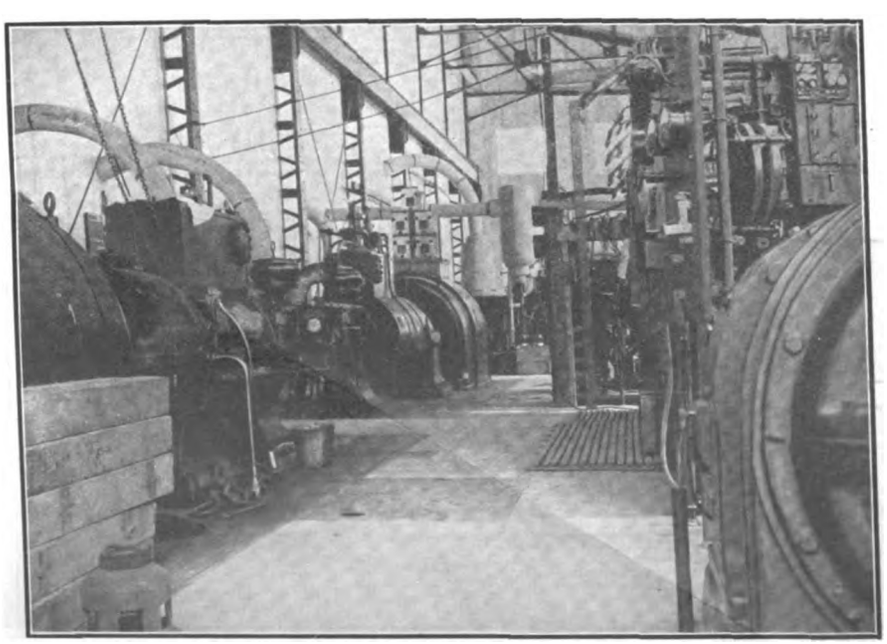
Douglas Island, at an elevation which made possible the bringing of most of the surface water to penstocks above the various mills. These penstocks lead to water wheels of the Pelton type, which operate the great machinery. During the cooler weather of the winter months the supply of water available from this source is very much decreased, due to the freezing up of streams and the prevalence of snow instead of rain. This made necessary the equipment of the plant with additional sources of power, which were supplied by providing steam-driven units, arranged to either supplement the water wheels or entirely supplant them during periods of water shortage.



New Power-Plant Building in Course of Construction Adjacent to Old Structure.

As the power requirements still further increased a separate water-power plant was developed near the face of the Mendenhall glacier on Nugget Creek. This plant is located some 15 miles from the mines, and the electrical energy developed there is sent to the mines and mills at Treadwell, on Douglas Island, from Nugget Creek on the mainland, over a transmission line paralleling the shore of the mainland until it reaches Juneau, where it crosses the Gastineau channel on high towers and then follows the east coast of the Island to the substation in Treadwell, from which it is distributed to the different points of usage. The output of this plant, however, is also limited during certain months of the year.

It therefore became necessary in 1909 to construct an additional auxiliary source of power. In keeping with the advancements of the art, it was decided at this time to electrify wherever possible, and as a consequence the new auxiliary steam station took form as an electric generating plant, having as prime movers two 800-kilowatt steam turbogenerators. These were supplied with steam by four 250-horsepower boilers. The steam, after leaving the boilers, was conveyed through a separately fired superheater in which it was superheated 125 degree Fahrenheit. The exhaust from the turbines was condensed in steam-turbine-driven LeBlanc condensers. These were jet condensers in which the condensed steam mingled with the circulating water. The balance of the plant equipment, consisting of auxiliaries and piping necessary for the satisfactory operation of the plant, were installed. The building was of special construction and proved so satisfactory under trying weather conditions that the same type of construction was later used in the large building later constructed to house the enlarged plant. Switching equipment was also provided at this time, and part of the building was devoted to a small motor-generator set used for charging batteries for the storage-battery locomotives, of which there are several on Douglas Island.



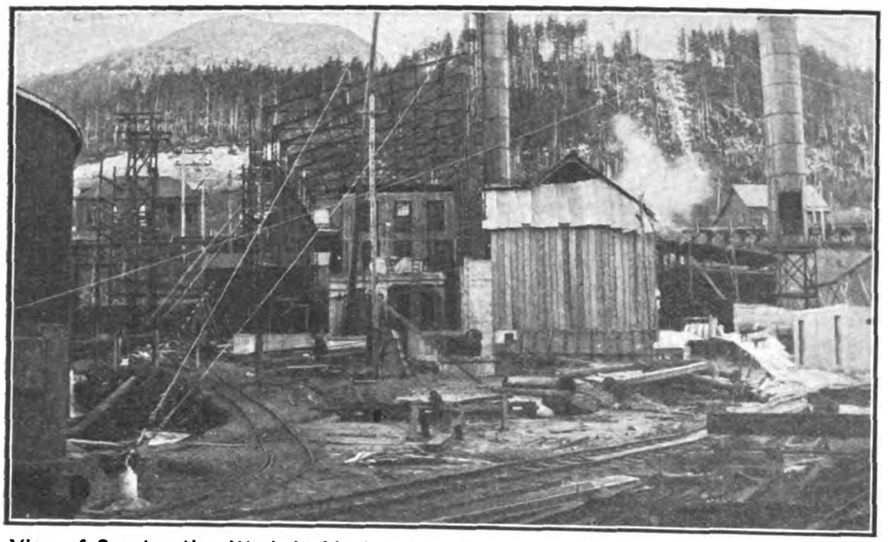
Interior of Old Plant, Showing Turbogenerators.

Early in the year 1914, it was decided to greatly enlarge the plant, and the purpose of this article is to describe this enlargement and the modifications of the existing plant. The enlargements were made necessary by the determination of the Treadwell Company to electrify a number of its tramways, increase the use of storage-battery locomotives, motor-driven compressors, formerly steam driven, and in general to continue the electrification of the whole property. Further increase in power was made necessary by the development work at new and lower levels. These contemplated improvements necessitated the tearing away of the building which housed the original plant, erecting a new and larger building in its place, and installing new equipment supplementary to the old machinery then in place. The plan required the performance of this construction and installation work without seriously interfering with the operation of the original plant, and under conditions which required the services of an organization thoroughly skilled in the design and construction of modern power plants of the most economical type.

Power House.

The new building was built to house the entire installation, constituting as a whole a serviceable and reliable plant of specified operating capacities, and providing space for further future enlargement to an ultimate capacity of 8,000 killowatts. The structure occupies a ground area of 104 by 145 feet, and consists of steel frame, with latticed columns, resting upon reinforced-concrete foundations, designed to take the several units of the installation. The side walls are specially con-

Digitized by Google



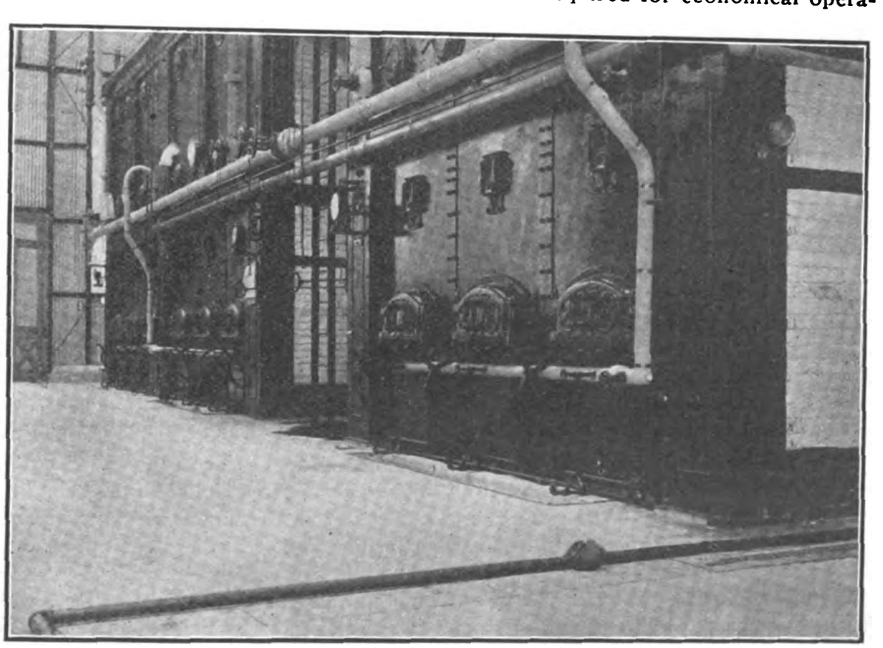
View of Construction Work Incident to New Plant. Original Plant Remains in Place.

structed to withstand severe climatic conditions, and are built up of mill board and asbestos paper in the center, with an exterior sheath of corrugated galvanized iron, and an interior siding of specially prepared galvanized iron. These materials are all held in position and stiffened by angle-iron framing running vertically and horizontally and fastened to the steel frame. The air space construction with double walls satisfactorily resists the transfer of heat and effectively prevents the interior sweating of walls, so often found in power plants where the outside is at low temperature and the interior is much warmer and contains a considerable amount of moisture in suspension. The floors are of reinforced concrete. The roof structure consists of 10 built-up steel trusses, supporting steel purlins. The roof itself, corresponding to the sidewall, is built up with wire netting placed on the purlins, then a layer of asbestos board 0.25-inch thick, this being overlaid with two thicknesses of tar paper, with an exterior covering of corrugated galvanized iron. Large overlaps are provided on all galvanized iron to reduce to a minimum the possibility of rain beating in with the driving force of the powerful Taku winds. The entire interior is divided into nine bays by the 30 latticed-steel columns, constituting the building frame work. The building is divided longitudinally by a reinforced-concrete wall, separating the turbine room from the boiler room. This wall provides a convenient and sturdy support for pipe hangers, anchorages and sliding supports for the high-pressure steam header paralleling the wall.

The equipment installed in the new building comprises three 512-horsepower water-tube boilers; 12 special Hammel oil furnaces, and Hammel oil burners for this type of boiler; three superheaters; one surface condenser; one automatic exciter engine; one 50-kilowatt direct-current exciter generator; two vertical centrifugal circulating pumps, and two vertical motors for operating them; one 750-kilowatt Curtis turbogenerator; one 2,000-kilowatt turbogenerator; one open-type feed-water heater; two Smith-Vail specially fitted fuel-oil pumps; one special oil heater, feed-water meter and fuel oil meter; two steel stacks and three steel breechings; magnesia coverings for boiler drums, for separators and heater bodies; boiler brick work, designs for foundations for boilers, turbines and auxiliaries; and all accessory equipment and fittings.

The new 2,000-kilowatt turbogenerator is of the latest type, horizontal and utilizes the steam on the impulse principle. It is very rugged in construction and has already proven its ability to carry heavy loads economically. The governor is of the latest type, doing away with the top control of admission valves, and allowing the closest regulation. Graphical records of the speed are kept by a special meter recording the cycles at which the system is operating and when this unit is in service great and marked improvement in the regulation is apparent. The turbine is of the new type without bed plate and its pleasing appearance is shown in one of the accompanying illustrations.

The three boilers furnished are of the well known Stirling type, each consisting of three steam and water drums and one mud drum connected by three banks of hot-drawn seamless steel tubes of proper curvature which form the heating surface. These boilers are designed for 180 pounds per square inch working steam pressure, and the drums are of heavy steel plate, with double-riveted, double-butt strapped joints. The boilers are arranged and mounted two in one battery and one set singly. The furnace structure is especially designed for the economical combustion of California crude oils. In the furnaces the burner head is recessed in the bridge wall, permitting the flame to shoot forward. The furnace is so constructed that it increases in size in the same direction as expansion of the flame, this giving a maximum furnace volume with a minimum of radiating surface, and permitting large overload capacities without unduly damaging the brick work or seriously affecting the life of the boiler tubes. It obviates the tendency to localize the heat. The furnace floor is supported by I-beams, the front part being blanked off solid with firebrick, while the back part provides a checker work through which air is admitted for combustion. With this design, the amount of air can be carefully regulated as required for economical opera-



Battery of Oil-Burning Furnaces and Boilers in New Station.

Digitized by Google

tion by both the front and rear dampers.

The three Babcock & Wilcox superheaters, especially designed for Stirling boilers, located between the first and second passes, are designed to give a superheat of from 125 to 140 degrees Fahrenheit at the superheater nozzle when boilers are operated at or above rating. These superheaters consist of two cross boxes connected by seamless steel tubes, hand holes being provided in cross boxes opposite tube ends. There are no corrugated rings or other obstructions to the rapid transfer of heat, and the smooth surfaces permit of easy regulation and thorough cleaning. The cross boxes are connected to the saturated steam nozzle and to superheater steam nozzle on the side of boiler setting. Special superheaters were also put in for the newly installed Heine boilers, designed to give from 125 to 140 degrees Fahrenheit superheat at the superheater nozzle when boilers are operating at about rating. They consist of cross boxes, connected by tubing forming the superheater surface, provision having been made for expansion and contraction in tubes.

The surface condenser for the 2,000-kilowatt Curtis turbogenerator has a rectangular shell and contains 3,446 square feet of cooling surface, made up of brass tubing 10 feet long, 0.75 inch outside diameter. The condenser is of the standard two-pass type, circulating water entering at the bottom and discharging out of the top pass, making the condenser of the counter-current principle. The shell is of cast-iron, of rectangular section, and has ribbing to resist external air pressure, and internal pressure due to operating the turbine non-condensing with atmospheric exhaust through relief valve. The tube plates are of rolled brass. In the top of the condenser shell is a separate pass known as a Volz heater. The condensate is pumped through this by tail pumps, thus securing an additional five degrees in temperature of feed-water.

The condenser is served by a steam-driven double-cylinder air pump, of the Edwards patent suction, valveless type. In this air pump all suction valves are dispensed with. The condensed steam and non-condensible vapors flow continuously by gravity from the condenser to the base of the pump and are removed by a conical bucket or piston, which works in a base of similar shape. By the action of the bucket, the water is projected without shock at a high velocity through the ports which are cast in the sides of the working barrel. This rising water is followed by a rising bucket, closing the ports and forcing the water and air through the discharge valves of the pump. The condensing equipment used on the 750-kilowatt turbogenerator is of the same general type as that for the large unit, though of smaller surface. It is served by a single-cylinder steam-driven Edwards air pump.

Two Platt vertical centrifugal circulating pumps, installed at caisson near wharf, are of the single-stage, double-suction, split-casing type, each capable of pumping 2,700 gallons of water per minute against a head of 35 feet. These pumps are operated by two 50-horse-power, 60-cycle, three-phase, 2,300-volt induction motors of vertical type running at 1,160 revolutions per minute, direct-connected through intermediate shafting. The extreme tidal range made necessary the use of vertical pumps and the placing of these pumps in a concrete caisson. This caisson was made of Lackawanna steel piling driven to bedrock and then connected in place. The pumps are located below extreme low water so that the water will flow into the suction inlets at all conditions of the tide. The long intermediate shafting between the pumps and the motors are carefully lined in place, are of ample diameter and secured at frequent intervals by liberally proportioned steady bearings.

The automatic horizontal high-speed engine for driving exciter generator has an 8.5-inch diameter steam cylinder, with 12-inch stroke, and operates at 300 revolutions per minute. It is of the self-oiling type. It is equipped with combination governor, and flywheel 51 inches in diameter with 11-inch face. The engine has heavy and substantial bed-plates connecting generator to engine frame. Direct-connected to this engine is a 50-kilowatt direct-current exciter generator, designed for operating at 300 revolutions per minute and furnishing excitation current at 125 volts.

The two steel stacks serving the plant are each 7 feet in diameter and 130 feet high above the boiler-room floor. Each stack is placed upon and supported by angle-iron base rings. The stacks are made of extra heavy plate to resist the action of the elements, and to secure as long a life as possible.

The open-type feed-water heater, rated at 4,600 horsepower, is of the two-section type; the shell is of cast-iron, made up in sections with joints machined and fitted with indestructible gaskets. This type of heater has a number of pans, or trays, with overflowing weirs the full length, bringing the water into contact with the steam. The filtering chambers, arranged according to the Stilwell method, handle the lighter impurities in the feed water, the heavier particles being deposited in the settling chamber below.

The feed-water meter is of the Venturi type. This meter has a recording chart on which the amount of water being supplied the boilers is indicated by a curve. In addition to this, there is a register dial, on the same principle as the register dial of a gas meter, which shows the accumulated totals of the volumes of water being supplied the boilers. Another indicating dial shows the amount of water supplied at a given time. The meter was installed in the feed-water header at the point of discharge from the feed pumps. A large air chamber with internal baffle deflector is so placed as to prevent the pulsations of the flow of water from reciprocating pump from affecting the accuracy of the meter.

The supply of fuel oil for the boilers is held in storage tanks of 40,000 barrels capacity, the oil being brought in and delivered from tank steamers. It is distributed to the several oil-burning plants, through a special oil-handling system, consisting of two special oil-fitted duplex pumps, oil heater and inter-connecting piping, oil strainers, relief valves and oil-pressure governors.

Expert Criticises Municipal Operation.

A report on the Chicopee, Mass., municipal electric light plant has been rendered to Mayor Dunn and the Lighting Commission by C. W. Whiting, advisory manager and investigating engineer, who has been in charge of the property for a short time.

Mr. Whiting criticises the lack of system in the conduct of the plant, recommends a thorough rearrangement of lines so as to reach all parts of the city with light and power, advocates improvements in station buildings, and points out that meters are in need of testing and investigating. The street lighting should be extended and improved, also.

It is stated that meters have been read only once in two months and that while a 20 per cent discount has been given for the payment of lighting bills within 30 days, no discount has been allowed on power bills. These conditions should be harmonized, says Mr. Whiting.

Under four months of proper management, the business has increased $7,564, and prospects for the future success of the plant are good, if business methods are employed.

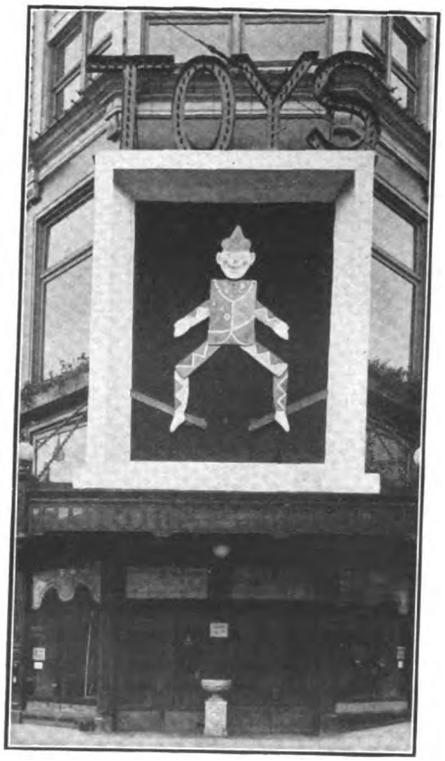
The returns to the Electric Light Commission of the State show a profit on business for the year to June 30, 1915, of $7,049.38, but a real deficit arose from carrying fixed charges and other requiste accounts, of $8,503.35. The schedule for public lighting is carried at the low rate of four cents a kilowatt-hour.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Seattle Sign Makes Big Impression.

What is undoubtedly the largest "Jumping Jack" in actual operation is on exhibition on the Marquise of the Standard Furniture Company's building, Seattle, Wash. The background is a framework, 16 by 18 feet, covered with black cloth set in a frame of white, which conceals 100 100-watt gas-filled lamps, which illuminate the "Toys" containing 200 5-watt 110-volt red lamps. From the attention that this novel display has attracted the store management considers the expenditure the most profitable ever made for general advertising purposes.



Jumping Jack Sign Operated and Illuminated by Electricity.

Lower Rates at Fall River.

The Fall River Electric Light Company, Fall River, Mass., has recently moved into new quarters, occupying an entire building of three stories and basement. The main floor is given to demonstration of electrical appliances and the cashier's, order and complaint desks. The general offices are on the second floor, and on the third are the purchasing and billing departments and offices of the treasurer and assistant treasurer. In the basement is a storeroom and fully equipped workshop.

The Fall River Electric Light Company is a consolidation of two pioneer lighting companies, the original Fall River company and the Edison Electric Illuminating Company, both organized in 1883. Albert F. Dow, formerly president of the Edison company, is the present head of the company, having been for 32 years in continuous executive connection with the industry. Owen Durfee, the present treasurer, has had 31 years of continuous service. Arthur H. Kimball, general manager, came to the company in 1908.

Coincident with the change of quarters, the company reduced its maximum lighting rate from 10 cents to 9 cents a kilowatt-hour, discontinuing the free renewal of all incandescent lamps. The economics of Mazda units over carbon lamps are set forth in a large display advertisement in local newspapers, and in a letter sent to the customers. At present more than 75 per cent of the lighting customers are using tungsten lamps.

The company has ceased to handle the carbon lamp.

ELECTRICITY CHEAPER
Reduction in the Lighting Rate to Take Effect
MONDAY, NOV. 1
New Rate 9 cents
Old Rate 10 cents
With this Reduction In the Lighting Rate, the Free Renewals of All Incandescent Lamps Will Be Discontinued.
EDISON MAZDA
New Type MAZDA Lamp 40 Watts—40 C. P.
Old Type GEM Lamp 50 Watts—30 C. P.
A 40 C. P. MAZDA Lamp Burning 1,000 Hours Costs $3.60
A 30 C. P. GEM Lamp Burning 1,000 Hours Costs $4.50
A 40 Watt MAZDA Lamp Gives 100% More Light at 20% Less Cost Than the 50 Watt GEM Lamp.
FALL RIVER ELECTRIC LIGHT CO.
85 NORTH MAIN STREET

Advertisement of Fall River Company Announcing Rate Reduction.

The power plant at Eugenia Falls, on the Beaver River, near Owen Sound, Ontario, was placed in operation in November. It is a hydroelectric installation and operates under a head of 540 feet. The capacity is 2,400 kilowatts, divided between two units.

Digitized by Google

New Rate Schedule Adopted by New Orleans Company.

A voluntary reduction in rates for all classes of service, made possible by increased business, has been made by the New Orleans (La.) Railway & Light Company, effective December 1. The new residential and commercial lighting rate is as follows:

7 cents per kilowatt-hour for the first 20 kilowatt-hours per meter, consumed in any one month.
6 cents per kilowatt-hour for the next 30 kilowatt-hours per meter, consumed in any one month.
5 cents per kilowatt-hour for the next 150 kilowatt-hours per meter, consumed in any one month.
4 cents per kilowatt-hour for all over 200 kilowatt-hours per meter, consumed in any one month.

In addition a monthly service charge of 25 cents is made for each meter. In addition the customer guarantees a monthly consumption of not less than 7.2 kilowatt-hours per meter connected. No free lamp renewals are given.

The retail power rate comprises a charge of 6 cents per kilowatt-hour for the first 30 hours' use per month of the customer's maximum demand, and a charge of 3.5 cents per unit for all excess. The demand for any month is determined as follows:

75 per cent of installations under 10 horsepower.
65 per cent of installations from 10 horsepower to 50 horsepower.
55 per cent of installations over 50 horsepower.

The consumer guarantees a minimum monthly consumption of not less than 8.4 kilowatt-hours per horsepower or fraction thereof in rated capacity of motors connected, and in the event this amount is not consumed, the consumer agrees to pay to the company its equivalent value at the rate of 6 cents per kilowatt-hour net, no installation to be rated less than 2 horsepower per meter connected.

The wholesale power rate includes a demand charge and an energy charge in accordance with the following:

DEMAND CHARGE.

$3.00 per kilowatt of maximum demand per month for the first 5 kilowatts.
$2.50 per kilowatt of maximum demand per month for next 15 kilowatts.
$2.25 per kilowatt of maximum demand per month for next 30 kilowatts.
$2.00 per kilowatt of maximum demand per month for next 150 kilowatts.
$1.50 per kilowatt of maximum demand per month for all over 200 kilowatts.

ENERGY CHARGE.

5 cents per kilowatt-hour for the first 500 kilowatt-hours consumed per month.
3 cents per kilowatt-hour for the next 1,000 kilowatt-hours consumed per month.
2.5 cents per kilowatt-hour for the next 3,500 kilowatt-hours consumed per month.
1 cent per kilowatt-hour for the next 45,000 kilowatt-hours consumed per month.
0.75 cent per kilowatt-hour for excess over 50,000 kilowatt-hours consumed per month.

The consumer guarantees a monthly maximum demand of not less than 5 kilowatts, also a minimum monthly consumption of 153.9 kilowatt-hours and in the event the consumption does not amount to 153.9 kilowatt-hours, the consumer agrees to pay the company its equivalent value at the rate of 13 cents per kilowatt-hour net.

The New York Edison Company Adopts New School Course in Electric Appliances.

The New York Edison Company, under the direction of Arthur Williams, general commercial manager, has inaugurated a new course of 12 lectures on electric appliances in the curriculum of its commercial school. The course is specially planned for the employees of the company who come in daily contact with the public. Enrollment in the course already exceeds 100. F. C. Henderschott, manager of the company's educational bureau, explained the purpose and plans of the new course as follows:

"For several months past the companies embraced in the New York Companies' Section of the National Electric Light Association have been analyzing through committees appointed for the purpose, the present load of central stations with a view to greater development. As a result of such study it is believed that electricity for light and power purposes is universally accepted as the most convenient and in every way most desirable. The public needs little if any education along these lines. Safety is conceded, convenience admitted and the only question open to argument is that of price or rates. But there is a new field and one full of promise which as yet has been little developed—the field of electric appliances. Take for example a small consumer of light only. There are many such consumers whose accounts are unprofitable. The overhead charges are greater than is the revenue derived; but add a simple electrical appliance to the installation of these customers and such accounts then become profitable. Here is a field of development for the immediate future.

"It has been found that a campaign of education of a special kind must be carried on if this load is to be secured and actual tests have demonstrated that there are many women and men, too, who do not hesitate to detach and attach an electric lamp, but who are afraid of an electric toaster or percolator or curling iron. There are still those who believe that if they were to touch a toaster with the current turned on they would receive a shock. The superstition must be overcome."

The schedule of lectures follows:

1. December 9. "Importance of electrical appliances to the central station," by J. F. Kelly, manager of showrooms. "Salesmanship," by F. C. Henderschott, manager of educational bureau.

2. December 23. "The Showrooms," by D. T. Brown, manager of Broadway office, and F. H. Kinnicutt, manager of district offices.

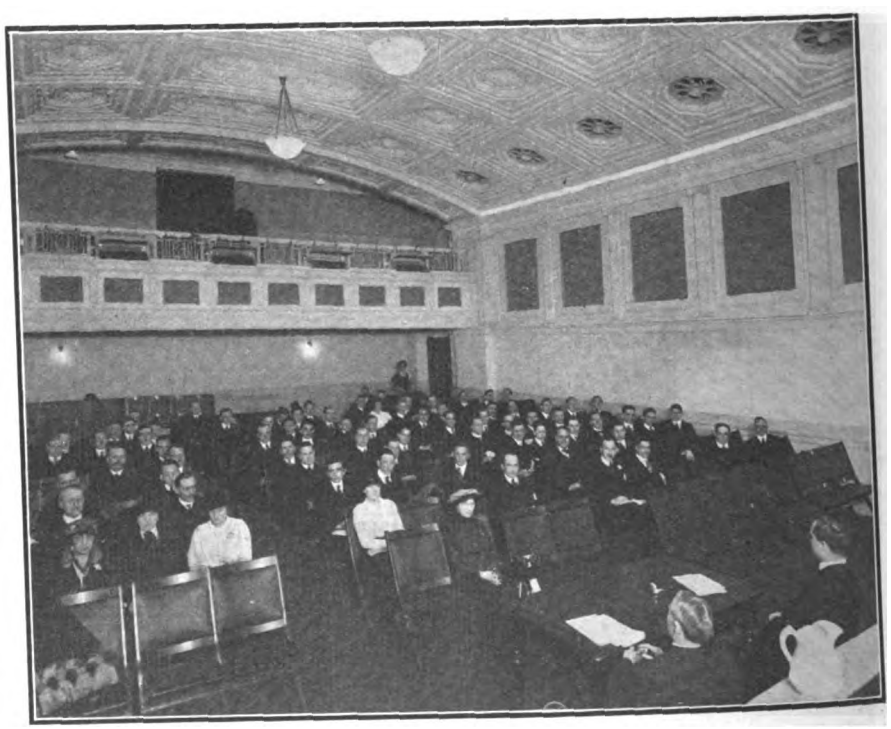
3. January 6. "Domestic Heating by Electricity," by J. F. Delahant, assistant manager of showrooms.

4. January 20. "The Heating Bureau," by C. N. Lewis, manager of heating bureau.

5. February 3. "Vibrators and Small Motors," by J. Jorgensen, of the Hamilton-Beach Company.

6. February 17. "Heating Appliances," by Roger Williams, of the Simplex Electric Heating Company. "Vacuum Cleaners," by Frank Davison of the Innovation Company.

7. March 2. "Heating Appliances," by B. C. Sprague, of the General Electric Company. "Vacuum Cleaners," by W. W. Wooledge, of The Frantz-Premier Distributing Company.



New School of New York Edison Company in Session.

Digitized by Google

8. March 16. "Washing Machines and Dish Washers," by A. W. Hartigan, of The Western Electric Company.

9. March 30. "Heating Appliances," by C. W. Sears, of Landers, Frary & Clark. "Vacuum Cleaners," by A. F. Staples, of the Hoover Suction Sweeper Company.

10. April 13. "Electric Signs," by E. A. Mills, manager of sign bureau.

11. April 27. "Home Economics," by Miss A. B. Broome, manager of home economics bureau.

12. May 11. "Electricity in the Laundry," by Wallace B. Hart.

Only one examination will be required. The questions which the enrolled employee will be required to answer are:

1. (a) What is the present status of electrical appliances in developing a central-station load? Give the facts upon which you base your conclusions. (b) What are the fundamental advantages of electrical appliances in the home and in industry?

2. What is the method and what is the policy which governs the company's showrooms? Is the policy the same in the Bronx and Yonkers as in Manhattan?

3. (a) What has been the relative development and introduction of electrical heating appliances as compared to gas and other similar appliances? (b) What is the relative position as to cost, based on the rates for gas and electricity for New York City, and on utility and safety? (c) What is the company policy as to repairs and maintenance of appliances?

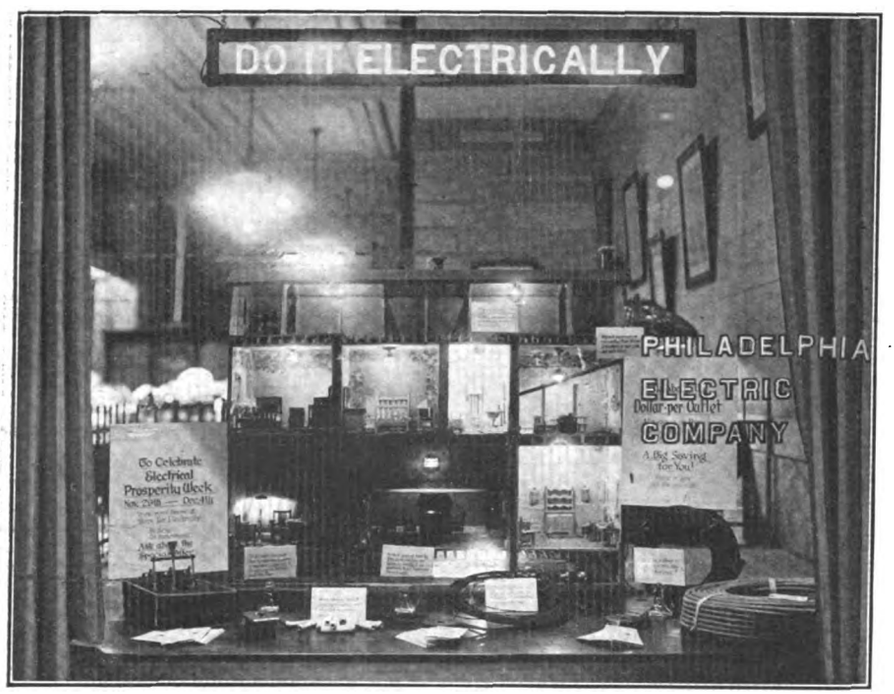
4. What is the company method and policy as to electric signs and installment installations?

5. What are the functions of the bureau of home economics?

House-Wiring Window Display Elicits 900 Inquiries in Six Days.

A sectional view of a miniature dwelling, so constructed that the various steps in wiring an already built house were graphically illustrated, formed the basis of a recent window display of the Philadelphia Electric Company that resulted in 900 inquiries being received in one week.

This miniature dwelling was about 4 feet long by 2 feet wide and 4.5 feet high. It was designed, built, wired and decorated in the Philadelphia Electric Company's shops, under the direction of the advertising department. In its construction no attempt was made to make it a specimen of architecture but all efforts were made to have in it a faithful replica of the problems met by an electrician in the wiring of old houses and the ingenious means used to solve them without undue damage. Hardwood floors, cross rafter, blind walls and tapestry wall papers are all shown together with the tools used in carrying the wires to a room without damage.



Window Display of Philadelphia Company Which Gained Business.

In this house there are six rooms and a bath, each room is furnished complete in every detail and electricity in the home is fully illustrated. On the table, in the dining room, there is a tiny chafing dish that looks most business like, while in the living room there is a tall reading lamp with a huge arm chair comfortably arranged alongside of it, a tray full of cigars in front and a general somebody-lives-here atmosphere about the whole room.

No attempt was made to minimize the facts of the case. Where in actual practice it is necessary to take up a board, it was taken up in this house; where it is necessary to open a wall, it was shown in this house; but there was a very decided effort to so clearly portray the benefits and advantages of electricity that the favorable impression was the one that stuck. That they succeeded is shown by the fact that people came inside for more information at the rate of 150 a day, every day during the week that the display was in the main office window, and that this interest continued to be shown in the several district offices to which the display was sent. The idea behind the building of this house was to back up the Electrical Prosperity Week campaign for the wiring of already-built houses and stores. To stimulate this campaign it was decided to make an offer of $1.00 per current consuming outlet on all stores and dwellings wired between the dates of November 1 and December 4. The result of this has been to turn the jobs that had been already estimated on but the people were "thinking it over" or where the estimate was more than the sum the people counted on spending.

This $1.00 per outlet campaign was given very vigorous support by all concerned. The Philadelphia Electric Company in its newspaper advertising and direct-by-mail pieces; the contractors who were furnished folders describing the offer; bulletin boards both by the Philadelphia Electric Company and some of the contractors and by the newspapers who carried a special page featuring the advertisement of the offer and the ads of contractors. That the campaign was a success is positive but more than the immediate success is the fact that the "dirtless workman" idea has been driven home in a most graphic and instructive way and that the old "Bogey" of dirt and fuss has been supplanted by the new idea of simplicity and cleanliness.

Attractive Christmas Sign for Boston Store.

A simple but effective Christmas illuminated decoration is that on the department store of W. & A. Bacon Co., Boston. It consists of a single-panel white enameled background 38 feet long, bearing the words, "A Merry Xmas to All" in white frosted four-candlepower lamps, outlined with a red and green border. There are 470 lamps in all in the sign, which is connected by festoons of greenery with an enormous bell composed of laurel leaves, high on front of the building.

The small wattage of the lamps makes the decoration an economical one to operate, and yet it is attractive and appealing to the sense. The first floor of the store is decorated with 2,300 15-watt colored lamps.

Digitized by Google

Southern California Edison Company Opens Campaign on Electric Ranges.

The Southern California Edison Company recently inaugurated a special campaign on electric ranges, the purpose of this immediate campaign being to sell ranges to residences in territory not already served with gas. An initial group of 530 ranges will, it is estimated, add a load of 210 kilowatts, replacing the noon sag in the load curve with a peak.

Plans were worked out at a meeting of the men of the commercial department at Los Angeles and presented by the general sales agent, S. M. Kennedy.

The company will do the installing of the ranges itself, practically at cost. Energy for lighting and cooking will be measured by one meter. The rate will provide for the first 40 kilowatt-hours at the present lighting rate, 7 cents per kilowatt-hour, and energy in excess thereof at 3.5 cents per kilowatt-hour, it being made an express condition, however, that the electric range be installed and used for cooking. The minimum will be $2.50 instead of $1.00 as for lighting. The average cost per connection for installing the range is estimated at $30.

Mayor Advocates More Electric Signs for Chattanooga.

Mayor Littleton, of Chattanooga, Tenn., has inaugurated a movement for the livening up of the town by means of more electric signs. At a recent meeting of the Commission, he suggested that the city set an example by placing a large illuminated sign on the City Hall. No action has been taken on this proposal as yet. To encourage the movement, he states that leniency will be shown in the construction of the fire regulations covering electric signs. At present they can extend only three feet over the sidewalk but it is stated that well-lighted signs that are not hung low will be allowed some lee-way in this respect. He also urges that signs be placed on the tops of buildings. Chattanooga does not compare with neighboring cities at night because of the lack of lighted signs, he states.

Indianapolis Bank Adopts Flood Lighting.

"Dignity" was emphasized in the electrical advertising of the banking interests of the Fletcher Savings and Trust Company of Indianapolis, when the new system of flood-lighting installed by the Merchants Heat & Light Company of that city was put into service on Sunday evening, November 28.

Looming up as a shaft of light it represents the most elaborate and dignified system of lighting beautiful buildings ever introduced in that city.

The Fletcher Savings and Trust Company Building towering to a height of fifteen stories above the street, and located on the corner of Market and Pennsylvania Streets, one of the most prominent corners in Indianapolis, offers exceptional and ideal conditions for a treatment of this kind. Built of Crotch Island granite to the fourth floor and above this of Bedford limestone, along simple Doric lines of architecture, its beauty is materially enhanced under the light playing on its smooth surfaces from the 100 projectors in use.

Night View of Indianapolis Bank Building.

The building which has a frontage of 120 feet on Market Street and 98 feet on Pennsylvania Street is 210 feet high. No attempt to flood-light it below the third floor was made, owing to an embellishment separating the granite and limestone in the architectural design. This gives a surface of 28,776 square feet on these streets which is illuminated and with the north and west exposures of 6,600 square feet constitute the area on which the light was directed.

Seventy-six projectors are used on the main exposures and twelve on each of the two smaller surfaces. These projectors were located on the roofs of surrounding buildings in batteries supported on structural-steel frames designed and installed for this purpose. The batteries illuminating the principal sides were set about 110 feet from the corner of the building and diagonally opposite, the north and west sides being covered by 12 projectors each on buildings about 50 feet away from the surface illuminated. Each unit consisted of a Bryan-March 250-watt flood-lighting lamp used in a National X-Ray projector.

The most important element, the reflector, is of mirrored glass with a new high-temperature backing developed for this service. Over the silvering there is placed a metallic surface which is then enameled.

The Merchants Heat & Light Company which is a subsidiary of the American Public Utilities Company of Grand Rapids, Mich., is exceptionally proud of this monument to the central-station industry, and expresses great satisfaction in this form of advertising lighting for buildings of this character. The bank is also very much pleased with the installation. particularly with its dignity. R. A. MacGregor is sales manager of the company.

Digitized by Google

Electrical Construction

NOTES ON INTERIOR WIRING.[1]

By Terrell Croft.

Switch and Cutout Suggestions.

Switches and fuses should, in general, control and protect all of the wires of the circuit which feeds through them. The reason for this will be evident from a consideration of Fig. 1. Consider branch circuit *A*, which is fed from the mains through a single-pole switch *D* and fuse *E*. If an accidental ground occur at *B*, and another ground exist simultaneously at *C*, a short-circuit would result, as shown by the dotted arrows, even though the single-pole switch *D* were open. It is also obvious that even if *D* were closed the fuse *E* would not "blow" and open the branch circuit under the short-circuit conditions just outlined. Furthermore, if there were an accidental ground at *F* on another branch circuit *K* (which is protected with a fuse in only one wire) then the incandescent lamps on branch *K* would be illuminated regardless whether switch *D'* was open or closed. This supposes ground *B* to exist, but ground *C* removed. Now, if a branch circuit is controlled with a fuse in each wire and a switch blade in each wire as shown at *G*, then the undesirable and dangerous conditions outlined above cannot occur. In practice it is not feasible or desirable to fuse and switch all of the wires of all circuits. The conditions under which such fusing and switching is not desirable nor required are noted in the following paragraphs.

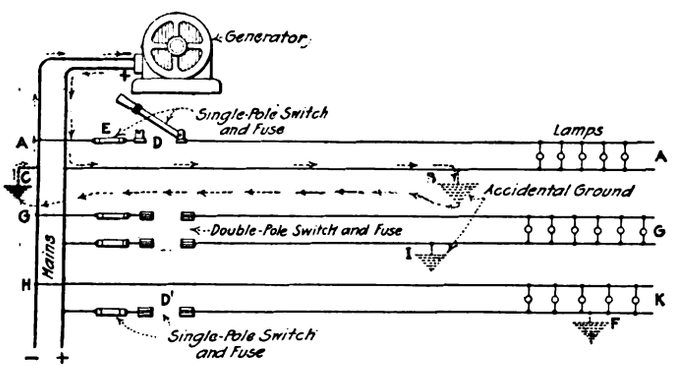


Fig. 1.—Showing Why All Wires of a Circuit Should Be Provided With Fuses and Switches.

The exceptions to Rule 19*a* of the National Electrical Code requiring a switch and fuse in every wire, are as follows:

(1) Rule 8*c* permits small motors of one-fourth horsepower or less capacity on circuits with voltages not exceeding 300 to be controlled with single-pole switches where the installation is not in damp places.

(2) Rule 25*a* specifies that heaters of 6 amperes or 660 watts capacity or less may be grouped under the protection of a single set of fuses, provided the capacity of the fuses does not exceed 10 amperes.

(3) Rule 43*c* specifies that it is not necessary to have a cutout and switch for each motor of an electric crane, where the crane does not have a cab.

(4) Rule 23*a* specifies that the fuse must be omitted from any permanently grounded service wire.

(5) Rule 23*b* specifies that the fuse must be omitted in any permanently grounded wire except where a two-wire branch circuit is derived from a three-wire system.

A fused two-pole knife switch is shown in Fig. 2. This switch is fused at the handle end and the fuse-clips on it are of the type required to accommodate National Electrical Code standard fuses of capacities of from 0 to 60 amperes. That is, they are of the ferrule-contact type. The metal parts of the switch shown are stampings, pieces formed from strap metal or screw-machine parts.

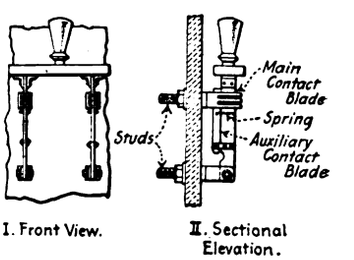


Fig. 4.—Quick-Break Knife Switch.

A three-pole knife switch fused at the hinge end is shown in Fig. 3. Switches of this type are used for controlling three-wire or three-phase circuits. The fuse contacts are of the type required for National Code standard fuses with capacities of 61 to 600 amperes and are known as the knife-blade contact type. The standard dimensions of these contacts are given in Code Rule 68. The switch is shown in the illustration mounted on porcelain knobs, which construction is frequently adopted for wiring installations in damp places, to maintain the switch as dry as possible.

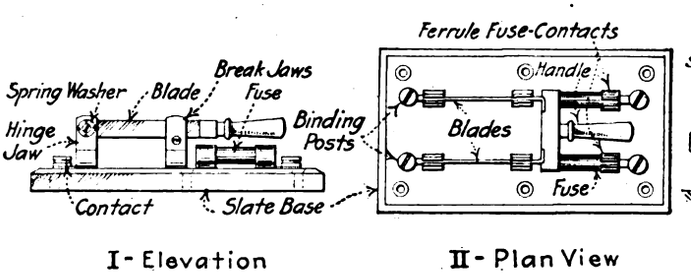


Fig. 2.—Double-Pole Front-Connected Knife Switch Fused at Handle End.

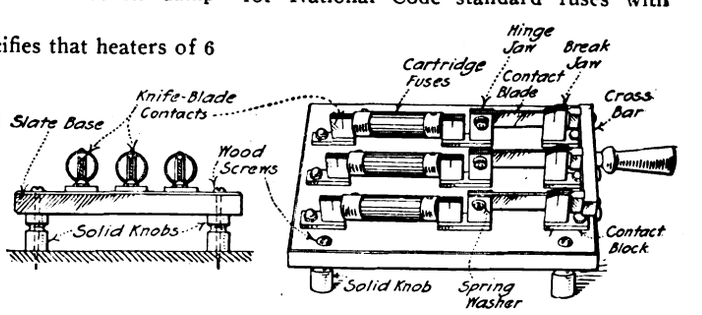


Fig. 3.—Three-Pole Rear-Connected Knife Switch Fused on the Hinge End.

1 All rights reserved. Reprint forbidden.

Digitized by Google

A quick-break knife switch is shown in Fig. 4. Where a knife switch of the type shown in Figs. 2 and 3 is opened under load there is always a tendency for an arc to form between the blades of the switch and the contact jaws. If the switch is opened slowly, these arcs may burn away the metal of the blades and contacts. This would ultimately cause a poor connection. With a quick-break switch, an arc is not readily formed. The reason is that when the main blade is opened slowly the auxiliary blade is held between the jaws by friction until the main blade has been almost wholly opened. Then the spring will pull the auxiliary blade out so abruptly and rapidly that an arc will not persist.

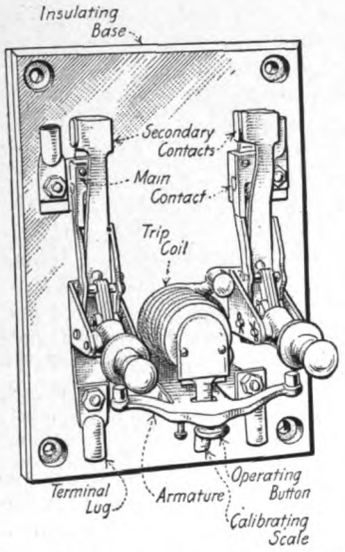


Fig. 5.—200-Ampere, 250-Volt Double-Pole Circuit-Breaker.

Circuit-breakers should be so arranged that no one pole can be opened without opening all of them. Fig. 5 illustrates the meaning of this requirement. For example, to open a circuit-breaker like that shown, one must press upon the operating button. This disengages the trips restraining *both* of the arms of the breaker, which permits them to open, thus disconnecting both wires of the circuit. Fig. 7 illustrates the construction of a large-capacity circuit-breaker. No solenoid is necessary for the trip coil of this breaker. The heavy current, for which it is designed, in passing through the lower copper terminal stud to the laminated copper brush creates a sufficiently strong magnetic field in the iron U-shaped yoke, which is mounted over the terminal stud, to trip the iron armature. When the iron armature is drawn up, the breaker opens. The different methods of mechanically interconnecting the arms and electrically interconnecting the trip coils of circuit-breakers so that they will afford complete protection for the circuits with which they are associated are so numerous, that it is not feasible to consider them in this brief article.

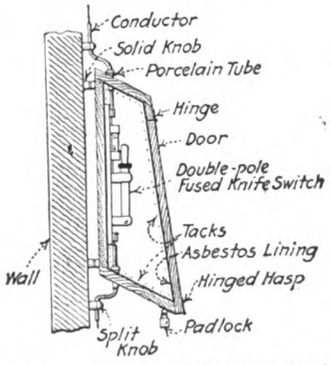


Fig. 6.—Home-Made Wooden Cabinet.

A single-pole circuit-breaker provides ample protection for a grounded street-railway circuit. It is obvious that, since the return conductor is grounded, nothing would be gained, insofar as overload protection is concerned, if an additional breaker were inserted in the ground lead. One side—usually the negative—of every street-railway circuit is then permanently grounded. Double-pole overload protection, is, as outlined in connection with Fig. 1, useful chiefly to protect against accidents which may occur due to grounds on a circuit all wires of which are normally free from ground connections.

Cutouts and switches in dirty places or where subject to mechanical injury should be protected by suitable cabinets. It is obvious that electrical fittings should be protected from mechanical injury, not only because of the defacement that may be caused thereby but also because such injury may result in short-circuits or grounds which may originate fires. Furthermore, switches and fuses in dusty, dirty, or linty places should be inclosed so that the arcs that may form when fuses melt will not ignite the finely divided material in the surrounding atmosphere. Fig. 6 illustrates a type of construction of a wooden switch and cutout cabinet which is suitable for use in connection with knob-and-tube or cleat work. The top and the bottom of the box are pitched so that they will not collect dirt and dust and the door is hung at an angle with the vertical, so that it will tend to always remain closed. Conductors where they enter and leave the box pass through porcelain-tube bushings. The back of the box is held away from the wall, leaving a free air space by mounting it on porcelain knobs. This insures that the box will remain dry, even if the wall becomes moist from rain beating against its outside surface.

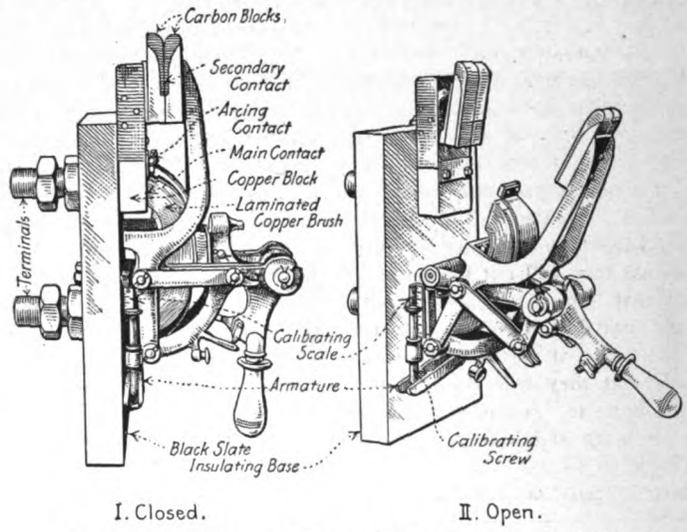


Fig. 7.—2,000-Ampere, 650-Volt Single-Pole Overload Circuit-Breaker.

Metal cabinet and cutout boxes should be used with flexible or solid conduit and metal-molding systems to insure the electrical interconnection of the conduit and the metal-molding systems. All components of switch systems should be interconnected and thoroughly grounded as specified in the Code rules. Fig. 8 shows a typical, metallic switch-and-cutout cabinet which satisfies these requirements. Metallic cabinets should be used even for knob-and-tube or open-work installations where the liability to mechanical injury is considerable. That is, steel cabinets should be used where they are located in exposed places in industrial plants and mills.

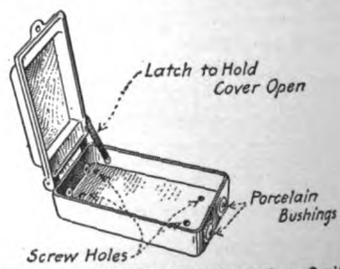


Fig. 8.—Metal Box for Inclosing Switches or Cutouts.

Oil switches usually have dustproof cases, as shown in Fig. 9. The illustration, although it shows a small-capacity oil switch, indicates construction that is fairly typical of all oil switches and circuit-breakers. The welded steel tank con-

Digitized by Google

tains the oil and is designed to hang from the top casting. It is held thereto by supporting bolts with which the tank can be drawn tightly up against the leather gasket glued to the lower face of the top casting. Dust and dirt are thus effectively excluded.

Approved metal cabinets should be used in damp places to protect switches and cutouts. The reason for this is that wood, even if it is thoroughly impregnated with some waterproof compound, is liable where exposed to continued moisture to become saturated and thereby become a reasonably good conductor. It is apparent then, that cabinets of metal, which is of course a conductor, are, insofar as insulation is concerned, about as good as wood. The metal cabinets have the further advantage that they are fireproof and that they will not warp out of shape and that the screws holding the cutouts and switches to them will not loosen. The doors of metal cabinets can be so made that they will close tightly, thereby tending to exclude moisture. They do not warp and bind as wooden ones are liable to do.

Sign flashers, time switches and similar appliances should always be mounted in cabinets, because they are liable to become disarranged and originate excessive arcs. In most of these devices there is some rotating part which frequently carries current and which is liable, if a screw comes loose, or in case of other accident, to engage with some other metal part of opposite polarity and thereby make trouble. Furthermore, in these devices when they are operating, there is nearly always a drum which is rotating and which pulls arcs at the different contactors several or many times each revolution. Such arcs, may, unless the apparatus is properly inclosed, create fires or explosions under certain conditions.

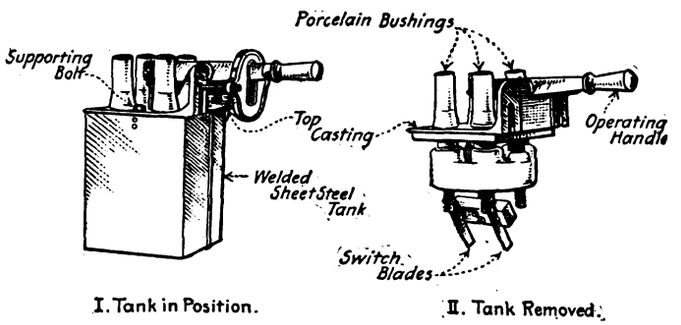


Fig. 9.—Dustproof Inclosure for Oil-Switch Mechanism.

Among the Contractors.

Buchanan-Boughton Company, of Marshalltown, Iowa, is wiring the new Strand Theater in that city. This is a modern electrical conduit job throughout, including two 30-inch ventilating fans; electric fountain in the lobby; a large electric sign with a fountain on the same; and a large illuminated canopy over the front walk.

THE INSTALLATION AND WORKING OF LEAD STORAGE BATTERIES.[1]

By R. Rankin.

In the choice of a storage battery, the most important point is to get it large enough, and the next point in importance is to get the charging plant of sufficient size to thoroughly and properly charge the whole battery. Certain auxiliary apparatus must be provided: a cell-testing voltmeter, a hand lamp, hydrometers and a hardwood or ebonite lath for clearing accidental short-circuits between plates. Without those requisites, it is quite unfair to expect any battery attendant to get satisfaction from the cells under his care. A further essential is means for charging, individually, cells which may get a little lower in condition than the body of the battery. Where cells are bolted together, a short bridging lead, consisting of a piece of cable with two suitable terminals, serves this purpose. The weak cell is disconnected from the circuit, and continuity obtained by connecting the cells adjacent to it by this lead. Where cells are of the burnt-up type, in which the plates are welded to connecting channel-bars, a small set called a milking booster, or "milker," is required. The generator of this set is connected to the positive and negative terminals of the "sick" cell, and a current passed so as to charge it.

When the bridging lead is used, the "sick" cell is taken out of circuit during the discharge and re-inserted on charge, this operation being repeated as often as is necessary to bring the cell into line with the others. On the other hand, a milking booster can be connected to a cell either on charge or discharge. On discharge, it is used to lessen the discharge current taken from the cell. It is essential to obtain a milking booster capable of giving at least the normal charging current specified by the makers of the cells.

A battery of suitable size having been decided upon, the erection and first charge next occupy the engineer's attention. The latter is a very important matter. The best plan is to ensure that the generating plant will be erected and tested before any attempt is made to fill up the cells. When it is reasonably certain that the generating set will run through without trouble, the cells should be filled with acid as quickly as possible. Immediately filling up is complete, the battery should be put on charge. The acid, usually, has an initial specific gravity of about 1,200 at normal temperature.

The usual rate for first charge is about two-thirds of the normal charge rate, which is, in general, roughly equal to the seven-hour discharge rate. The charge, once started, should be continuous, if possible, and the current should be kept steady, unless the temperature of the cells becomes too high. The temperature should not rise above 100 degrees Fahrenheit, and if it shows signs of approaching this figure, the charging current should be reduced so as to keep the temperature below the permissible maximum.

For the first few hours, the specific gravity of the electrolyte falls, reaching a value from which it begins to increase. This increase continues until the whole of the sulphate in the cells is reduced. The cell voltage increases until a maximum is reached, when the cells are fully charged. The only reliable indication that the cells are quite fully charged is constancy of voltage and specific gravity, and the first charge should not be considered complete until there is no increase in either for a period of about six hours. A temperature correction may have to be applied to the specific gravity.

The time required for the voltage and specific gravity to reach constancy depends on the state of the active materials on the plates, and may be anything from 40 to 60 hours.

The first charge being finished, the battery may be put into commission immediately, but it will usually be found necessary to adjust the specific gravity and level of the electrolyte in all the cells. At first the working should not be too heavy, and a generous amount of excess charge should be given after each discharge. This is mainly on account of the positive plates, and tends to adjust inequalities among them, and get the active material into a state suited to the condition of working.

The battery being in active service, it remains for certain elementary facts to be recognized, and steps taken to insure that a few simple, yet indispensable rules, be followed.

The elementary facts are:

1. A battery is not to be looked on as a generator.

2. The capacity of a battery varies with the rate of discharge.

[1] Portion of paper presented to Association of Supervising Electricians, London.

Digitized by Google

3. The permissible minimum final voltage of a battery varies with the rate of discharge.

4. Switchboard and other instruments may be, and probably are, inaccurate.

5. Sick cells must be nursed.

The simple, but indispensable, instructions are:

1. Do not discharge beyond the limits specified by the makers.

2. Do not leave the battery in a discharged condition longer than is unavoidable.

3. Make sure that every charge is a full one.

4. Unless for special reasons, charge only at the normal specified rate.

5. Do not predetermine the charge to be any definite percentage in excess of the discharge.

6. Attend to defective cells at once.

7. Check, periodically, the accuracy of instruments.

8. Keep the level of the electrolyte above the tops of the plates by the addition of pure water only.

The facts or axioms concerning batteries which have been enumerated may be dealt with as follows:

(1) It must not be assumed that an engineer can put his battery on load at any time, and at any current it will carry, unless it is at the time in a fit condition. What a battery can do at any time depends on what it has already done at that time.

If it is intended to use a battery at unexpected or irregular times, steps must be taken to have it, as far as possible, always ready in a charged condition. If this is arranged, even a small battery will deal with emergencies which would very much overtax a generator of the same normal rating, the overload capacity of a battery in current being enormously high.

(2) and (3) Approximate relative capacities, and the corresponding currents and final voltages of a cell at different ratings, are given in the following table. If discharge is invariably continued to some definite voltage, irrespective of the rate, over-discharge may result.

Duration of Discharge in Hours.	Capacity in terms of Maximum.	Rate of Discharge in terms of 10-hour Rate.	Minimum Final Volts.
10	1.00	1.00	1.83
9	0.98	1.09	1.83
8	0.95	1.19	1.83
7	0.92	1.31	1.83
6	0.88	1.46	1.83
5	0.83	1.67	1.83
4	0.78	1.95	1.80
3	0.72	2.39	1.80
2	0.63	3.17	1.78
1	0.50	5.00	1.75
0.75	0.45	5.84	1.70
0.5	0.37	7.45	1.70
0.25	0.22	8.95	1.70
Peak		12.50	1.60

(4) If discharge is always continued until a definite total voltage is reached, and if the switchboard voltmeter is reading high, the battery may be over-discharged on every discharge, and the effect will be disastrous. Cells slightly lower in capacity than those in the body of the battery will get into bad condition, and will never get a chance to pull round again.

(5) If low or sick cells are not attended to at once, each discharge will bring them into worse condition, and if the trouble is not attended to and removed the cells may be ruined. It may be observed that the amount by which they are out of line with or lower than the others, need only be small to give trouble of this sort a beginning. Where cells are properly charged, however, the usual excess charge is sufficient to level up small inequalities in the condition of the cells, but if a few of the cells are allowed to get very low in condition, and the battery as a whole, therefore, seems low in capacity, nothing but harm can result from overcharging the whole battery on their account.

In dealing with the indispensable instructions to be followed, it will probably be best to take them up individually, and discuss the effects of neglect of, or non-compliance with them.

(1) Transgression of this means over-discharge and excessive sulphation. If a battery is over-discharged, more than the normal amount of overcharge is required to bring the cells fully up. Sulphate, on a positive plate, occupies a different volume from that occupied by the active peroxide material. On Planté positives, the active material being in the form of a skin on the grid, this variation in volume sets up stresses in the plates, and leads to buckling. In buckling, some parts of the positives get closer to the negative plates than others, and thus are overworked; this, if heavy working is continued, augments the buckling tendency, and the final result is short-circuiting, and, in due course, ruination. The point to be observed in all this, is that the trouble is cumulative.

(2) A battery in a discharged condition is just in the state in which it is most liable to the formation of sulphate and, naturally, the longer it is left thus, the more danger there is.

(3) If the charge is not full, some of the active material farthest from the surface remains in a sulphated condition, and this sulphate may develop into the stubborn variety.

(4) The normal rate is that which the makers have found by experience to be the most efficient and the most suitable for their plates.

It is a fact, little realized, that a cell cannot be properly charged at very low rates. The negative plates will be charged, but if the charging current is below a certain value, it simply sulphates the positives instead of charging them. Charging at high rates is bad for several reasons. For one thing, it is inefficient. Diffusion of the electrolyte in the pores of the active material, cannot keep pace with the reduction of the sulphate on the more accessible parts of the material, and part of the effect of the current is wasted in gassing.

Gassing has the effect of loosening the active material on the positives and causing a heavy deposit, and thus a reduction in capacity.

Excessive charging rate also means spraying, and heavy loss of electrolyte. The results of this are lowering of the insulation resistance, possibly electrolytic troubles, and rotting of the wooden stands and containers, if those are of the lead-lined wood type.

(5) Charging a battery in such a way that the ampere-hours put in on charge always exceed those taken out on discharge by a definite percentage, is one of the most fruitful sources of battery trouble.

It is a very common notion that the charge in ampere-hours should be 10 per cent greater than the discharge. It is easy to show that not only is this figure wrong, but that the idea underlying it is wrong.

If a cell is allowed to get badly sulphated, it will gas furiously long before it is fully charged. In fact, attendants who like to see a cell "milky" may have their heart's desire in a cell so badly sulphated as to be almost ruined, and, what is worse, a high voltage accompanies this "milking," making it doubly misleading. In such a cell, continuance of the charge will reduce the "milking" and the voltage, contrary to what happens in a cell in normal healthy condition.

(7) The necessity for checking the accuracy of instruments on which the welfare of the battery depends will be obvious.

(8) If the level of the electrolyte falls below the tops of the plates there is, consequently, less active plate area available. The result is a reduction in available capacity, and if the full rated number of ampere-hours is taken out, the part of the plate in actual use is over-discharged which is conducive to over-sulphation.

Another effect of low electrolytic level is that it gives rise to corrosion on the positive plates. Corrosion, when experienced, usually occurs at the surface of the electrolyte, if it gets a start. It is assisted by the fact that the specific gravity of the electrolyte is lowest at the tops of the containers, for corrosion proceeds most rapidly in weak electrolyte.

To diminish this tendency and the tendency for the heavy acid to settle at the bottom of the containers, it is best to add water by means of a glass funnel and tube, so that it reaches the bottoms of the cells first.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

The Prescott Gas & Electric Company was ordered to file by January 1 a detailed inventory of its property used and useful.

The Southside Gas & Electric Company. The application of the company for a rehearing of the rate case, reported in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, October 23, 1915, was denied by the Commission.

CALIFORNIA.

Great Western Power Company of California. A plan for the financing of the Great Western Power Company of California, a corporation recently formed by the merger of eleven light and power companies, has been submitted to the Railroad Commission for approval.

The Anuual Report of the Commission for the year ending June 30, 1915, has been compiled and transmitted to the governor.

The Pacific Gas and Electric Company. The Commission denied the company's application for a rehearing of the complaint of the city of San Jose against the company.

The Great Western Power Company was authorized to issue $1,400 par value of common capital stock at not less than par to pay organization expenses.

DISTRICT OF COLUMBIA.

Monthly Reports. The Commission has adopted a form for monthly reports of all electric companies operating in the District, which will show the number of customers supplied under each of the schedules in effect, and the amount of energy consumed and the revenues obtained under each schedule.

The companies are ordered to keep, after January 1, 1916, such records as are necessary to the compilation of the required data for each fiscal month.

Filing of Annual Reports. The Public Utilities Commission has sent to Congress the draft of a bill providing for 30 days' extension of the time allowed public service concerns to file their annual reports.

Paragraph 14 of the Public Utilities law provides that the accounts of the public utilities shall be closed annually on December 31, and a balance sheet taken therefrom, and, together with such other information as the Commission shall prescribe, filed with the Commission on or before February 1.

If amended, as proposed, the law will allow the utilities until March 1 to file their annual reports. Experience has demonstrated, the Commission states, that the time allowed under the existing law is too short to permit the utilities to close books and prepare the necessary data.

Rules of Procedure. On December 1, 1915, the Commission adopted rules to govern its proceedings and to prescribe the manner of conducting its investigations and hearings.

INDIANA.

Rochester Electric Light and Power Company. The Commission has authorized the Rochester Company to file a new schedule reducing certain of its rates for electric service. The new residence lighting rates are 10 cents for the first 50 kilowatt-hours and 5 cents for all excess, with a 50-cent monthly minimum charge. The rates for cooking service are: 10 cents for the first ten kilowatt-hours and 2.5 cents for all excess.

The Akron Light, Heat and Power Company has surrendered its franchise and received an indeterminate permit from the Commission.

The Citizens' New Telephone Company, of Ellettsville, was authorized by the Commission to increase its rates to the following schedule: For stone quarries, individual lines, $2.50 a month; for business telephones, individual lines, $1.50 a month; for private residences, individual lines, $1.25 a month. A charge of 25 cents a month additional is prescribed for such lines as have connection with the Bloomington (Ind.) system.

KANSAS.

Kansas Natural Gas Company. The Commission has rendered a decision practically reaffirming its former order handed down last July, and finding that an increase to the 28-cent rate is reasonable. The Commission also recommends that the affairs of the receivership be wound up promptly and the property turned over to the owners.

NEW HAMPSHIRE.

Annual Report. The report of the Commission for 1914, Vol. IV, contains the annual reports of the various railroad corporations and public utilities under jurisdiction of the Commission for the year ended June 30, 1914, and a summary of the Commission's work for the two years ended August 31, 1914.

NEW YORK—First District.

Oscar S. Straus was appointed by Governor Whitney to fill out the unexpired term of Edward E. McCall, who was removed from office December 7, following the investigation of his record on the Commission by the Thompson Legislative Committee. Mr. Straus will take office about December 20 as chairman of the Commission. Commissioner Cram, the senior commissioner in point of service, was elected temporary chairman for the interim.

Commission Procedure. On motion of Commissioner William Hayward, hearings before the Public Service Commission for the First District hereafter, instead of being assigned to individual commissioners, will be set down for hearing before the whole Commission.

Reports of Decisions. The First District Commission has issued Vol. V. of its Reports in bound form. The report contains determinations of the Commission passed upon by the court amendments to the Public Service Commissions Law enacted in 1914, and decisions of the Commission for the calendar year of 1914. A Documentary History of Railroad Companies is issued as Part 5 of the annual report of the First District Commission for the year 1913. The Commission required all companies under its jurisdiction to file all documents relative to their incorporation, franchise rights and intercorporate relations. About 7,000 of these documents are now on file. From the data thus collected, the Commission has compiled a summary of the essential data relating to railroad companies.

Second District.

The Montgomery County Electric Light and Power Company was authorized to extend its lines into the towns of Sharon and Cherry Valley and the village of Cherry Valley, with the purchase and dissolution of the Cherry Valley Gas Company, which is at present supplying the village of

Digitized by Google

Cherry Valley with acetylene gas, is provided for in orders of the Commission recently handed down.

The franchises from the town authorities are approved and an issue of $15,000 of the common stock of the company is authorized to be sold at par, the proceeds to be used in the new extension.

The Municipal Gas Company of Albany has had in effect a minimum charge of $9.00 per year. In cases where less than nine dollars' worth of current has been used in the last year, the company experienced some difficulty in collecting bills presented for the balance due under the minimum charge provision. The Commission has issued an order which it is hoped will do away with the confusion. In any month in which a customer's bill for current is less than 75 cents the company is permitted to send a bill for this monthly minimum under the rates provided. If at the end of the year the company has collected more than $9.00 and the customer has not used nine dollars' worth of current, the company will refund the difference between the amount collected and the nine-dollar minimum.

WASHINGTON.

Puget Sound Railway and Light Company. The Commission ordered a reduction in the lighting rates for the City of Everett. The value of the properties of the Puget Sound Railway and Light Company is found to be $2,170,592.58, and the value of the light and power department is fixed at $469,465.48. The Commission estimated that the company's net profit in 1914 was 15.81 per cent. A reduction was ordered, which with the same number of consumers, will give the company a return of 8 per cent.

WISCONSIN.

The Superior Rural Telephone Company, operating as a mutual company, refused to extend service to an applicant for service unless he would become a subscriber to the company's stock. The complaint filed with the Commission raises the question as to whether or not the company can compel an applicant for service to become a stockholder in the company.

The decision says: "The Commission has never issued a formal ruling on this question, but has informally expressed the opinion in correspondence that such a requirement is not a reasonable one. A mutual telephone company which serves its own stockholders exclusively may nevertheless be a public utility within the meaning of the public utility law. For example, if a mutual company should number among its stockholders all except one or two of the inhabitants of an isolated valley, and should refuse to serve such nonstockholders, they would not be able to secure service from any source unless the mutual company could be compelled to extend its service to them. No outside telephone utility could be required to enter such a field for the service of one or two patrons. Whenever a mutual telephone company is so located in a community that residents cannot secure any reasonable telephone service except through it, the business is of a public nature and the mutual company is a public utility." . . .

This is found to be the situation in the present case.

"A public utility is required by law to render adequate service at reasonable rates. A customer may be charged a rate sufficient to provide a reasonable return for the utility, but he cannot be required to share in the undertaking. The ownership of stock in this company makes a person liable to assessment if the revenue is insufficient or if unforeseen contingencies arise, and entitles him to share in any profits of the enterprise. The assumption of the responsibilities of a stockholder, however, is purely optional with the consumer, and cannot be forced upon him as a condition procedent to receiving service."

The company is ordered to extend service to the complainant and to desist from its practice of requiring applicants for service to purchase stock in the company.

Reasons for Electrical Progress.

C. P. Sparks, president of the (British) Institution of Electrical Engineers, in his inaugural address delivered in London in November summarized the hampering effect of past legislation upon electricity supply business in England, and referred to the initial mistakes as to supply areas which had resulted in the want of coordination and uniformity that characterize the supply systems of the London district. Owing to those difficulties it is still impossible for the subject of London's supply as a whole to be considered from an engineering point of view. The president devoted one section of his address to an account of the various inventions, developments and main engineering features that had in spite of the above handicap resulted in improving the reliability of supply and in greater economy of production. Later Mr. Sparks gave four main reasons why we should expect a large further expansion in general electric supply apart from electric traction and electro-chemistry, as follows: (1) Necessity for fuel economy; (2) The extension of lighting; (3) The increased range of transmission; and (4) Domestic use of electricity. He said in part as follows on these points:

(1) *Necessity for Fuel Economy.*—The economical use of fuel has been hindered in this country by its low price. Only a fraction of the total coal consumed is at present used for centralized source of supply of power and heat; the principal future economy in fuel is to be found in increasing the use of such centralized supply to allow the most efficient use to be made of the world's coal supplies. To attain this economy, large capital outlay is required on plant for converting the heat energy of the coal into electricity, but the present apparent lower cost using fuel inefficiently at a large number of isolated points retards progress in the direction of centralization, as immediate results are often only considered.

The fuel-saving by using a centralized supply is due to the reduction of standby losses and to the higher efficiency of large generators and boiler plant when worked under skilled supervision. The fuel-saving under average conditions from a central scheme as compared with isolated plants is not less than 75 per cent. With the gradual increase in the cost of fuel, it is unquestionable that all main supplies for power and heat will be obtained in the future from centralized sources.

One of the next steps to lower the cost of production of electricity will be the gas-firing of boilers, the gas being obtained from producers worked at a low temperature. This will provide by-products from the distillation of the coal as a raw material for other industries. The sizes and positions of most of the present power stations prevent this system being used, as by-product processes can only be successfully worked on a large scale and with plant operating at a high load-factor; but the increase of electrical energy taken from centralized sources of supply and the gradual change from comparatively small stations to main power stations, will allow of this method of generation.

(2) *The Extension of Lighting.*—Apart from hygienic reasons, it is certain that electricity will prevail more and more as an illuminant owing to the greater number of candlepower-hours that can be obtained from a ton of coal by using electricity as compared with gas. With electricity generated in modern power houses using 25 British thermal units per watt-hour, and with 85 per cent efficiency of distribution the number of candlepower-hours obtained per ton of coal is, with metal-filament lamps of 15 to 20 candlepower no less than 750,000, as compared with 260,000 in the case of gas, gas mantles of 20 candlepower and 13,000 cubic feet of gas per ton of coal carbonized being assumed. The amount of coal required with electricity for small units of light is thus only one-third of that necessary for an equal illumination with gas.

It may be suggested that further im-

Digitized by Google

provements in the gas mantle will equalize matters; but it must be remembered that electricity is more than holding its own in new developments. The half-watt lamps now on sale have again reduced the energy per candlepower-hour by more than 50 per cent for lamps of 120 candlepower (smaller units of light being available when lower pressures than 100 volts can be obtained by transformation).

(3) *Increased Range of Transmission.*—Further research should result in improved dielectrics which would allow higher working pressures for underground cables, thus lowering the cost of transmission, increasing the size of each centralized undertaking, and again raising the operating load-factor by the greater diversity in the demand.

Pending this development, the economical radius of transmission can be increased by using overhead lines outside the thickly populated districts, and it is not too much to expect legislative action in the national, as against private, interests. Statutory powers should allow the erection of transmission lines along the most economical routes, reasonable rents for wayleaves being fixed by an independent tribunal.

(4) *Domestic Uses of Electricity.*—There is no section of the general supply that opens up greater possibilities than electric cooking and heating, since at a low estimate the units required for these purposes would be ten times those required for lighting. This development would utilize to much greater advantage the distributing mains in residential areas, which are at present only fully loaded during a few hours per annum. An improved load-factor would lessen the cost of suplying energy.

While the efficiency of conversion in the present electrical apparatus is high, and the system is an ideal one hygienically since there are no products of combustion, development has been slow for the following reasons:

(*a*) With the present method of conversion of the heat energy in the coal to electricity it is only possible to deliver to consumers some 15 per cent of the heat energy in the coal.

(*b*) The present cost of the apparatus and its maintenance. A large expansion of business would enable manufacturers to meet this point, and immediate improvement will take place as soon as the supply undertakings are prepared to let on hire and maintain apparatus on liberal terms in the same manner as the electric motor business was developed.

(*c*) The rates charged for this class of supply are in many cases not sufficiently low to encourage development. A low rate is essential and is justified by the high diversity-factor and the large number of hours of use, resulting in a greatly improved load-factor from the residential demand.

ELECTRIC-MOTOR CONTROL.

Monthly Meeting of the American Institute of Electrical Engineers.

The 316th meeting of the American Institute of Electrical Engineers was held in New York City on the evening of December 10. President J. J. Carty occupied the chair. A paper was presented by C. D. Knight entitled "The Principles and Systems of Electric Motor Control."

This paper pointed out the important place which the electric motor has attained in industrial activities, due largely to ease of control. The different types of resistor were described and their temperature characteristics shown by diagrams. Manual control was considered satisfactory until a few years ago, but for large motors and frequent reversals has now been largely superseded by automatic contactors. The different methods of applying these were discussed. The essential parts of a contactor are contacts, blow-out, magnet, frame and pivot bearings. These were considered in turn. Solid copper contacts are preferable to carbon or laminated copper. Direct-current shunt contactors, series contactors, and alternating-current contactors were then considered. Methods of control are by counter electromotive force, current-limit relays, or series contactors for direct-current motors; for squirrel-cage motors the voltage is reduced by resistor or autotransformer; for slip-ring motors current-limiting relays are usually used. Time-limit devices may be used for either direct or alternating current. Dynamic braking was also briefly considered.

The paper was discussed by Bassett Jones, Edwin J. Murphy, W. I. Slichter, F. B. Crocker, J. H. Albrecht, H. F. Stratton, M. D. Goodman, Selby Haar and F. W. Gay.

Mr. Jones referred to the trouble which inexperienced men meet in getting appropriate control apparatus for motors.

Mr. Murphy referred to railway work and steel mill drive, where manual control became impossible, as introducing automatic control. He advocated copper in preference to carbon contacts, and air-break in preference to oil-immersed contactors. A serious limitation to the counter-electromotive-force system of control is that a drop in voltage may cause the last contactor to fail to close. Time-limit devices are suitable where a definite load is handled, but for general purposes a current-limiting device is preferable. For fire-pump work the time-limit method was recommended.

Professor Slichter questioned whether all the regulating and protective devices usually included in control systems are so essential that they warrant the complexity introduced, and whether a uniform system of conventional symbols might not be used to advantage. Complexity may be reduced by the method using series relays. The use of contactors energized by alternating currents meets difficulties owing to the liability of chattering with pulsating flux, and because at constant voltage the current required to produce the flux is large when the contactor is open but small when it is closed. In both dynamic braking and "plugging" heat is generated in the armature, which must therefore be of larger capacity than if these methods were not used.

Professor Crocker gave reminiscences comparing the state of the art today and 25 years ago.

Mr. Albrecht advocated the use of graphite for the initial contactor to prevent "freezing" or sticking of the contacts with large currents when jogging results from quick manipulation. The final contact is made with copper. He favored air-break switches for high alternating voltages, as they are easily inspected and have other advantages. He did not favor either mechanical or electrical interlocking; a drop-out relay is preferable. He referred to a rolling-mill set of the Bethlehem Steel Company, consisting of a 12,000-horsepower direct-current motor supplied from a flywheel motor-generator set running on alternating current. The motor of this set has a capacity of 2,000 horsepower. The mill motor is permanently connected to the generator, and is controlled by the generator field and motor field, the speed varying from 0 to 120 revolutions per minute. This method avoids large losses of energy in rheostats, and provides for regeneration when the load goes off entirely, this energy speeding up the flywheel.

Mr. Stratton emphasized the reasons for the constantly increasing use of electric power. Modern manufacturing is characterized by increased wages per hour, decreasing wages per unit of output and increasing investment for equipment. Operations must be planned and regulated as to speed, feed, etc., so as to keep the output up to the capacity of the machine. This is where electric control excels, and its proper development is along lines of increasing production and decreasing labor cost.

Mr. Goodman advocated copper contacts. Carbon is not satisfactory where there are thousands of operations per day. To overcome rebound a loose plug may be inserted in the main contact arm, thus avoiding arc-

Digitized by Google

ing. He referred to an inverse-time-element overload relay which can be used for all classes of service.

In closing Mr. Knight explained how the motion of the contactor prevents freezing and would not admit that carbon or graphite would wear as long as copper. He agreed that the electrical interlock might be dangerous in certain cases, due to the contactor not instantly going all the way home.

At the close of the meeting the members were invited to join the meeting of the New York Electrical Society in conjunction with the National Electric Light Association, which was also held in the Engineering Societies Building. A number of electrically driven piano players were demonstrated, and Lee De Forest exhibited his singing incandescent lamp. This is an adaptation of the audion amplifier, which under certain conditions emits musical tones.

Electrical Accidents; British Government Inspector's Report.

The annual report of G. Scott Ram, electrical inspector of factories, regarding accidents in factories, workshops and power stations in the United Kingdom, shows that in public lighting and traction power stations and substations there were 350 non-electrical accidents, seven of which proved fatal, and 31 non-electrical accidents in other stations, three proving fatal. The electrical accidents in both classes of stations numbered 99, an increase of 5 for the year, and they were made up as follows:

TABLE I.

At switchboards when engaged in ordinary routine work	26
Cleaning, repairing, etc., at live switchboards or other live conductors (two fatal)	49
Cleaning, repairing, or other handling of switchboards supposed to have been made dead (one fatal)	2
Adjusting brushes and cleaning commutators and flashing at commutators	6
Miscellaneous (one fatal)	16

The electrical accidents in factories, other than electrical power stations, numbered 350, including 16 fatalities. This represents a decrease of 68 or 16 per cent for the year. Table II shows the causes.

TABLE II.

Arcing of switches, 38; of fuses, 9	47
Shocks or burns when replacing fuse wires	22
Portable apparatus, connectors and flexible wires (two fatal)	65
Unprotected conductors, switches, terminals, fuses, etc. (seven fatal)	36
Working on live electrical apparatus or conductors, skilled persons, 42; unskilled, 46 (three fatal)	88
Miscellaneous electrical manufacturing and repair works accidents, chiefly in testing operations (one fatal)	55
Adjusting brushes and cleaning commutators and flashing at commutators	6
Miscellaneous (three fatal)	31

Concerning Table I, some of the accidents in the first line were due to mistakes on the part of the switchman; others were due to matters beyond his control, either to faulty switch gear or to faults on the circuit at some distant point. In all cases the injuries were burns. In one the tank of an oil switch burst and the attendant was injured by the burning oil. Six of the accidents occurred in the renewing of fuses. One-half of the station accidents occurred to men when working on live conductors, chiefly on switchboards. Eight occurred on extra-high-tension systems, and three on high-tension systems. In most of the high-tension accidents the injured persons were doing work which was unauthorized and they were themselves to blame.

An engineer attempted to do some work in a switch cubicle (10,000 volts); the switch was not in use, although alive on one side, and it could have been made dead by means of the isolating switches provided for the purpose. This, however, involved the taking down of a heavy iron screen, and rather than do this he took the risk. Mr. Ram says that this accident emphasizes the desirability that such doors should be hinged or made to slide on runners so that they may be readily opened.

One accident was caused through a short-circuit to the framework of the switchboard by the metal end of the insulating pole provided for operating the isolating switches. Sixteen of the accidents on medium and low-pressure systems were caused by making short-circuits by ordinary spanners, screwdrivers or pliers; one was due to short-circuit in attempting to remove the tank on a live oil switch.

An engineer-in-charge took hold of live conductors of a high-tension arc-lighting switchboard thinking they were dead. A switch controlling the switchboard had apparently, contrary to the usual custom, been inadvertently left on from a previous shift.

In the miscellaneous section of Table I the fatal case was that of a man who touched with his head a neutral conductor of a high-tension alternator. Several alternators were running in parallel, the neutral point of one being definitely connected to earth. It had previously been assumed that the neutral points of the other machines would have been very nearly at earth potential. In this case it appeared that there was 500 volts pressure to earth. The machines were of different types, and the one in question was of lower voltage than the others and connected through a step-up autotransformer.

Some of Mr. Ram's district staff point out that many contractors put in inferior apparatus and material on account of cheapness, knowing perfectly well that it does not comply with the government regulations, being afraid that if they tender for work which will comply with the requirements other contractors will not do so, and will get the orders on the question of price alone. The factory occupier eventually has to suffer, and is put to a greater expense in putting the matters in order, than if he had paid for the proper material in the first instance. Contractors should be called upon to put it right at their own expense. Local contractors are, however, beginning to realize that bad work is liable to be found out and condemned, and they are improving their standards accordingly. Attention is drawn to the inefficiency of earth connections on most installations. Some high-tension switchboards were found which had passageways only 18 inches wide and unprotected conductors all along one side.

The accidents in renewing fuses (Table II) afford examples of the dangers of different types of fuses referred to in previous reports by Mr. Ram. Most of the injuries were burns from short-circuit, but some were from shock. In some cases short-circuits were made by getting the fuse wire or pliers or other tool across the terminals of both poles or between one pole and the metal case. In some instances the fuses had been protected by a switch, but this being at a distance was not used. In other cases where there was a switch at the fuses it was connected on the wrong side so that the fuse terminals were live whether the switch was "on" or "off." Several occurred with fuses in porcelain carriers having the fuse wire in a groove in the front of the porcelain. In these cases the fuse having blown, the attendant replaced it without having investigated and rectified the fault which caused it to blow in the first instance, with the result that immediately the fuse-holder with the new fuse wire was put into contact, the fuse blew again, burning his hand. Others, causing shock, occurred with the "bobbin" or "grip" type carrier having live metal at each end of the porcelain. None of these fuses complies with the regulations. "Fuses not protected on the live side by switches should be of the switch-fuse type, so constructed that the hand when grasping the handle cannot touch live metal and is shielded from the arc should a fuse blow when being plugged in."

Turning now to accidents in the use of portable apparatus, 26 of these occurred in handling the flexible conductors. In one fatal case a man, working on the wet floor of a dry dock scraping a ship's bottom, is supposed to have trodden on the flexible cable of a portable lamp cluster, a nail in his boot piercing the insulation of the cable. Mr. Ram says that in many works there is no proper examination of the flexible conductors, which remain in use after being badly damaged and worn out. In some cases the metallic armoring of the flexible wires had broken and pierced the insulation. Metallic armoring, especially in the form of a wire helix, is not a desirable form of protection. The earth connection is liable to become disconnected, and through rough usage and constant bending the wire is likely to break and pierce

Digitized by Google

the insulation, and becoming live is very dangerous. Mr. Ram says that other forms of protection, such as rubber or hard-cord braiding are generally preferable. Twenty accidents in this class occurred in connecting the flexible wires to the circuit. In six cases "adapters" were being put into lampholders and short-circuits occurred. In other cases pin plugs of the old type were used, the wires short-circuiting at the point where they enter the plug. In most of these cases the use of safety-type hand-shield plugs would have prevented the accidents. The short-circuits which occur in this way are often very heavy, leading to very severe burns, by reason of the circuit being too heavily fused. In one case it was found that the circuit for a hand lamp was fused for 60 amperes.

Three cases of shock occurred from unearthed portable drills. A fatal case occurred, in a dry dock, in the use of a portable cargo lamp. A cluster of several lamps was mounted in a metal reflector and the whole fitting became alive by reason of a terminal screw in one of the lampholders being in contact with the barrel of the holder. The man took hold of the reflector of the fitting and was killed. The fitting was not earthed and it did not comply with the regulations.

After briefly summarizing the accidents of the "unprotected conductors" class, Mr. Ram refers to electrical testing work in electrical manufacturing works. This he says is largely carried on by apprentices and pupils as the ages of victims show. One experienced electrician, however, was killed by touching 2,000-volt wires, thinking that they were dead; two hours' application of artificial respiration was not successful. In another case a man touched some 12,000-volt testing leads and artificial respiration succeeded. In the other cases the injuries were mostly burns from short-circuits.

It is remarked that the testing departments of electrical manufacturing works are often carried on in a very unsatisfactory manner, there being unnecessary exposure of live conductors where they are liable to be accidentally touched. Any old connecting cables with damaged insulation are considered good enough; even in high-pressure testing unnecessary risks are run.

In one large armature winding shop it was customary to test the armatures by applying 2,000 volts between the commutator and the spindle. A twin flexible cable was connected to a transformer in a cabin, the other end being moved about to whatever part of the shop a test was required, perhaps 20 or 30 yards from the cabin. The cable terminated in bare ends projecting from short vulcanite sleeves. There was only one tester, who could, of course, not be at both ends of the cable at the same time. An accident occurred at an armature under test, the armature winder, who was applying the ends of the test leads, getting a shock. The tester was walking back to the test cabin where at the moment there was no one to switch off the current. In this shop also there was no one qualified or instructed in first-aid methods.

The inspector lays emphasis upon the need for artificial respiration being applied, refers to the fact that death in electrical shock cases is often only "apparent," and mentions the ignorance of the medical profession in regard to the matter.

Summarizing the fatal cases, all were due to shock from alternating current. Eighteen were due directly to shock, and two to fall following shock. Fifteen were from pressures of 440 volts or less. Most of the shocks being to earth from touching one conductor only of the system, the voltage received by the victim was less than the voltage between phases.

As usual many other reports by factory inspectors are issued simultaneously with that of Mr. Ram. Illumination questions receive only slight attention, and only brief reference to this and one or two other points is necessary here.

The importance of adequate lighting is being appreciated more every year, and though the inspectors have no statutory authority to require lighting generally, they have made suggestions, which have been adopted, remedying conditions which have been injurious to both eyesight and general health. "Though the more modern works have usually enough lighting force, the arrangements of the lights is often bad." The Bristol inspector (Mr. Shinner) refers to the injurious use of metallic-filament lamps with clear bulbs and very small shades, close to the eyes of the workers. He has recommended large, opaque shades, and comments thus: "Very little attention appears to be given to providing good, or rather well arranged, artificial lighting. I think it is largely left to any contractor who puts up the lights, and in regard to electric lighting the number of points affects the cost and tends to handicap proper distribution." Other inspectors report that great improvements have recently been made in artificial lighting by the substitution of electricity for ordinary gas lighting.

In referring to the difficulties surrounding the proper disposal of the dust and fumes collected by the fans in town factories, electrical deposition is advocated by Mr. Harston, of Birmingham, as being a better method than any commonly used. He mentions the successful operation of such a system in American factories for dealing with fumes and dust.

It is found that overhead electric cranes are responsible for a number of fatal and serious accidents. The importance of adequate sound signals has been impressed upon managers, and in numerous instances the means of access for the crane driver have been improved. In one works repeated accidents occurred, after conversion of the overhead cranes from rope drive to electric control, due to men being crushed between the crane framing and fixed vertical columns when leaving or approaching the cranes. Various devices were tried unsuccessfully, but no accident has happened since the installation of electric glow lamps, both near and at the top of the ladders leading to the crane tracks. These are automatically lighted as the crane approaches within a few yards of each ladder head.

Lighting With Gas.

The December meeting of the New York Section, Illuminating Engineering Society, was held in the auditorium of the Consolidated Gas Company, New York City, on December 8.

The first paper, on "Residence Lighting by Gas," was presented by M. A. Coombs, of the Consolidated Gas Company.

Among the advantages cited in favor of gas lighting, as it is being offerred for sale, were the low intrinsic brilliancy of the units themselves and the extensive use of diffusing glassware.

The second paper, on "Progress in Outdoor Lighting with Gas," was read by Charles I. Hodgson, of the Brooklyn Union Gas Company. Store-front and billboard lighting were the features taken up, the unit being the outdoor gas arc. The success of this branch of the company's business is based upon service, and the author dwelt upon the things which are essential to holding the customer as well as getting the business. By means of slides the appearance, equipment, fittings, magnet valve control, maintenance, inspection, sales efforts, booklets, advertising and the handsomely equipped gas offices, of which there are ten in Brooklyn, were all given due credit and consideration. The lamps are sold on an installment maintenance plan for $1.25 a month for two years, or $30. At the end of this period most of the lamps are then maintained under a regular maintenance contract.

The discussion was opened by J. E. Bullard, who felt that gas lighting has not received sufficient publicity. As an instance of the wrong kind of publicity, he cited a book published on the care of books in which the statement was made that gas was injurious owing to the effect of the sulphur on the bindings.

Norman Macbeth said that A. T. Stewart made his first success as a merchant when he tried to sell the things that the public wanted. The only competitor that either gas or electricity has is darkness.

J. P. Hanlan, G. E. Smith, H. T. Owens, E. C. Brown and Thomas Scofield also spoke.

Digitized by Google

School Lighting Discussed by Chicago Illuminating Engineers.

A meeting of the Chicago Section of the Illuminating Engineering Society was held in the Edison Building, Chicago, on the evening of December 9. W. A. Durgin acted as chairman. An illustrated paper was presented by M. Luckiesh entitled "Safeguarding the Eyesight of School Children." Mr. Luckiesh stated that very little has been published regarding appropriate lighting of schools as it affects the eyesight of school children. He referred to the work of the Committee on School Lighting, the primary object of which is the conservation of the children's eyesight.

Mr. Luckiesh reviewed the chief principles involved in satisfactory school lighting which he illustrated with numerous diagrams and curves. He referred to some studies made of the vision of pupils in Swedish secondary schools, showing that, although an improvement resulting in the reduction of nearsightedness had been evident in recent years, due doubtless to improved lighting in both schools and home, there is still room for much further improvement. The curves drawn up from this study showed that nearsightedness increased as the pupils advanced in their grades and was more noticeable in schools teaching classical subjects, due to much reading. Mr. Luckiesh then showed a large number of views taken in schools which were typical of bad lighting and of good lighting.

He then outlined briefly a preliminary code for school lighting which has been drawn up by the committee. Among the most important features emphasized are: The lighting should be referred to an expert before the plans are finally drawn; the minimum illumination on the desks in class rooms should be 2.5 to 3 foot-candles; glazed or glossy surfaces must be eliminated; glare from blackboards must be avoided; walls should be fairly light; window area must be ample and equivalent to at least 20 per cent of the floor area; the width of the room should not be over twice the window height; the ratio between maximum and minimum illumination should not exceed 100 to one; all artificial lighting should be from screened sources; local units should be avoided in shops, drafting rooms, etc.

Mr. Luckiesh also advocated strongly that school children should be taught how to conserve vision. The principles of good lighting should be incorporated in the course, particularly in the case of home-making classes. As a rule the arrangements for daylight have been found to be good, but in many cases where artificial illumination is used the conditions are very unsatisfactory. Where the lighting has been rehabilitated along the most approved lines there has been a growing tendency to use semi-indirect units. Mr. Luckiesh also referred to the work of the Illuminating Engineering Society of Great Britain which has made an extended study of school lighting.

The discussion of the subject was opened by John Howatt, of the engineering staff of the Board of Education, of Chicago, who touched on some of the practical difficulties of different systems of artificial lighting. A study of the subject in the Chicago schools led to the adoption of screened direct lighting equipment because it was believed that indirect systems would require too much cleaning. In the shops of manual training and technical high schools there has been found a need for localized lighting. The standard equipment for class-room use has been designed primarily to meet the particular conditions prevailing. About 30 of the Chicago schools are night schools. These have been studied with great care and their equipment has been remodeled first on account of the limited funds available.

Arthur H. Ford, of Iowa City, Iowa, suggested that prism glass was desirable for aiding the uniformity of daylight illumination in rooms over 20 feet wide. In the engineering drafting room of the University of Iowa Professor Ford said that individual lamps were provided because only a few of the desks are in use at night, and also because of a seeming psychological demand. He has observed that pupils demand much better light now than some 20 years ago.

M. G. Lloyd emphasized the need for good school lighting. A marked improvement has been noticeable in this respect in the schools most recently built. The lighting of the older schools should be rehabilitated as soon as possible. Need for further agitation of the subject is greater in suburban districts and small towns than in the large cities. Respecting the proposed code there is danger in going too far in standardization. The committee drafting the code should consider the possibility of radical changes in school-room design in the future; for example, a greater use of skylights in rooms entirely devoid of windows, since this arrangement doubtless gives the best daylight illumination.

J. R. Cravath recommended that the minimum illumination suggested in the code be raised to at least between 3 to 6 foot-candles, partly because many eyes require more liberal illumination and also because of the depreciation of lighting equipment. He also suggested that the maximum brightness should be lowered. He thought that the Chicago schools are meeting the conditions as they are now found very satisfactorily, but he hoped that it will be possible to go further in the future because the additional expense involved will well repay itself. Night-school students need particularly good lighting because their eyes are already fatigued from the day's work.

Albert Scheible criticized some features of Professor Ford's suggestions, especially the use of local lamps in drafting rooms. He believed that indirect systems have now been designed that are capable of ready cleaning from the floor.

Otis L. Johnson also spoke very strongly in favor of general lighting in shops with practical elimination of local lighting. Extension cords or local lamps should be used only where absolutely necessary. The ordinary workman is no judge of proper lighting and the pupil in a school is still less fitted for proper judgment of this matter.

H. D. Butler mentioned several schools in the western suburbs of Chicago where skylights are used with very good results. He also mentioned schools in several cities where pure indirect lighting is very successfully used.

W. A. Durgin thought it was as reasonable to give each pupil an individual source of light as it would be to provide them with individual sources of heat. The use of gas-filled tungsten lamps is increasing so fast now that any direct lighting system installed is soon likely to be entirely unsatisfactory because not adapted to the use of the more efficient lamps. Others who discussed the subject were K. A. Auty and A. L. Arenberg.

The discussion was closed by Mr. Luckiesh, who stated that the suggestions of the code were only tentative and much condensed. He urged that even the older schools have their lighting systems entirely remodeled which can be done at very low cost. He also spoke strongly against the use of local lamps on drafting boards, sewing tables, lathes, etc., because pupils have very vague notions as to how to manipulate such local lamps properly. There are 18,000,000 school children in the United States, a very large number of whom have defective vision. A proper consideration of the economic value of such vision to the pupils shows the importance of making the conditions of lighting as favorable as possible in all the schools. Respecting the use of glare-free paper for text books, he believed that such a paper of comparatively low cost is now available.

Digitized by Google

Additional Electrical Prosperity Week Returns.

Reports from Philadelphia, Atlanta, Texas, Denver and Elsewhere Indicate Marked Stimulation of Business as Result of Campaign.

Philadelphia Campaign Results in 1,160 House-Wiring Contracts.

Electrical Prosperity Week in Philadelphia was very much more successful and celebrated in a very much more general way, throughout that city, than had been anticipated or even hoped for by the most optimistic. The Philadelphia Electric Company was extraordinarily successful in obtaining the co-operation of the business men throughout the city in the entire celebration. The co-operation of the electrical fraternity throughout the city, other than the central-station representatives, was to be expected, but the extent of the co-operation finally obtained was again due to the carefully laid plans of the central station.

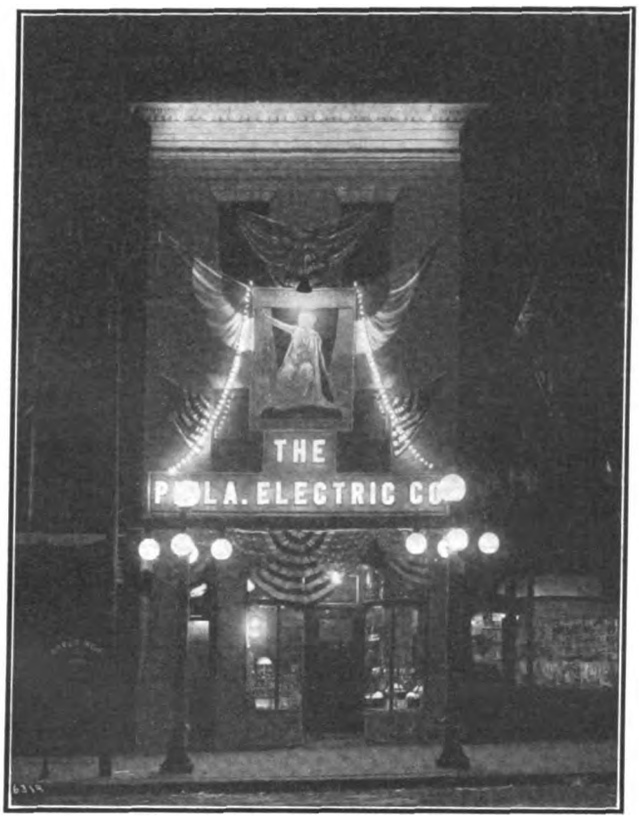
All the preliminary work was handled by a committee of the Philadelphia Electric Company's employees, and all the details were worked out by them. It was decided quite early in the game that something to hang Electrical Prosperity Week upon was absolutely necessary. In other words, that unless the Electric Company had something definite to offer the public, other than general prosperity talk, they could not expect the public, generally, to enter into the spirit of the occasion from the viewpoint of the industry.

The offer as finally evolved and presented was as follows: "To celebrate Electrical Prosperity Week the Philadelphia Electric Company offers an allowance of $1.00 per current consuming outlet on the cost of wiring any already-built house or store located along its existing lines and requiring no other than the ordinary service connections, provided that the contracts for both wiring and service were signed between November 1 and December 4."

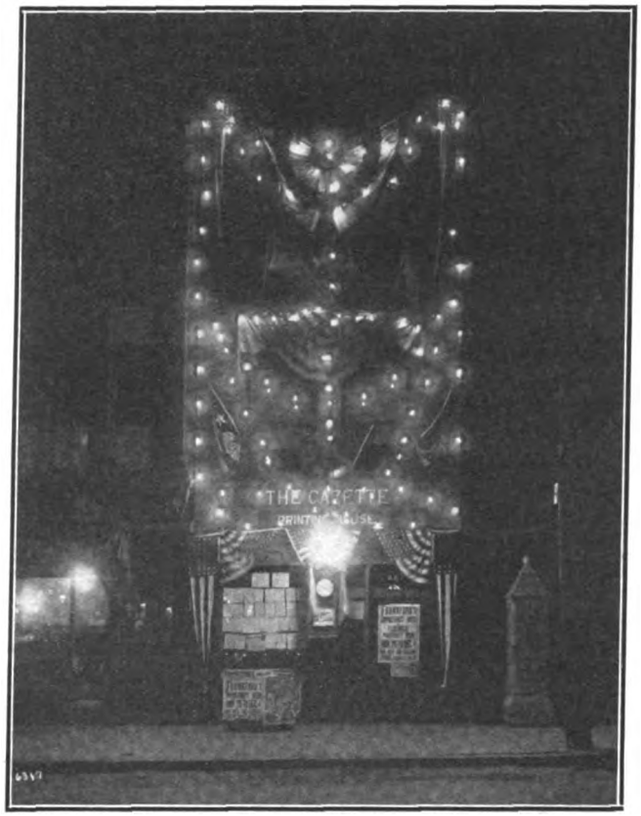
This $1.00 per outlet allowance meant a saving of practically 20 per cent upon the cost of the wiring. The company, in its advertisements, pointed out that it was not in the wiring business, therefore the amount of the wiring estimate obtained from the favored contractor, of the prospective customer, was not influenced in any way by this offer and that the $1.00 per outlet allowance, therefore, was a positive saving. This offer was, naturally, enthusiastically received by the wiring contractors inasmuch as they were not asked thereby to give up any of their profits. It was so favorable an offer that all the progressive contractors added to their force of salesmen and actively aided the canvass made by the salesmen of the Philadelphia Electric Company.

While this offer naturally interested the public, the active co-operation of the business men was obtained in a different way. Philadelphia as a city, in addition to the main business center, contains six or eight retail business districts which are, in effect, almost separate small cities. The business men in all of these districts are banded together in numerous business men's associations. These associations are most active in endeavoring to keep the purchasing public of each district from buying elsewhere. The district offices of the Philadelphia Electric Company are located in these various sections, and the district managers are members of the business men's associations. It was pointed out to these business men that it was to their great advantage to endeavor to "cash in" on the enormous amount of advertising that was being done all over the country to make Electrical Prosperity Week a national event and the especial timeliness of this week was pointed out as a stimulus to the Christmas "Shop Early" movement. The result was that the business associations in almost every section co-operated by inaugurating a local "Booster Week."

The electrical interests in the city, headed by the central station, constructed



Typical Decoration of Philadelphia Electric Company's Stores.



Prosperity Week Decoration of Newspaper Office Building.

Digitized by Google

about 15 floats, all of them electrically illuminated and most of them quite elaborate in character. A schedule was arranged so that each business district was given one night upon which this electrical parade would traverse the principal business streets of its section. This created a great deal of enthusiasm, and the business men in each district co-operated by entering floats, decorated trucks and delivery wagons, automobiles, etc., in these nightly parades. As a result these parades contained from 75 to 150 entries, representing the local business men.

In one district, the Government was represented by two "Preparedness" floats, entered by the United States Arsenal. In many of the districts cash prizes were offered by the business men's associations for the best decorated floats, the best electrically decorated windows, and the best electrically decorated buildings; these prizes aggregating $500 per night, all of which money was put up entirely by the business men. The business houses along the routes of the parades, in each district, were most elaborately decorated by bunting, flags, electrical streamers, and in fact all of those deocrations which are used, from time to time, to celebrate great events.

Naturally, all this enthusiasm and co-operation could not have been obtained without liberal advertising. The Philadelphia Electric Company, of course, shouldered this end of the expense. Practically all of the advertising matter furnished by the Society for Electrical Development was utilized, such as street-car cards, window cards, muslin signs, lithographed window posters, poster stamps, folders, etc. In addition to the Society's printed matter the company issued a great deal of individual advertising. Thousands of folders were mailed containing the wiring offer. Two thousand four hundred street-car cards carried similar advertisements. The company "Bulletin" was made an Electrical Prosperity Week number and sent to all customers prior to the week. Large newspaper space was utilized in the daily papers, and spreads were used in all the local newspapers. Illuminated sign boards were used for one month in advance of the week, and special advertising letters, containing the house-wiring offer, were sent to the names of those on prospect lists.

The results, as stated above, were beyond all expectation. The parades during the week were witnessed by exceedingly large crowds, and the most favorable comments were elicited. The daily newspapers, during the week, contained columns of reading matter relative to Electrical Prosperity Week generally, and its features locally. There were numerous editorials upon the subject of electricity. The City Hall was illuminated in outline lighting throughout the week. The Bell Telephone Company and the main buildings of the Philadelphia Electric Company were illuminated by flood lighting, and all of the Philadelphia Electric Shops and district offices were elaborately decorated inside and out.

The Week in Philadelphia was an unqualified success; not only as far as the public was concerned, but also from the standpoint of closer relationship between the electrical interests. The wiring offer resulted in the signing of approximately 1,160 contracts, which means at least $100,000 worth of business for the electrical contracting firms. It is figured that 20 per cent of these contracts, or something over 230, would have been secured anyway in the normal run of business; but that the other 80 per cent—or about 930 contracts—may legitimately be credited solely to the special offer and the intensive sales campaign of the central station and electrical contractors.

Two points worth noting are that all this new business was secured at the regular prices for wiring, the allowance being borne by the central station; and, further, that the number of wiring contracts secured by each contractor was in direct proportion to the energy and aggressiveness he displayed in capitalizing the interest stirred up by the central station's advertising.

Atlanta's Activities.

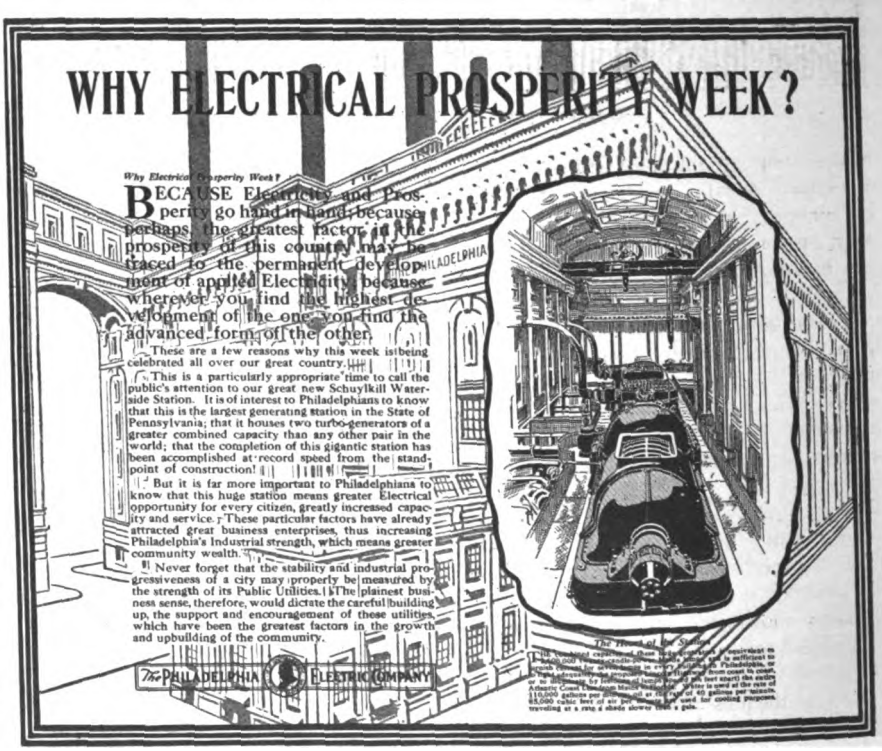
Electrical Prosperity Week was celebrated in Atlanta by an Electrical Show held in the Healey Building, one of Atlanta's latest and finest office buildings, one-half of the entire ground floor being used for the Show. The General Committee in charge of the Show was headed by Rawson Collier, of the Georgia Railway & Power Company.

The Show opened promptly Monday morning, November 29 and the attendance showed a steady increase each day during the week, the attendance on Saturday being more than 100 per cent in excess of the attendance on the first day. The total attendance for the week was approximately 14,000.

News items appeared in all of the Atlanta papers each day of the Show, these items generally occupied about a column of space, and towards the latter part of the week, editorials appeared in all of the papers calling the attention of the people to the Show and its educational value. The program of special days was as follows: Monday, Georgia School of Technology Day; Tuesday, College Day; Wednesday, Anti-Tuberculosis Association Day; Thursday, High School Day; Friday, Rotary Club Day; and Saturday, Children's Day.

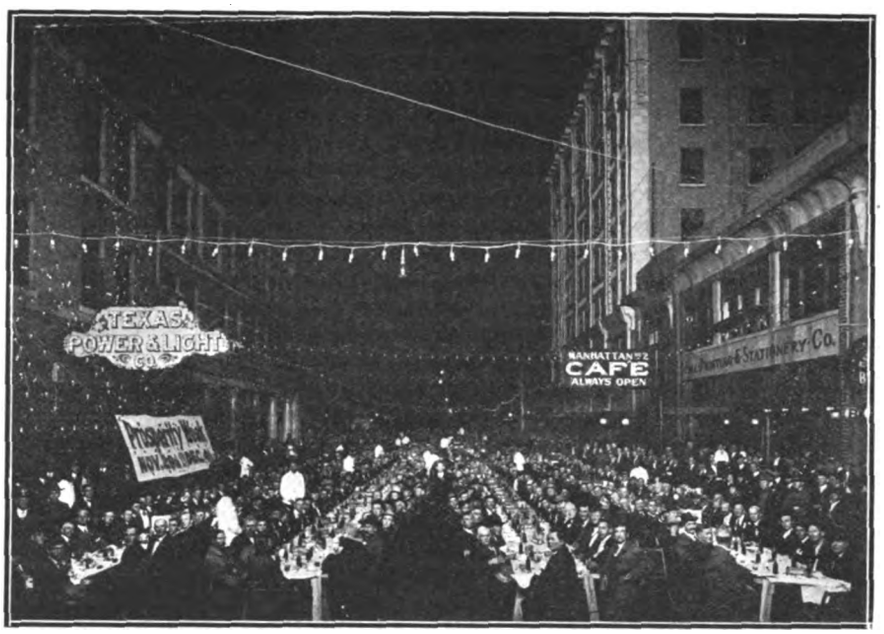
Music was furnished by the Automatic Player Piano Company, which installed a $5,000.00 electrically operated Orchestron, and each day special numbers were presented. On Rotary Club Night, the entire Rotary Club attended the Show in a body and after spending an hour in inspecting the exhibits, the Club held an electrical dinner at the Hotel Ansley. After the dinner at which electrical favors were given to all of the ladies, there was a dance, the room being festooned with small lamps, these lamps working from a flasher. On Saturday Night after the Show, an electric supper was given to all those participating in the Show, by Rawson Collier.

The Rotary Club at its regular meeting on Tuesday following the Electrical Show, gave an electric luncheon the


WHY ELECTRICAL PROSPERITY WEEK?
Why Electrical Prosperity Week?
BECAUSE Electricity and Prosperity go hand in hand because, perhaps, the greatest factor in the prosperity of this country may be traced to the permanent development of applied Electricity; because wherever you find the highest development of the one you find the advanced form of the other.
These are a few reasons why this week is being celebrated all over our great country.
This is a particularly appropriate time to call the public's attention to our great new Schuylkill Waterside Station. It is of interest to Philadelphians to know that this is the largest generating station in the State of Pennsylvania; that it houses two turbo-generators of a greater combined capacity than any other pair in the world; that the completion of this gigantic station has been accomplished at record speed from the standpoint of construction!
But it is far more important to Philadelphians to know that this huge station means greater Electrical opportunity for every citizen, greatly increased capacity and service. These particular factors have already attracted great business enterprises, thus increasing Philadelphia's Industrial strength, which means greater community wealth.
Never forget that the stability and industrial progressiveness of a city may properly be measured by the strength of its Public Utilities. The plainest business sense, therefore, would dictate the careful building up, the support and encouragement of these utilities which have been the greatest factors in the growth and upbuilding of the community.
The PHILADELPHIA ELECTRIC COMPANY

An Advertisement Published During Week by Philadelphia Company.

Digitized by Google



Outdoor Banquet Held at Waco, Tex.

favors being a replica of Edison's original lamp. A talk was made by Evanda H. Ginn of the General Electric Company, his subject being "Electrical Interests in Atlanta." This paper proved to be one of the most interesting papers ever read before the Rotary Club in Atlanta. At the dinner, essays were submitted by the various ladies present, the essays being entitled "Advantages of Electricity in the Home," a prize being awarded to the lady writing the best essay.

Electrical Prosperity Week In Texas.

The results obtained through "Electrical Prosperity Week" in Texas cities operated by the Texas Power & Light Company show what can be done in even the smaller towns when the proper effort is applied.

Perhaps the most unique and noteworthy celebration in the State was the "Prosperity Banquet" held in the street in front of the Texas Power & Light Company's office in Waco, Texas. The success of this banquet is more remarkable due to the fact that it followed within a few weeks after the Waco Cotton Palace, an annual fair and exposition held in this city every year by the commercial organizations. The mild Texas climate made the banquet possible.

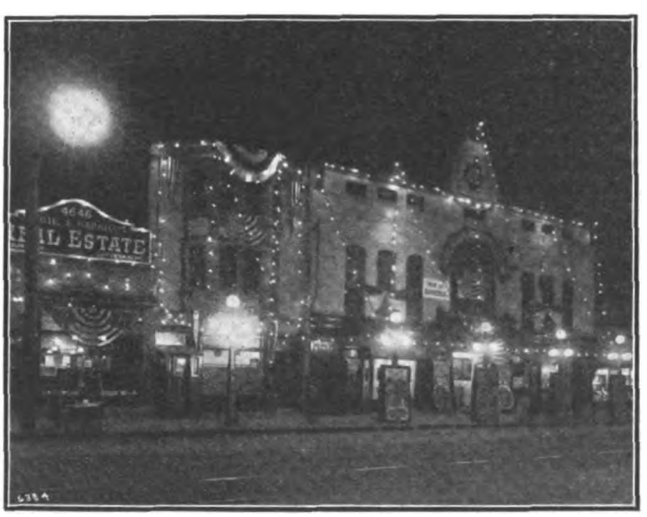
This stunt was staged under the auspices of the Waco Young Men's Business League, an organization that has been very active in promoting the prosperity of the city. One of the members of the league was approached early in the campaign and told of what was being planned for "Electrical Prosperity Week" and his co-operation was secured. The time was very opportune due to the fact that over $1,000,000 worth of good roads had recently been completed, something to make everyone rejoice. Accordingly the matter was brought up and met with instant response. It was decided to hold the banquet and to invite the farmers from the surrounding territory as guests of the occasion in celebration of the completion of the good roads and the general prosperity of the section. It might be mentioned here that this progressive attitude on the part of the merchants is one that has been consistently followed in Waco and has been a great factor in bringing in trade.

Committees were appointed and everyone was given an opportunity to help the good work along. The necessary money was obtained by selling "Prosperity" badges at $1.00 each. The local manufacturers contributed flour, coffee and most of the other necessities for the feast and other merchants and manufacturers prepared this material. W. C. Duncan of Texas Power & Light Company was given charge of the illumination, which was donated by the Company, and one has only to glance at the illustration herewith to see that the street was made as bright as day. Green sawdust was sprinkled over the street which made it look very much like a lawn party.

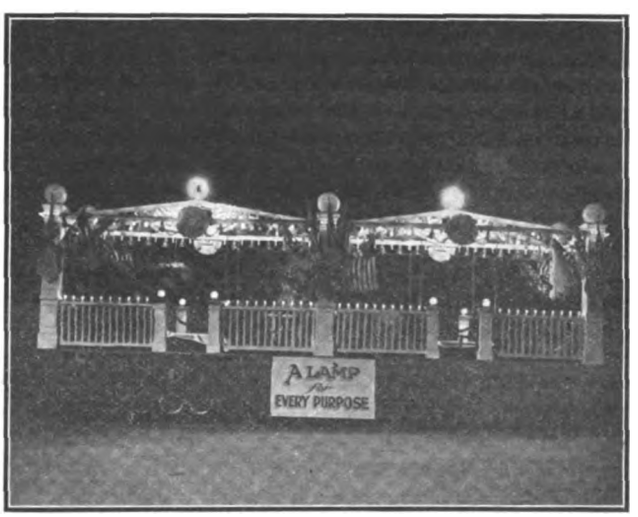
The banquet was held on the evening of Tuesday November 30. Over 1,500 persons partook of the big meal and as many more watched the proceedings from the sidewalks. No other celebration ever held in Waco made such an impression. The local papers were very liberal in their support of the idea.

Perhaps one of the most noteworth announcements during the banquet was a statement by J. F. Strickland, president of the Texas Power & Light Company and the Southern Traction Company, who spoke on "Electrical Prosperity" that there was a good possibility that the present interurban from Dallas to Waco might be extended to Temple and Austin during 1916. He also stated that there was a possibility of an interurban from Waco to Houston via Marlin. These lines will mean much for the development of Waco when they are finally built.

The celebration in Brownwood, Texas was started at a meeting of the Chamber of Commerce and was later taken up with the Retail Merchants' Association. A few days after this a joint meeting of the two bodies was held and it was at this meeting that the real enthusiasm was generated. Every man present agreed to devote at least an hour a day to committee work if called on.



Typical Street Scene in Texas Town.



Float Used in Philadelphia Parade.

Digitized by Google

The local papers agreed to publish nothing but prosperity news on their front pages during this week and it might be mentioned that this one feature was the biggest factor in the week's celebration.

Each day of this week was made a special day. One day was "Pay-Up" day, another was "Chamber of Commerce" day and so on throughout the week, Saturday being "Farmers'" Day. As an indication of the success of this plan, during "Chamber of Commerce" day over 100 new members were obtained.

Another notable feature was the support which the local merchants gave the newspapers. Over 5,000 inches of advertising was pledged by the merchants for this week. This in a town of some 10,000 population is remarkable.

In Hillsboro, Texas the retail merchants and the business league also co-operated, the week being designated as "Prosperity and Pay-Up" week. All the stores were decorated in Christmas attire. An aviator was secured for the occasion and a carnival was also made a feature. On the first day, Monday, over 2,500 persons were in town for the celebration. And this in a town of not much more than 8,000 population. Again it goes to show what co-operation will do. The city was made bright by special festoons of electric lamps hung by the Texas Power & Light Company. Reports show that the merchants did a big business and were able to start there holiday trade going in full swing during this week.

Temple also had a "Prosperity Week" the Chamber of Commerce, Young Men's Business League and the Retail Merchants co-operating. No special features were noted but holiday trading was greatly stimulated.

The idea of the Texas Power & Light Company in making this a "General Prosperity Week" and inviting the co-operation of the merchants explains the success of the general plans. Only a few towns were worked on this year, it being thought that it would be better to make a successful show in a few towns than a half success in all the towns operated by the Company.

Directly the company profited by iron-exchange sales which were put on through the local contractors, 25 cents being offered that week for old sad irons, the amount being applied on the purchase of a new electric iron.

Indirectly the company has profited in good will of the merchants. Without exception the citizens of these towns praised highly the liberal policy of the Company and its attitude in making this celebration a co-operative one.

Next year the Company hopes to start the ball rolling for a "Texas Prosperity Week" to be celebrated in every town in Texas.

Denver Holds Noteworthy Celebration.

If Electrical Prosperity Week in Denver had produced no result other than to advertise electricity for lighting, heating, cooking and power purposes, the expenditure of money and energy by those interested in its success would have been justified.

An analysis of the week and the electric show indicate remarkable results were attained.

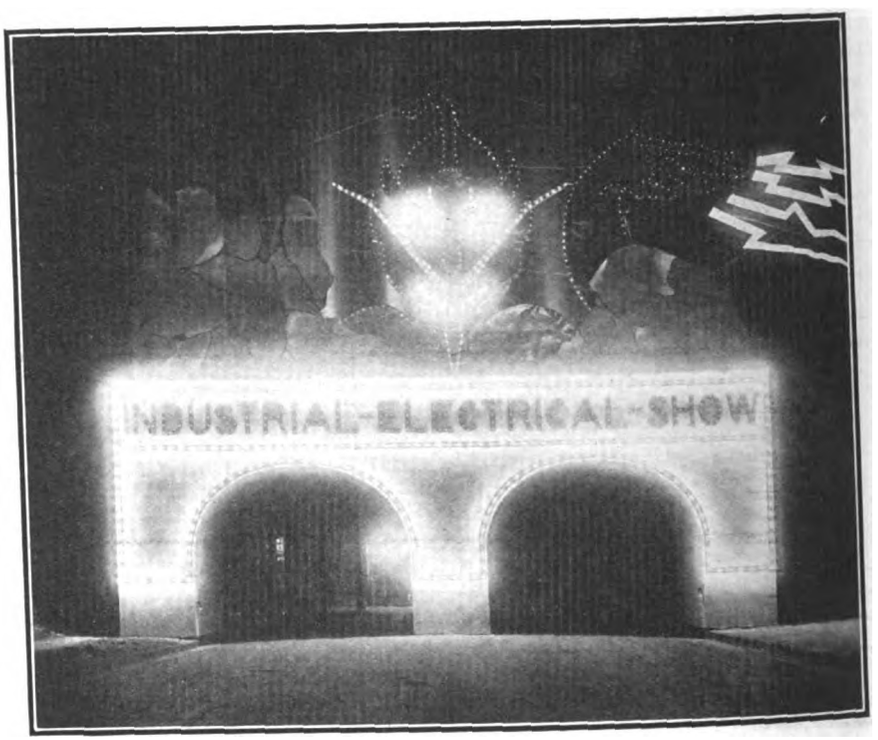
In the first place, it provided opportunity to give extensive publicity to electricity and electrical devices of all kinds, therefore, fulfilling the primary purpose for which the week was intended.

Secondly, or, perhaps, it might be considered first in importance, the campaign, as handled by Denver electrical men, produced a result exceedingly pleasing to the central station. It promise of being the biggest year in the company's history, and already the books show a 25-per-cent increase in Christmas sales over the same period of last year.

Judging Electrical Prosperity Week from the effect it has had in Denver it would appear that the week set aside by the Society for Electrical Development for the advertising of electricity and electrical appliances was well timed.

If other cities throughout the country have experienced results similar to those of Denver electrical interests, electricity and appliances which consume it will have received the greatest impetus in the history of the industry.

To William J. Barker, vice-president and general manager of the Denver Gas & Electric Light Company, belongs much of the credit for the success of Electrical Prosperity Week in Denver. Plans devised by him were placed in the hands of a corps of competent assistants. These men were grouped into committees with Mr. Barker directing them.



Entrance to Denver Auditorium, Where Electric Show Was Held.

made hundreds of friends for the Denver Gas & Electric Light Company. This was due mainly to the efforts of the company in advertising its consumers—the business men and manufacturing men who spent large sums yearly for the purchase of light, heat and power.

As will be conceded this method of procedure gained the friendship for the company of the men thus advertised, and they in turn, feeling gratified, sought to show their appreciation by spending their own time and money in boosting Electrical Prosperity Week, the electric show held in conjunction with it, and incidentally the Denver Gas & Electric Light Company.

Another important feature of the celebration, which has been especially noticeable since the close of the prosperity celebration, is the increase in the company's Christmas trade. It gives

Advertising played an important part in the campaign. Newspapers, due to the efforts of a corps of publicity experts, issued special editions giving publicity to the affair.

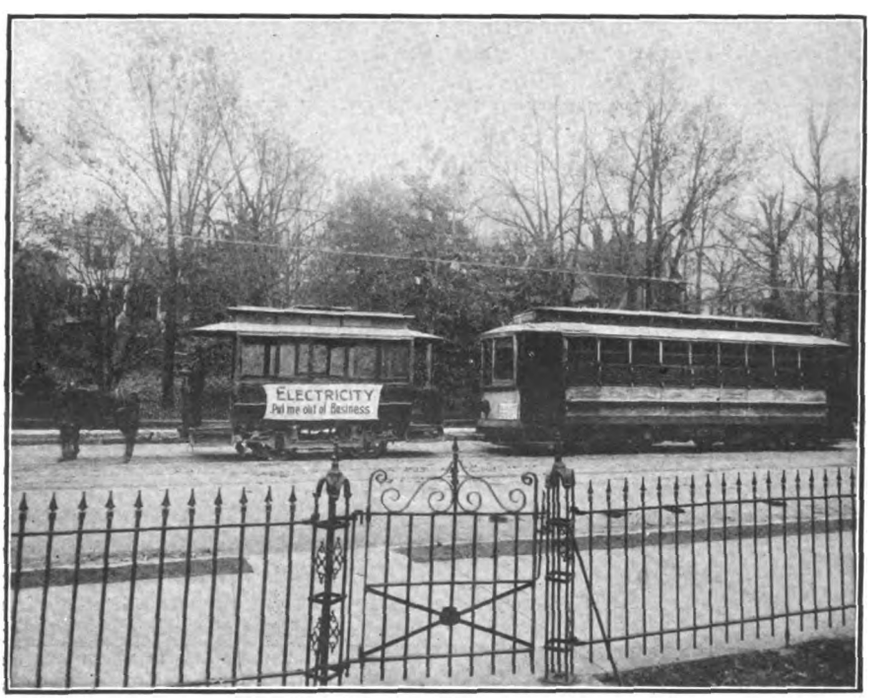
Every conceivable form of advertising was utilized to call attention to the celebration. In addition to newspaper advertising the phrase "Electrical Prosperity Week" stared at 250,000 Denver people from billboards, street cars, the show windows of every department store, manufacturing concern and a hundred odd other business concerns.

Digitized by Google

The Denver newspapers did themselves proud in playing up Electrical Prosperity Week in their news columns. How much this advertising was really worth cannot be figured in dollars and cents. In the first place it was advertising that could not have been purchased at any cost.

In the hands of John M. Connelly, publicity manager of the Denver Gas & Electric Light Company, was intrusted the duty of advertising the electric show and Electrical Prosperity Week. The results accomplished best demonstrate how successfully the plans were executed.

The plan of selecting a queen to preside over the show was hit upon and eventually carried into effect. Electra was the name chosen for the queen.



Impressive Exhibit of Hot Springs Company.

She was selected from among hundreds of Denver's most beautiful women, five artists having national reputations judging her as the most perfect in beauty, carriage and figure of those responding.

On the night of her coronation, November 30, thousands of persons packed the Denver auditorium where the electric show was held. Mayor William H. Sharpley crowned her queen of the show. He was introduced by Clare N. Stannard, secretary of the Denver Gas & Electric Light Company.

Manufacturers and business men desiring knowledge on the latest in electrically power driven machines and lamps for interior and exterior illumination purposes were attracted to the show by the personal touch which the company used in its advertising campaign.

Advertisements seeking to attract their attention and which had the desired result, probably are unique in the electrical industry. It was these advertisements which gained the Denver Gas & Electric Light Company hundreds of friends among the best business men and manufacturers of the city.

Hot Springs, Ark., Celebrates.

Electrical Prosperity Week was celebrated in Hot Springs, Ark., in a manner that far exceeded any event of its kind ever held in that community. Steven Mather, assistant secretary of the Interior and W. P. Parks, superintendent of the United States Reservation, representing the government, the Business Men's League, Merchants Association and all lines of trade took part in the brilliant parade which was held on the night of December 2.

One of the features of the parade was the exhibit of the Hot Springs Street Railway Company, which had in line a mule-drawn street car used 30 years ago and which was followed by a modern double-truck car, the latter being brilliantly illuminated with varied colored electric lights. This car was occupied by young ladies singing patriotic songs.

Minneapolis Jovians Celebrate During Week.

Bubbling over with enthusiasm and crammed full of plans for the future entertainment of Minneapolis Jovians, the newly elected Jovian officers and Jovians in general are still talking of the wonderful success of the Electrical Prosperity Week social which was held in Minneapolis, Minn.

The Minneapolis affair really goes to show what can be accomplished in the way of a good get-together electrical party when the proper spirit within us is aroused, lethargy is cast aside, and action is the word.

Of course the most interesting event of the week was the social. In addition to this there was a mighty display by a battery of searchlights from the roof of the office building of the Minneapolis General Electric Company, the local central station, which attracted city-wide attention and added considerably to the week's publicity. Aside from the Jovian activities the part played by Minneapolis in the nation-wide movement consisted mainly of newspaper advertising, each of the three English dailies carrying a full electrical page of paid advertising, each paper devoting several columns of interesting write-up to electricity in general.

Especially attractive offers by all dealers and department stores was the principal feature contributing to the large sale of appliances for the week which undoubtedly reached unusual proportions. The local central station, in spite of the fact that it handles devices in only a very limited way, reported twice the average number of sales.

Business Stimulated in Louisville.

Celebration of Electrical Prosperity Week in Louisville was so successful that the Jovian League, which held an electrical exposition at the First Regiment Armory, has been asked by a number of the exhibitors to repeat the event next year.

The business results of the displays were splendid, it was reported. Dealers and contractors received a marked stimulation of their trade, and exhibitors of goods like electric vehicles made a number of sales at the show.

Indicating the possibilities of the exposition from the standpoint of business-getting, the Louisville Gas & Electric Company, which had a booth fitted up chiefly as a rest room, conducted a contest to determine the number of beans shown in a 1,000-watt nitrogen globe. A hole had been bored in the bottom of the globe and beans of all sorts and sizes put in, after which the hole was covered with sealing wax. The feature of the contest was that the first prize was to be awarded only to a person having an unwired house, those whose houses were wired being eligible to the other prizes, consisting of electrical appliances. The first prize was $25 toward wiring a house for electricity. Indicating the amount of interest excited, over 9,000 guesses were entered, and of these 2,200 were submitted by people with unwired houses. The company secured about 700 live prospects, as those who submitted guesses were required to state whether they were "interested."

Digitized by Google

National Independent Telephone Association and the Independent Association of America Hold Joint Convention and Merge to Form United States Independent Telephone Association.

An important event in the history of independent telephony was the gathering at the Hotel La Salle, Chicago, on December 8, 9 and 10, in joint convention of the National Independent Telephone Association and the Independent Telephone Association of America. As a result of the meeting a reunion of the two organizations followed in which each gave up its existence to form a new association called the United States Independent Telephone Association. The meeting was attended by nearly 1,000 delegates, and was said to be the largest gathering of independent telephone men ever held in this country.

On the morning of December 8 each of the two associations held a brief separate meeting. President C. Y. McVey, of the old National Association, called upon S. G. McMeen, Columbus, O., to explain the negotiations of the last few months, which led to bringing the two organizations together. It was realized that the growing number of important problems, particularly relating to regulation by the Interstate Commerce Commission, and by various state commissions, called for united action on the part of the telephone men. Other addresses were made along the same line, and it was then moved that the Association dissolve, a Liquidating Committee taking care of its final finances and other matters. At the same time the Independent Association of America had a brief session presided over by E. B. Fisher, Grand Rapids, Mich., who called on Secretary W. S. Vivian to explain the proceedings that led to the consolidation. Upon motion this Association also was dissolved, and all of the members, as those of the old National Association, were urged to join the new United States Independent Telephone Association.

Upon the conclusion of the brief separate meetings, the first joint session, constituting the first meeting of the new United States Independent Telephone Association was called by E. B. Fisher, chairman of its board of directors. Addresses were made by Mr. Fisher, President McVey, of the new Association and others. Mr. McVey then presented his retiring address as president of the old National Association, in which he dwelt upon the fact that the independent movement was just 21 years of age. When it began in 1894 there were scarcely 30,000 telephones in the United States. At the present time there are nearly 10,000,000 independent and Bell telephones in use in the country. He reviewed the work carried on by the National Association during the past year, particularly the work of its Committee on Accounting. He urged loyalty to the new Association and united and harmonious efforts. A brief address was also made by E. B. Fisher as retiring president of the Independent Association of America, in which he referred to the work undertaken by it in conducting operating schools for service betterment and other activities of the Association during the past year.

F. B. MacKinnon, retiring secretary of the National Association, presented a report on the work of organization, referring particularly to further negotiations with the American Telephone & Telegraph Company regarding the toll-line contract. Further work along this line will be undertaken, and about January 15 next a joint committee representing the Bell and independent interests will begin an exhaustive study of the toll situation in various parts of the country, investigating all classes of existing arrangements for interchange of toll business. The committee will visit various toll centers to ascertain the exact conditions prevailing, and to work out methods for mutually satisfactory agreements. Much attention has been and more will be given to the working out of the famous valuation order No. 18 of the Interstate Commerce Commission. W. S. Vivian presented his report as retiring secretary of the Independent Association of America, referring particularly to the work that has been conducted along lines of standardization of telephone transmission and of improvement in service work. During the past year Mr. Vivian conducted about 30 operators' schools.

The session on Wednesday afternoon was opened by an address of welcome by William R. Moss, on behalf of the Chicago Association of Commerce. This was eloquently responded to by N. G. Hunter, of Wabash, Ind., on behalf of the Telephone Association.

Beecher W. Waltermire, chairman of the Ohio Public Utilities Commission, made an address on "Commission Regulation of Public Utilities." He called attention to the very rapid increase in the growth and importance of public utilities in this country. The necessity for utility regulation has become more and more felt in recent years; when this era began a feeling of hostility was marked on both the side of the public and the utilities. It is imperative that this feeling of antagonism should be eliminated and that harmony should prevail. Mr. Waltermire decried the tendency to let politics enter into regulation, since economic questions like this cannot be settled at the polls.

On Thursday morning the session was devoted entirely to accounting, being conducted by the Accountants' Division with L. R. Parker, of Columbus, O., chairman. The work of the joint Committee on Accounting, composed of representatives of the American Telephone & Telegraph Company and of the Independent Telephone Associations, was briefly referred to. This important work will be continued, and its results will not be available until perhaps about one year. Brief addresses were made by F. W. Sweeney, chief examiner of accounts of the Interstate Commerce Commission; E. M. Prisk, Hazelton, Pa.; C. P. Russell, Lincoln, Neb.; A. L. Staferman, Terre Haute, Ind.; J. W. Van Sant, examiner of accounts of the Interstate Commerce Commission; J. M. McShane, chief accountant, Missouri Public Service Commission, and others.

On Thursday afternoon the session was opened with an address by A. J. Shands, St. Louis, Mo., entitled "The Traffic Manager from His Own Viewpoint." The speaker reviewed the duties of the traffic manager. He must see that the service provided is rapid and yet accurate and courteous. Mr. Shands urged strongly that managers should thoroughly acquaint the operators with the proper procedure, and impress upon them that they are the sales representatives of the telephone company.

Statistician Meyers, of the Interstate Commerce Commission, spoke briefly on the importance of the auditor in any telephone system, particularly in relation to the statistics required by the Interstate Commerce Commission. In order that these may be of any value there must be a uniform system of gathering and reporting the figures. He reviewed the work on uniformity of accounting as regards reports of railroad companies which has been done by the Commission. LeRoy Parker, Columbus, O., then spoke on "The Auditor from His Own Viewpoint." He called attention to the increased value placed upon accounting by all up-to-date telephone companies, and, in fact, by all utility companies.

L. E. Hurtz, Lincoln, Neb., then read a paper entitled "The Plant Superintendent from the General Manager's Viewpoint." He outlined the organization of larger telephone companies, and explained the interconnection of the various departments. In each of the departments specialization must be carried out to a high degree, but their activities must be carefully co-ordinated.

At the banquet held on Thursday evening chief interest centered in the address made by William Howard Taft, former president of the United States.

Digitized by Google

Another important address was that made by Robert B. Glenn, former governor of North Carolina. S. G. McMeen was toastmaster.

The final session of the convention on Friday morning was devoted to standardization. R. V. Achatz, Lafayette, Ind., explained the work that has been undertaken and accomplished by the Standardization Committee. A tentative code specifying standards of telephonic transmission has been compiled, the study of which was urged. All the independent companies should attempt to improve their transmission as far as possible to the standards defined.

F. J. Heavens, Pittsburgh, Pa., spoke on the need for standardization. Although telephony is now the fourth industry in importance in the country, it is the least standardized of the leading industries. A great variety of standards of telephone transmission are in use, in fact, in many plants no standards whatever exist.

W. H. Hay spoke on what the adoption of the proposed standards would mean to the operating companies. He emphasized the value of toll business to any company. This can be obtained only by providing high-grade transmission. He narrated several instances in which the transmission was greatly improved by relatively simple changes in the present plants, usually by replacing wornout or antiquated equipment. He analyzed the conditions in central offices, lines and substations, pointing out how slight improvements here and there will have a very important effect upon the transmission. However, standardization of transmission is not the only thing to be taken up. Uniformity of operating practice is nearly as imperative as improved transmission.

Arthur Bessey Smith spoke on standardization from the viewpoint of the manufacturer. Heretofore telephone manufacturers have sometimes been compelled to sacrifice transmission to improved switching methods. Most of the manufacturers, however, already make telephone equipment in accordance with the proposed standards. He pointed out that there are two aspects of standardization, the first being the setting up of standards by which transmission can be measured; second, that the standard transmission specified should be the practical limit for which the public is now willing to pay. There is great need for standard means of measuring the transmission prevailing. Great improvement has already taken place among the manufacturers in testing equipment put on the market.

H. D. Currier spoke on the influence of standardization upon the independent telephone business as a whole. He said that standardization really means only good management. It should be noted that standardization is necessary in all branches of the telephone business, construction, operating, accounting, etc. Many managers think they know the entire telephone business. However, the latter has so developed that specialization is imperative. Improved transmission means calling upon telephone experts to make a study of every plant. Even though many present comparatively inefficient plants are a commercial success, a study of each plant to reduce its losses and to improve its transmission efficiency, will make a very decided commercial improvement.

Frank A. Wolff, of the Bureau of Standards, Washington, D. C., reviewed the work of this organization, which now has grown to have over 400 employees, over two-thirds of whom are engaged in scientific work. He described the institution and its facilities, and gave an outline of its most important branches of activity. The United States now has the largest standardizing laboratory in the world. The principal activities now are the establishment and maintenance of standards of measurement, standards of quality, standards of performance, standards of service and the promotion of industry. Some of these were explained by Dr. Wolff at length, and he also pointed out some of the more recent work in the drafting of standards of gas and electric service, and of the proposed electrical safety code, which is now in process of formulation. He said the Bureau is in hearty sympathy with the Association on standardization and would co-operate as far as possible in furthering the work.

The subject of standardization was also discussed by President McVey, Secretary Vivian, H. B. Folsom, W. C. Polk, E. B. Fisher, Francis Dagger, L. E. Hurtz, H. E. Bradley, R. H. Polk and others.

The report of the Committee on Resolutions was then presented by its chairman, Judge N. G. Hunter. Three resolutions were recommended and adopted as follows: the first urging that state commissions prescribe a fiscal year for telephone companies to be the calendar year, as is required by the Interstate Commerce Commission; second, urging that Congress appropriate sufficient funds to enable the Bureau of Standards to take up a study of the standardization of telephone transmission, apparatus, etc.; third, resolutions of gratitude for the participants in the banquet, the hotel management, and others who had contributed to the success of the convention. The meeting then adjourned.

As usual, the manufacturers of telephone equipment made very representative exhibits of their apparatus and supplies which occupied all of one floor of the hotel.

The officers of the new United States Independent Telephone Association, who were elected at a meeting of its board of directors held on December 7, are as follows:

Chairman of the board, E. B. Fisher, Grand Rapids, Mich.

President, C. Y. McVey, Cleveland, O.

First vice-president, W. H. Bryant, Mobile, Ala.

Second vice-president, G. W. Robinson, St. Paul, Minn.

Third vice-president, F. B. MacKinnon, Washington, D. C.

Secretary-treasurer, W. S. Vivian, Chicago, Ill.

Electrical Credit Men Hold Annual Convention in Chicago.

A closer co-operation between the credit and sales departments of electrical companies was the keynote of the annual meeting of the Electrical Credit Association of Chicago, which was held at the Hotel La Salle, on December 9.

It was suggested in the course of the discussion that at the sales conferences which form an important feature of the commercial activities of most companies the credit department should be represented and credit methods explained. The salesmen come in closer contact with purchasers and prospective purchasers than do men of any other department and if they are properly advised as to credit matters they can often act as missionaries and tend to overcome unpleasant relations between the purchaser and the house.

A. J. McGivern, sales manager of the Manhattan Electrical Supply Company, took a leading part in the discussion at the meeting in advocating such activities, and suggested that it would be a good plan to gain co-operation with the salesmen by offering suitable prizes to the salesman in whose territory the least credit loss was suffered during the year. The value of house and interdepartment conferences was pointed out by C. H. Minor, of the Western Electric Company, who presented a paper on this subject. It was shown that the individual is disappearing in all important business houses, although the human element in business should not be neglected. House conferences are stabilizing, educational, harmonizing and humanizing. Department conferences make for the greater co-operation and for departmental protection.

The question as to whether salesmen should be asked to collect accounts was discussed by A. H. Powell and J. L. Hall, it being conceded that

Digitized by Google

while a salesman is in a position to collect valuable data for the credit department, it is not desirable to ask salesmen to collect accounts, as it is likely to hurt their standing with the customers, particularly among those who, while good credit risks, are not always in a position to pay bills promptly.

The election of officers resulted as follows:

President, Henry Schwab.

Vice-president, A. O. Kuehmsted.

National representative, F. M. Pierce.

Secretary-treasurer, Frederic P. Vose.

Assistant secretary-treasurer, Walter S. Vose.

Members of the Executive Committee, H. O. Claire, for two years and Thomas I. Stacey and S. E. Kennedy for three years.

Papers dealing with the Electrical Credit Association and its relation to the industry were presented by W. W. Low, W. R. Herstein, G. A. Richards, W. W. Johnson and others.

The meeting concluded with a dinner and entertainment in the evening, the affair being characterized as "Stunt" night.

SYSTEM OF KEEPING RECORDS OF CURRENT WORK IN ELECTRICAL INSPECTION DEPARTMENT.

By Washington Devereux.

Applications.

Applications which arrive in the first morning mail are received by the Electrical Department. These are looked up in a certificate cabinet to determine whether or not a reinspection was ever made of the electrical equipment and repairs not completed. If there is a reinspection on the risk the application (Fig. 1) is immediately turned over to the reinspection clerk. If there is no reinspection on the risk the full rated location is placed on the application. Application is then passed to the inspector in whose district the risk is located. After the inspector has made a copy, on form shown in Fig. 2, of the location of the risk, name of the occupant, equipment, source of supply and name of contractor, the application is placed by him in a cabinet provided for this purpose, which cabinet is divided into compartments, the compartments each bearing the name of the inspector. These applications are then gathered by a clerk and delivered to the cashier who, with an automatic numbering stamp gives each application a consecutive number, known as the application number. Each application is then entered in its proper order (with reference to the application number) in the Electrical Inspection Record Book, and a receipt for the cash payment is immediately mailed to the applicant.

This book contains columns for date, name of applicant, location, date paid, cash, charged. Applications which arrive during the day are received by the cashier. If applications are made by firms having charge accounts, bills are rendered at the end of the month. If the installation is not completed at the end of the month, a charge is made for the equipment reported, in accordance with a schedule of charges, and the contractor billed for the balance of the installation upon completion, if original report was not correct. If overpaid a rebate is made to the applicant. The inspectors' reports on these applications, upon completion, are referred to the cashier by the Electrical Depart-

Form 13p. 15m-7-12-

Certificate No. ..... Application No. ..... File No. .....

Philadelphia, ... 191....

Philadelphia Fire Underwriters' Association,

CHAS. A. HEXAMER, Secretary,
131-141 South Fourth Street, 8th floor,
(Electrical Department)

We desire inspection of electrical equipment on premises:

Located .....

Located as rated .....

.....

Occupied by .....

Floor .....

For ..... arc lamps ..... incandescent lamps ..... c. p.

For ..... Nernst lamps ..... Glower.

For ..... Tungsten ..... Wattage ..... High Efficiency ..... c. p.

For ..... signs ..... (Give number of lamps in each sign, also low voltage Transformer location) .....

..... motors and generators ..... h. p.

Miscellaneous (see other side.)

.....

.....

.....

MAKE OF WIRE .....

If changes, give full detail report—see other side.

UNDERSCORE CHARACTER OF WORK.

Concealed Knob and Tube. Conduit. Moulding. Open Work.
Original Installation. Extension. Repairs.

Location of Cut-outs ..... Size of Feeders ..... Mains ..... Branches

Current to be from .....

Work to be started ..... to be finished .....

Referred to Inspector ..... Date .....

FIXTURE WORK.
(ATTACHING OF FIXTURES ONLY.)

Combination ..... Straight Electric ..... Name of Insulating Joint .....

..... *Contractor*

(*Address*) .....

[OVER]

NOTICE. APPLICANTS MUST FILL IN IN FULL ALL ITEMS WHICH REFER TO WORK DONE, BOTH WIRING AND FIXTURE. APPLICATIONS WHICH ARE INCOMPLETE WILL BE RETURNED TO APPLICANTS.

Fig. 1.—Application for Inspection.

Amount of fee paid .....

Amount of fee charged .....

Philadelphia Fire Underwriters' Association
ELECTRICAL DEPARTMENT
Inspectors' Notice and Report File No. .....

Received ..... 191.... Application No. .....

Referred to Inspector ..... Date ..... 191....

Located .....

Location as rated .....

.....

Occupied by ..... Floors .....

For ..... arc lamps ..... incandescent lamps ..... C.P.

For ..... Nernst ..... Glower ..... High Efficiency ..... C.P.

..... motors-generators ..... H.P. ..... Tungsten lamps ..... Watts.

For ..... Signs ..... (Give number of lamps in each sign, also low voltage transformer location.) ..... Tungsten lamps ..... Watts.

Alterations and repairs .....

Miscellaneous .....

.....

Fixtures—Combinations, straight electric Receptacles ..... Capacity .....

CHARACTER OF WORK (UNDERSCORE)

Concealed. Knob and tube. Conduit. Moulding. Open work. Original installation. Extension.

Make of wire .....

Temporary work. Yes. No. Previously approved record void. Yes. No.

Location of cutouts ..... Size of Mains ..... Branches .....

Current to be from ..... Work to be started ..... to be finished .....

Contractor ..... Address .....

Re-allotted .....

Temporary certificate issued, covering .....

.....

.....

.....

Permanent Certificate No. ..... Disposition made of Temporary Certificate ..... Expiring .....

(If Temporary) Date of expiration .....

Temporary Rough Wiring Fixture } Certificate No. ..... Date issued .....

Inspector.

Fig. 2.—Form of Inspector's Report.

Digitized by Google

ment. After the cashier has completed his record of the applications, they are immediately sent to the Electrical Department.

The inspectors who report at the office in the afternoon telephone the office in the morning and are advised of the applications that have been allotted to them. By this means the greatest number of installations are inspected on the same day the application is received. This allotment is preliminary to the formal allotment, as represented by the inspectors' notice (Fig. 2).

Applications are then taken care of by the record clerk, who places his stamp thereon. The applications are then referred to the rating cabinet and the maps with a view of verifying and correcting the location as stated in the application. As each risk, on which there is a record of electrical equipment, is assigned a different file number and correspondingly numbered folder, in which all the records on that risk are filed, the importance of securing the correct and complete location of the risk is so evident, that no effort is spared in looking up the location, before the file number is assigned. In this way the possibility of having two different file numbers and folders on any one risk, is reduced to a minimum. After the record clerk is satisfied that the location is complete, by means of this investigation, he refers the application to the Certificate Record Cabinet, in order to ascertain if there is a record of an electrical equipment previously installed in the risk, and, if such be the case, to note the file number on the application.

This article describes the methods and record forms used in electrical inspection by the Philadelphia Fire Underwriters' Association, of whose Electrical Department the author is director. He is also vice-president of the National Association of Electrical Inspectors. A number of the forms used are reproduced.

The Certificate Record Cabinet is a cabinet containing a card record of every electrical certificate which has been issued by the Department, and of equipments in course of installation. The record cards are filed according to location, with reference to street and number of the risk. The method or order of filing the cards is: (1) Corner locations, these being arranged alphabetically; for instance, the card for Broad and Arch Streets would precede the card for Broad and Diamond Streets. (2) The odd street numbers. (3) The even numbers, these being separated from the odd numbers by a guide card marked "Even Numbers." If a building has several locations, cross-reference cards are filed under each location, referring to the principal location. For instance, the record for the risk located at 700 Market Street, 2-6, South Seventh Street, Southwest corner Seventh and Market Streets, would be found under 700 Market Street. A cross reference is filed under the location 2-6 South Seventh Street, giving the file number and stating "See 700 Market St." In the same way a cross-reference card is filed under the corner location, under South Seventh Street, giving the file number and stating "See 700 Market St." With this method it is possible to locate the record on a risk no matter under which one of its several locations the inquiry or application is received. With further reference to corner locations, it may be well to state that in order to save time, a definite rule is observed as to which one of the two streets the card is filed under. For instance, the card for Broad and Diamond Streets is filed under Broad Street as the letter "B" precedes the letter "D" in the alphabet. In the same way, if one of the two streets is a numeral street, such as Seventh and Market Streets, the card is filed under Seventh Street, being the numeral street, which is given the preference in filing. Special stress is laid upon the method of filing cards, to show every precaution that is taken to guard against the possibility of failing to find the previous record when looking up an application, and in this way assigning another certificate and file number to a risk and thereby separating the record. The above method also facilitates answering queries regarding any risk, as the complete record on that risk is located with dispatch and certainty.

If, on referring to the Certificate Card Cabinet, the record clerk does not find a previous record, he assigns a new file number to the risk, making up a card which contains the location and file number. A supply of these cards is numbered consecutively by means of an automatic stamp, thereby making it impossible to duplicate the file numbers. The clerk then files the card in the Certificate Record Cabinet, and in this way verifies the accuracy of the investigation.

If there is a record in the Certificate Record Cabinet on the risk for which inspection is desired, the file number found on the card is noted on the application. The contents of the folder are then examined, and any reports which have not been closed out are attached to the application. The inspectors' notices are then made out. Postal cards (Fig. 3), one addressed to the applicant and one to the public service corporation, are filled out. These postal cards are spaced off in such a manner that there is small liability in confusing numerals or alphabetical indications. Postal cards give date, file number, date of request of inspection, date of inspection, location of consumer, class of equipment and wireman's name. If the installation is for light only the inspector marks off the word "power" on the postal card, and *vice versa*. If both light and power are used, the postal card is not disturbed in that respect. The object in this feature is that an inspector sent by the public service corporation will know just what to fuse for, as there may be instances in which an application is made for both light and power, and only one of the equipments approved, the other being defective. The name of the wireman is also given as a matter of record for the public service corporation. The numerals used are arranged in a small pamphlet known as the "Electrical Key" (to be explained later). These numerals call the attention to certain defects and requirements which experience has shown to be largely misunderstandings or violations of the Code. Further-

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION
131-141 SOUTH FOURTH STREET
EIGHTH FLOOR
ELECTRICAL DEPARTMENT

PHILADELPHIA.....

In reply refer to File No......

In accordance with request of.....inspection was made of the electrical equipment installed by you in premises located .....(Date).....191

See KEY

Location of assured.....floor.

Installation Lt. and Pr.....

Wireman's name .....

Yours truly,

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION.

Form 368. 10M. 11-12-R

Fig. 3.—Postal Card for Immediate Report.

Digitized by Google

more, by use of the postal card and the Key, the inspector can in a moment place the numerals on the postal card, dropping same in the first post box which he comes to, thus quickly advising the installer or contractor of the result of an inspection, as for instance, if key "L" is placed on a postal card it would indicate certificate issued for introduction of current. If key "W" was placed on the postal card it would indicate certificate issued for lighting equipment only, power equipment defective. If key "X" is used, it would indicate power equipment O. K., lighting equipment defective. By this means quite often a contractor is advised of the result of an inspection on the day on which the application is filed. This affords him a ready opportunity to make corrections the same day and advise the Inspection Department to that effect in the first mail of the following morning. The inspector is notified immediately and revisits the risk to ascertain if corrections have been properly made. If so, certificate (Fig. 4) is issued. If otherwise, the contractor is again advised of existing conditions. To carry out this feature of the work, every electrical contractor and all their employees are furnished gratis with a copy of the Electrical Key, and to further promote the efficiency of the Department, inspectors and contractors are requested to make suggestions to be added to the Key, which in their judgment would be helpful to them in their work. The postal cards are attached to the inspector's notice and placed in the inspector's individual compartment in a cabinet provided for that purpose, each inspector having a separate compartment indicated by a name plate, provided for outgoing work. The postal cards are mailed by the inspector, after filling the space "Key ——" immediately after making the inspection. By this means the contractor and public service corporation are advised immediately of the result of an inspection.

After the Inspector's Notice is made up, the Suspense Card is made up. This card, which is practically a condensed copy of the application and inspector's notice, is filed in the Inspector's Allotment File, under the date on which the inspector received the notice. Each inspector has a separate allotment file, which consists of date cards. This file enables the office to check up the inspector's work, one day being allowed in which to make an inspection, and prevents the inspector from overlooking an order for inspection. The file is gone over daily and note is made of any cards remaining in the file for one preceding day, and the inspector is requested to make an immediate report on the overdue allotments, giving a reason for the delay. If the occasion for the delay is due to an unusual amount of work in an inspector's district, the matter is immediately called to the attention of the chief of the department. One or two inspectors who are known as floating men are immediately assigned a portion of the work in the overcrowded district, in order that the work may be immediately cleared up. The inspectors, after making up their reports (Figs. 2 and 5) place them in their individual compartments in the cabinet provided for Incoming Work, from which they are taken by a clerk, who counts them and checks the number of reports with the Daily Report (Fig. 6).

The clerk then removes the Suspense Cards for these reports from the Suspense File (which is a cabinet containing all cards filed on work in course of installation), the cards being found in the Allotment File or in the Progressing File (explained later). There should be a card for each report.

The character of the reports will permit of the following classifications:

(1) Finished work.

(2) Rough wiring O. K. and other reports on which no letters need be written and which do not require following up, due to the fact that the contractor has been advised by the postal card system previously referred to.

(3) Reports on work in progress.

(4) Reports on defective work and other reports which require letters and following up.

We will describe the treatment given each class, in its order.

The Suspense Cards for the reports on finished work for which certificates are to be issued, are removed from the suspense file, stamped Electrical Certificate Issued (date), and filed in a date file under the date on which the certificates were issued. This constitutes the Receipt Follow-up File, which will be described more fully later. The reports are referred to the Certificate Record Cabinet, for the purpose of ascertaining if there is a previous record on the risk. If such be the case, and the installation is consequently an extension of an existing equipment, the certificate number found on the card in the cabinet is noted on the report, and notation of the certificate about to be issued is made on the card. This notation consists of the date, equipment, floor and application number. If the installation is original, or if it is a risk not previously having had approved electrical equipment, a new certificate number is placed on the card. Notice is also made of the approved equipment, date of issuing of certificate, floor and application number. After all the reports on finished work are referred to the Certificate Record Cabinet, certificates are made out. The numbers for new certificates are arranged consecutively and placed in a book provided for that purpose, thus preventing the duplicating of numbers. When a certificate number is once assigned

Form 143-12500-1-14-8

Application No. .....

File No. .....

Date *191*

Location .....

.....

.....

.....

.....

.....

TEMPORARY APPROVAL. Application No. ..... File No. .....

PHILADELPHIA, ... 191

The Philadelphia Fire Underwriters' Association,

Both Phones. 131-141 SOUTH FOURTH STREET. (Eighth Floor.)

Certifies, That the Electric Equipment in premises

Located .....

For .....

On .....

as far as completed is installed in accordance with the Rules and Requirements, and is approved, and the use of electric current is permitted. This approval is good until .....

CHAS. A. HEXAMER,
Secretary.

.....
Inspector.

☞ **PRESENT THIS CERTIFICATE TO THE LIGHTING COMPANY FURNISHING CURRENT**

Fig. 4.—Temporary Certificate of Approval.

Digitized by Google

Form 330. 10M-10-1914

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION

ELECTRICAL INSPECTORS' REPORT ON WORK IN PROGRESS

*File No.*_____

*Date of Inspection*_____ 19__ *Date Received*_____ 19__

*Location*_____

*Occupied by*_____

(Underscore Character of Work)

Concealed. Knob and Tube. Conduit. Moulding. Open Work.

Installation in what stage, or if not as reported, what additions, if any, conditions or defects.

Rough concealed wiring O. K., not lathed.	Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
Progressing in accordance with National Elec. Code.	Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
No change.	Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
Finished as applied for, or	Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
Building Locked. Time _____	
Work not started	

Remarks: _____

Inspector.

Fig. 5.—Report on Work In Progress.

to a risk, all subsequent certificates bear the same number, hence the importance of keeping the numbers consecutive. The certificates are then typewritten. Two carbon copies of the certificates are made. The brown copy is so worded as to constitute a notice to the public service corporation supplying the electric current that the certificate has been issued. This notice is sent to the public service corporation on the same day the certificate is issued. The white carbon copy is so worded as to constitute a receipt, and is sent to the electrical contractor with the certificate, to be signed and returned to the Inspection Bureau.

After the certificates are made out, to avoid the liability of an error, they are checked with the reports by two clerks, one clerk reading the report and the other noting the correctness thereof on the certificate. If the report and certificates compare, the clerk handling the certificate places his initial thereon. The object, of course, in placing initials on certificates is to fix the responsibility in the event of an incorrect certificate leaving the office. If an error is found on a certificate, a new one is made out, erasures and corrections not being permitted on certificates. The certificates are then passed to the chief of the Department for signature. In his absence the signing of certificates becomes the duty of the chief clerk of the Department, who signs the chief's name, per his own. The certificates are then mailed, usually to the applicant for inspection, together with the receipt.

Reports on installations which are temporary and for which temporary certificates are to be issued, are so noted by the inspector. The temporary certificates are then typewritten, one carbon copy being made. This copy is a notice to the public service corporation that the temporary certificate has been issued and is mailed to it. The temporary suspense card for the report on which the certificate is issued, is noted as to date of expiration of the certificate, and is filed in a date follow-up file under the date on which the temporary certificate expires. This file is known as the Temporary Certificate Follow-up File. The card in the Certificate Record Cabinet is noted as to date, expiration, equipment, floor and application number. The certificate numbers for temporary certificates are consecutive, irrespective of any other certificate number applying on the risk. The temporary certificates are checked with the reports by two clerks, one clerk reading the report and the other noting the correctness thereof on the certificate. If the report and certificate compare, the clerk handling the certificate places his initial thereon. The object, of course, in placing the initials on certificates is to fix the responsibility in the event of an incorrect certificate leaving the office. The certificates are then passed to the chief of the Department for signature. In his absence the signing of certificates becomes the duty of the chief clerk of the Department.

Philadelphia Fire Underwriters' Association.

ELECTRICAL DEPARTMENT.

INSPECTOR'S DAILY REPORT.

Inspectors will report daily the orders in their possession two days, also the number of visits made and reports completed each day.

File	Location	Date Allotted	Cause of Delay

NEW WORK		SPECIALS		RE-INSPECTIONS		USELESS VISITS			
Reports Written	Risks Visited	Reports Written	Risks Visited	Reports Written	Risks Visited	Building Locked	Work Not Completed	Refused Inspection	Other Causes
									State on opposite side of blank "OVER"

Date, ... 191 ..... *Inspector.*

OVER

Fig. 6.—Inspector's Daily Report.

Rough Wiring O. K.

The reports on installations of this character are entered on the Suspense Cards. As these reports do not require following up of any kind, the Suspense Cards are filed in the Certificate Record Cabinet, directly in front of the record card on that risk. If these cards are required in the future for following-up as, for instance, on receipt of the application for inspection of fixtures, the card is removed at the time the application is looked up in the Certificate Record Cabinet, and attached to the application, and subsequently attached to the new Suspense Card made out for the fixture application. Or, if final inspection of the rough wiring or other condition is requested, the card is removed from the Certificate Record Cabinet, and again becomes active in the file for work in course of installation. The reports on conditions of this class are then submitted to the chief clerk, who selects those reports on which Rough Wiring Certificates and Fixture Certificates are to be issued. *(To be continued.)*

Digitized by Google

New Electrical and Mechanical Appliances

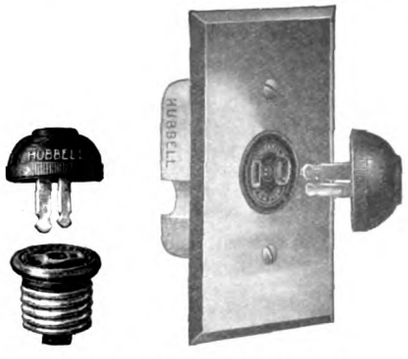
Polarized Attachment Plug and Receptacle.

In many cases buildings are equipped with both alternating-current and direct-current circuits, the latter being required for some special purposes for which direct-current apparatus is particularly suitable. In such cases a distinctive means of determining between the two types of outlets has been found very desirable.

This function can now be very satisfactorily performed by means of a new line of polarized attachment plugs and receptacles, both of the surface and flush types. In the accompanying illustrations are shown a small separable polarized plug and a polarized flush receptacle; these two devices are characteristic of this new line of equipment, which is manufactured by Harvey Hubbell, Incorporated, Bridgeport, Conn.

The polarized feature is obtained by making one of the knife-blade contacts smaller than the other, both in length and width; one slot in the base is likewise proportionately reduced. As the opposite blade is of the standard size it cannot be inserted into the small slot, thus making it imperative to insert the cap in the base in only one way, which is the right way. By this means correct polarity is absolutely assured at all times. This variation in the length of the contacts is also found of assistance in making rapid connection, as by rotating the cap the longer blade is led into the proper slot by means of the bevel edge and at the same time the opposite blade is automatically engaged.

The cap for this new type of polarized plug can be interchanged not only with the complete line of polarized receptacles but also with the entire line of T-slot wall and flush receptacles made by the Hubbell firm. The concealed-contact feature which distinguishes all Hubbell plugs is retained in this new line of polarized devices, thus commending it to those who desire electrical safety.



Polarized Plug and Receptacle.

Patented Three-Volt Dry Battery.

In place of the usual six-inch 1.5-volt dry cell used in the hand lamps now on the market, the Interstate Electric Novelty Company, 29 Park Place, New York City, has been granted letters patent on a three-volt battery of the same size and shape which gives twice the light and is claimed to last four times longer than the ordinary dry cell. With this battery the average hand lamp and bicycle lamp gives an exceptionally bright light which has so far not been equaled. The new battery is called the "Radio Nitrogen Battery" and has proven very popular. Numerous infringements and inferior imitations have already appeared on the market. The company states that injunctions will be sought against all imitations.

The accompanying illustration shows the new battery. Its interior arrangement was shown on the patent pages of our December 4 issue.

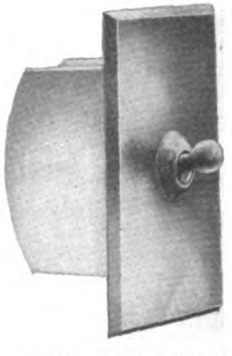
Three-Volt Dry Cell.

Portable Tuner for Wireless Devised by Boston Experimenters.

What promises to be an important advance in the development of wireless apparatus has been achieved by Henry C. Gawler, Boston, and Herbert M. Hammett, Roxbury, Mass., who have gained some very interesting and satisfactory results by the use of an exceptionally compact tuner. By the employment of this device, which is portable and can be contained in a box about 12 by 16 by 18 inches, and by the use of a comparatively small antenna, which may be only about 225 feet long and not over 50 feet high, and consists of two wires, these operators have been able to receive from radio stations at Nauen and Eilvese, Germany, either by day or by night.

The Newton Toggle Switch.

A new type of wall switch with an attractively artistic face plate has been put on the market by the Newton Manufacturing Company, Lynbrook, N. Y. This switch is known as the Newton toggle switch. It is operated by a simple, but reliable, toggle mechanism, of which the projecting operating lever needs merely to be tilted up and down. This method of operating has been found very popular in England, but heretofore no practical attempt has been made to introduce it here.



Newton Toggle Switch.

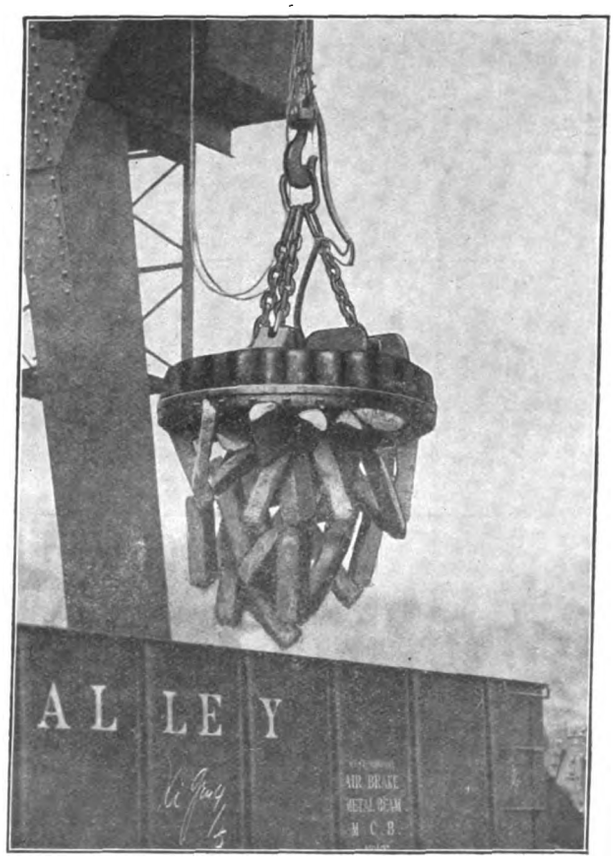
A distinctive feature of this switch is that its face plate is free from fastening screws. It is also small and neatly finished, the projecting lever corresponding with the face of the plate. The standard plate is rectangular in shape, as shown; circular and elliptical plates can also be used.

This type of switch is made single and double pole, also as a three-way or four-way switch. It is suitable for all classes of service, but because of its handsome appearance it is peculiarly appropriate for residences, apartments, and other buildings where every feature of the interior finish has been carefully thought out by the architect or owner.

Digitized by Google

Big Increase in Lifting Capacities of Cutler-Hammer Lifting Magnets.

Since the feat of salvaging the boat load of barbed wire and nails from the muddy bed of the Mississippi River accomplished by Cutler-Hammer magnets in 1907, no important change has occurred in lifting-magnet design. The Cutler-Hammer Clutch Company, Milwaukee, Wis., is now, however, announcing a new series of magnets of the same rugged and water-tight construction but having lifting capacities ranging from 20 to 60 per cent greater than before. The lifting capacity, for instance, of the 62-inch magnet as given up to the present was about



Cutler-Hammer Lifting Magnet of New Design.

2,600 to 3,000 pounds, but now this is increased to 4,000 and over. This increase in the lifting capacity allows the handling of more material in the same tim or the same amount in shorter time. It also reduces the number of magnets, cranes and crane operators needed, since in many cases two of the new magnets can do the work formerly done by three. The fewer trips a magnet must make, the fewer times its dead weight must be lowered, raised and conveyed, the more efficiently and quickly the material can be handled. Because of the labor shortage and the demand for speed at the present time the increased capacities are of particular importance.

The Cutler-Hammer Clutch Company has had this type of magnet in use and on test for nearly three years before standardizing. It is now claimed that the lifting capacities of Cutler-Hammer magnets are greater in proportion to magnet weights than for any magnet ever made.

Leeson-Universal Electrical Coil-Winding Machine.

In the design of electric coils, whether for electromagnets, transformers, fields, or other purposes, it is desirable to obtain sufficient mechanical strength in the body of the windings themselves so that these form a self-sustaining unit independent of any core, spool, bobbin or other framework on which they may be wound. If such strength is obtained, the coil has a very much greater factor of safety against rupture from the violent mechanical stresses due to short-circuits or excessive currents; it is also better able to withstand handling in assembling or repairing the apparatus in which the coil is used.

By means of a system of cross winding in which the successive layers cross at an angle, considerable inherent mechanical strength is obtained. Many coils, however, are not adapted to such a winding and require that all turns be substantially parallel. To meet the need for greater strength of such coils there has been perfected a special system of winding known as the Leeson-Universal winding system. This is accomplished entirely automatically by means of the compact machine shown in Fig. 1. This machine has a number of adjustments by means of which the coil dimensions can be readily varied, as well as the nature of the intermediate layers of cotton yarn which serve to cross bind the turns of each successive layer of wire.

In this system each layer of wire is put on with its turns closely side by side as on a spool of thread. On top of each layer of wire there is wound a layer of cross windings of cotton. The arrangement of these layers depends upon the use for which the coil is being wound. In many cases it is grouped as shown in Fig. 2, where the cotton cross windings are wider and wider as the right end of the coil is reached; on top of the next layer of wire is applied another similar cross winding of cotton, but in this case the groups of cotton turns are wider at the left end than at the right end. This alternation is repeated between the successive wire layers until the coil is complete. On the outside of the coil a layer of protecting cotton may be uniformly cross wound, as shown in Fig. 3, or left in the manner shown in Fig. 4 on next page.

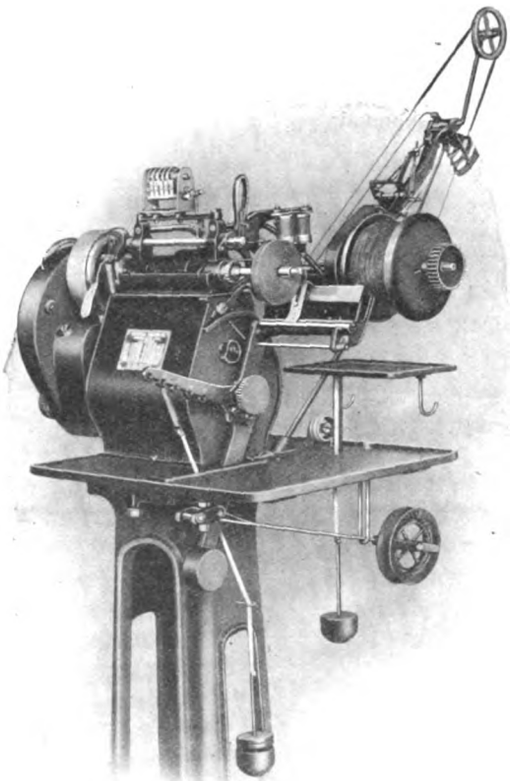


Fig. 1.—Leeson-Universal Coil-Winding Machine.

Fig. 2.—Coil Wound on Leeson-Universal System.

Digitized by Google

An important feature of this winding machine is that it winds on the cotton layers simultaneously with the wire layers, the mechanism being ingeniously contrived to avoid interference. The extreme edges of the cotton layers are wound a little beyond the edges of the wire layers, thus affording a cushion protection to the ends of the coil.

Coils wound by the process have electrical advantages as well as additional mechanical strength. The arrangement of the cotton layers, although these are of very fine yarn, makes an extra amount of insulation at the ends of the coils, which is graded toward the middle, thus providing most insulation where the potential stresses between adjacent layers are greatest. The cotton layers also provide crevices between the wire layers which promote the thorough impregnation of the coil, if insulating compounds are to be applied. The coil is also made elastic against sudden stresses. These coils may be wound in cylindrical, ring or rectangular form.

Fig. 3.—Leeson-Universal Field Coil.

Fig. 4.—Leeson-Universal Meter Coil.

The machine shown in Fig. 1 is capable of winding coils not exceeding 3.25 inches long and 5 inches in diameter, using wire not larger than No. 20 B. & S. gauge. These machines are made by the Universal Winding Company, 95 South Street, Boston, Mass.

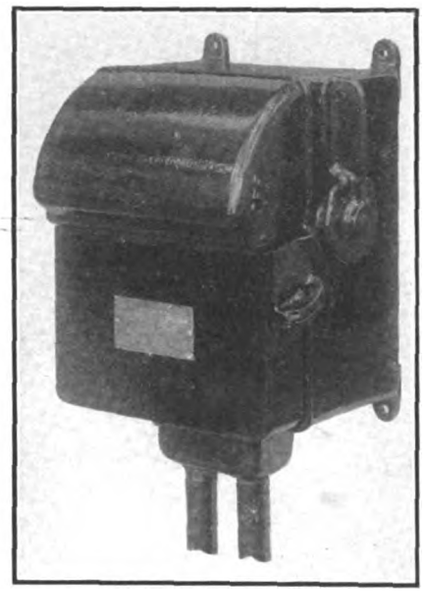
Haynes Stellite Company to Install Snyder Furnace.

The Haynes Stellite Company of Kokomo, Ind., has placed a contract with the Snyder Electric Furnace Company, Chicago, for a 1.5-ton per 24-hour electric melting furnace. The furnace has an eighth ton holding capacity, 50 kilowatts input and will produce 12 heats per 24 hours. The Haynes Stellite Company is the manufacturer of the cutting alloy Stellite which has been making a number of remarkable records during the past two or three years.

New Self-Starter for Small Direct-Current Motors.

A new self-starter for small direct-current motors in sizes one-half to three horsepower, 115 and 230 volts, has been designed for constant-speed, machine-tool or similar service where frequent starting is required. The starter consists of a line switch, line contactor, accelerating contactor and resistance. These units automatically regulate the speed of acceleration and open the circuit in case the voltage fails. Fuses protect the motor against overload.

The switch is totally inclosed in a cast-iron case and is arranged with certain safety features which protect the operator from injury. The cover over the switch parts can be opened only when the line switch is open. The line switch, operated by a lever outside of the case, can be closed only when the cover is shut. In addition, the cover can be locked shut or the switch can be locked open.



Self-Starter for Small Motors.

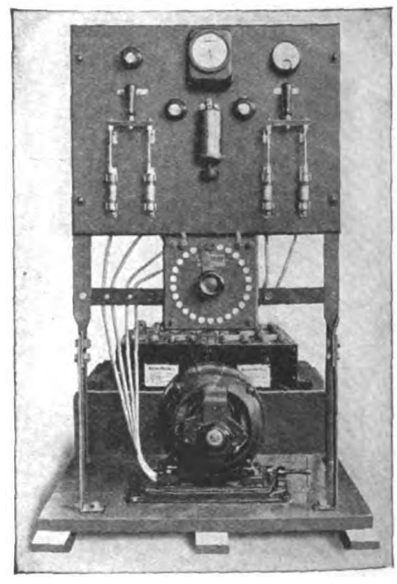
The new starter can be operated by push-buttons located at convenient points or by the line-switch handle on the right-hand side of the starter. It is manufactured by the General Electric Company, Schenectady, N. Y.

Rural Lighting and Power Plant.

Electricity need no longer be classed as a luxury obtainable only by those living in thickly settled communities reached by central-station circuits. The little generating plant illustrated herewith makes it possible for anyone on a farm or country place to enjoy the conveniences of electricity for lighting, heating and power purposes, no matter how far removed from power lines he may live. They are useful in country homes, on farms, and in small manufacturing establishments in rural districts where they furnish power for lights, for operating fans, vacuum cleaners, sewing machines, washers, heating appliances and motors driving pumps and small farm machinery.

The plant illustrated consists of a Westinghouse low-voltage generator and control panel and a Hyray-Exide storage battery, all of which are mounted on skids, rendering the outfit portable. The generator may be driven by any ordinary oil, gas, or gasoline engine or, if water power is available, it can be used and the electricity will cost practically nothing.

The operation is simple. The generator is driven by an engine and the current is either expended directly or else accumulated in the storage battery for use at some future time. An automatic switch on the control panel maintains a steady voltage on the battery when charging, and an ampere-hour meter shows at all times the exact amount of reserve energy in the storage battery and indicates when to start and stop the charge.



Rural Electric Plant.

The outfits are sold complete without the engine by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. They are made in various sizes to suit different conditions. The battery is fully charged when shipped and is ready for immediate use.

New Fire Alarm Station for San Francisco.

A new central fire-alarm station has recently been put in service at San Francisco, Cal. It is located in the center of Jefferson Square, a public park, so as to be free from the danger of any possible general conflagration, such as that which visited the city in 1906. The cost of the structure and equipment was $85,000.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

BUFFALO, N. Y.—Plans are being made by the Buffalo General Electric Company for the erection of a $1,500,000 plant for the generation of electricity by steam.

PAULSBORO, N. J.—Harrison & Brothers, of Philadelphia, will erect a large brick and concrete manufacturing plant here. The owners will take bids at their headquarters, Thirty-fifth Street and Gray's Ferry Avenue, Philadelphia, Pa.

PHILADELPHIA, PA.—Clarence H. Geist, of Philadelphia, president of the Northern Indiana Gas and Electric Company, has purchased the holdings of the Indiana Lighting Company, which supplies power, light, gas and water to twenty Indiana and Ohio cities. The company is capitalized at $4,500,000. G.

PHILADELPHIA, PA.—A three-story brick and stone addition will be made to the courthouse at Twenty-first and Race Streets by the City of Philadelphia. The electrical equipment will be complete. J. T. Windrim, Philadelphia, is the architect.

PHILADELPHIA, PA.—The S. B. & B. W. Fleisher Company will shortly erect a $1,000,000 five-story brick and concrete factory building at Twenty-sixth and Reed Streets here. William Steel & Son Company are the architects.

MASON, W. VA.—The Ohio River Salt Company will install an electric ligh plant on its property.

NORTH CENTRAL STATES.

LOWELLVILLE, O.—The Stone & Webster Engineering Corporation has recently started work on an extension to the Lowellville power station at Youngstown, O., for the Republic Railway and Light Company. The following summary briefly describes the new work: Turbine and boiler rooms, four bays, brick and structural steel with reinforced concrete floors and roofs; five 600-horsepower Babcock & Wilcox water-tube boilers with superheaters and stokers, one forced draft fan and engine; one 15,000-kilowatt, 2,300-volt, General Electric turbo-generator; one 200-kilowatt combination motor and turbine-driven exciter set; three 3,125-kilovolt-ampere General Electric step-up transformers; one 1,000-gallon capacity feed pump, condensing equipment, separate screen well and intake tunnel; coal bunker for full length of the boiler room, ash hoppers, coal gates, chutes, tracks, etc. The original station of 15,000 kilowatts capacity was designed and built by the Stone & Webster Engineering Corporation in the summer of 1912.

DETROIT, MICH.—The State Railroad Commission has approved an issue of $3,500,000 short-term, five per cent trust notes by the Detroit United Railways. Of this about $500,000 will be used for street-railway extensions and betterments; the remainder will be used to retire securities about to mature.

BYRON, ILL.—The Byron Electric Light and Power Company has incorporated. The company's capital stock is $15,000, and it is to furnish electric current for public service. William H. Vanston, Thomas M. Hench, Willa H. Dillon, George W. Sherman, A. Roy Mize, Lester D. Beitel and James C. Woodburn are the incorporators. Z.

MACOMB, ILL.—Plans for the establishment of a municipal electric light plant are being discussed by the city council. Mayor S. B. Dawson is leading the movement. Z.

MONTICELLO, WIS.—Bonds have been issued for $12,000 for municipal electric light plant. Address Dr. Edward Blumer, mayor.

GUTTENBERG, IOWA.—The citizens have voted to establish a municipal light system. Address city clerk.

CIRCLEVILLE, KANS.—Bonds have been voted for the erection of an electric light plant. Address city clerk.

HAVEN, KANS.—The council plans to improve street lighting in Haven. Address town clerk.

CORTLAND, NEB.—A. J. Goodban will install an electric light plant.

DIXON, NEB.—Bonds have been voted for an electric light plant. Address town clerk.

ABERDEEN, S. D.—The installation of additional machinery is necessary before the electric company can furnish more lights. Address town clerk.

SOUTH CENTRAL STATES.

CYNTHIANA, KY.—The Kentucky Utilities Company, Lexington, Ky., will install additional generating equipment in the local plant to provide 24-hour service. G.

MT. OLIVET, KY.—The Mt. Olivet Light and Power Company is buying equipment for an electric light plant to develop 40 horsepower. The machinery needed includes an oil engine, alternator and supplies. G.

KNOXVILLE, TENN.—The city of Knoxville, Tenn., will receive bids until December 31, for furnishing the city not less than 600 arc lights, and lighting city buildings. Address Robert P. Williams, recorder and secretary.

NASHVILLE, TENN.—The Nashville, Chattanooga & St. Louis Railway will purchase electrical power equipment for the operation of coal-handling machinery at Cowan, Tenn.

HEAVENER, OKLA.—The city of Heavener will not build a new municipal plant as authorized recently when voters approved an issue of $20,000 bonds. Instead, the city will proceed to purchase the Heavener Light and Power Company's plant. A purchase price of $9,325 has been agreed upon. The city will spend $6,000 for improvements.

DALLAS, TEX.—Active construction work has been started on the new eight-story Interurbanu Union Terminal Station for Dallas, which will be built on Jackson and Browder Streets. Contract for the excavation work has been let and the work will proceed as rapidly as possible. The station will be a terminal for the Northern Texas Traction Company, Texas Traction Company, and Southern Traction Company, interurban lines running from Dallas to Fort Worth, Denison, Corsicana and Waco. The Dallas Electric Light and Power Company, the Dallas Consolidated Street Railways Company, the Southern Traction and Texas Traction Companies and the Texas Power and Light Company will occupy offices in the new building when completed. This station will be one of the most up-to-date in point of construction of any in the entire country. The work is being done by the Stone & Webster Engineering and Construction Company.

DALLAS, TEX.—A plan is under way to change the entire street lighting system in Dallas in accord with recommendations being made by City Electrician Leon Taylor. It is proposed to increase the number of units installed and decrease the size and distance apart.

SAN ANGELO, TEX.—The Interstate Electric Company, which owns the local electric light and power plant, is considering the construction of a street railway system here. J. D. Sugg, owner of the existing system of street railway, recently offered to give the property to the city as a free gift, but the tender was refused. He claims that it is unprofitable to operate it. It is stated that it will probably be either taken over by the Interstate Electric Company and the lines extended, or the latter company will build an entirely new system. D.

WESTERN STATES.

HARDIN, MONT.—The Big Horn Irrigation and Power Company, according to J. J. Harris, of Hardin, president of the company, will construct and operate a large power and irrigation project on the Big Horn River, and will make the following improvements; 415-by-1,000-foot dam, 400 feet thick at base and 30 feet at top; power plant of 170,000 horsepower capacity; railroad from Custer, Mont., to Billings, to cost $800,000; ditches, laterals, etc.; total cost is estimated at $12,000,000. O.

SCOBEY, MONT.—It is stated that the Scobey Electric Light Company is planning to enlarge its plant at this place.

LIBERTY, COLO.—The city council has under consideration the installation of a municipal electric light plant. Address the city clerk. U.

LIMON, COL.—Application has been

Digitized by Google

made to the City Council by W. J. Cowhick, Pueblo, for a franchise to install and operate an electric-light plant in Limon.

FLORENCE, ARIZ.—An electric power transmission line will be built from the Salt River Government plant to Florence and the surrounding district. D.

WALNUT GROVE, ARIZ.—Mrs. Eleanor Whitman, of Philadelphia, Pa., has had plans prepared for a reinforced concrete dam which she will build across the Hassayampa River near here, and the construction of a hydroelectric plant, at an estimated cost of one million dollars. The reservoir to be created by the proposed dam will afford a water supply for irrigating 17,600 acres of land. Fred Dennett, of Phoenix, Ariz., is Mrs. Whitman's representative in the project. D.

RENO, NEV.—The city council has plans under consideration for the installation of electroliers in the downtown district and the gradual extension of the system into the residential districts. The plans call for eight lights to the block.

WENDELL, IDAHO.—The installation of an ornamental electric lighting system is being considered by the council, and it is understood plans for the improvement are under preparation.

LANGLEY, WASH.—The proposition of issuing bonds to purchase and extend both the electric light and water systems in operation in this city will be placed before the voters by the town council. O.

OKANOGAN, WASH.—Plans have been completed for the extension of lighting and power lines along the Okanogan River by the Okanogan Valley Power Company, between Malotte and Okanogan, current to be supplied for lighting and irrigation purposes. It is understood the Okanogan Company has negotiated a deal with the Government for one of the power plants owned by the Government in his section, which is now idle. The plant which will be employed has 300 horsepower capacity. O.

OLYMPIA, WASH.—Hugh L. Cooper, promoting the construction of power plants on the Pend O'Reille River, near Metaline Falls, has been granted overflow rights on shore lands on both sides of the Pend O'Reille River for a distance of about seven miles, from McInnis Mills to one mile north of Blue Slide, by the State Board of Land Commissioners at Olympia. The company which is represented by Cooper has also made applications for overflow rights for a distance of 12 miles from Ione to a point one mile north of Blue Slide, and if this application is granted, the company will have overflow rights to shore lands on both sides of the river for a distance of 40 miles, or practically the entire length of Pend O'Reille County. O.

PORT ORCHARD, WASH.—The Bremerton-Charleston Light and Fuel Company has applied to the commissioners of Kitsap County for a franchise to construct and maintain poles and wires over the county roads.

PROSSER, WASH.—A special election to vote bonds for the construction of a municipal power plant is being considered by the city council. The council proposes the construction of a power plant a few miles east of town, on the Yakima River. The Pacific Power and Light Company, holder of a 25-year franchise, now supplies Prosser and contiguous territory. O.

SEATTLE, WASH.—The council of Seattle is considering the submission of a $3,000,000 bond issue to the voters on March 7 next, the funds to be used for the purchase of an additional power plant. The purchase of an additional power project, payment to be made in utility bonds, has been considered by the council for some time, but Superintendent of Lighting J. D. Ross prefers that an extension of the lighting system, or the construction of an additional power plant, come before the people and be officially authorized by them. O.

LA PINE, ORE.—According to reports, the Pringle Falls Water and Power Company of this city, maintaining offices in Portland, Ore., was recently sold to a syndicate of eastern capitalists, which is headed by Thomes Bros., of Nebraska. Reported consideration was $300,000. The company plans supplying power for the irrigation of the entire La Pine Basin, Eden Coulee, Silver Lake and Fort Rock Valleys. O.

RICKREALL, ORE.—The Oregon Power Company, of Dallas, A. L. Martin, manager, is considering the extension of the electric transmission lines to serve Rickreall and vicinity. It is understood work on the extension will be started shortly after the first of the year. O.

BERKELEY, CAL.—Steps have been taken here toward lighting the city under a district plan. The city council has approved specifications for lighting a district including everything south of Derby Street and east of College Avenue, and plans for the creation of another district to take in the region north of the University of California campus are being prepared.

CALEXICO, CAL.—The city has signed a contract with the Holton Power Company for the establishment of a street lighting system. Plans call for six 600-candlepower lights, fourteen 400-candlepower, and twelve 250-candlepower lamps.

GILROY, CAL.—The Coast Counties Gas and Electric Company has leased the local electric light plant and is to make improvements in the distributing system. A new electrolier system is to be installed on Monterey Street.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,483. TELEPHONE APPARATUS.—A new telephone company is being formed in South America, and it is suggested that manufacturers of telephone apparatus suitable for long-distance work might be interested. Correspondence should be in Spanish.

NO. 19,491. ELECTRIC ENGINES.—A company in India informs an American consular officer that it desires to be placed in communication with manufacturers of small engines capable of being driven by electricity. The engines to be of simple construction and capable of developing five horsepower.

NO. 19,492. ELECTRIC FIXTURES.—A report from an American consular officer in Russia states that inquiries have been received for names and addresses of manufacturers of electric fixtures and appliances of all kinds, such as buttons, switches, fuses, lamp holders, and electric meters. Catalogs, samples, and conditions of sale are requested. Prices should be quoted c. i. f. Russian ports in Russian equivalents.

NO. 19,501. FIRELESS COOKERS.—A manufacturer's agent informs an American consular officer that he desires catalogs and full information from manufacturers of fireless cookers. Correspondence may be in English.

NO. 19,506. ELECTRICAL SUPPLIES, ETC.—A report from an American consular officer in France states that a firm in his district would like to be placed in communication with manufacturers of optical goods, clocks, sewing machines, and electrical supplies, with a view to becoming their agent. Correspondence should be in French.

NO. 19,512. ELECTRICAL SUPPLIES.—An American consular officer reports that a firm in France desires to be placed in communication with manufacturers of electrical supplies, and lamp shades made of metal and porcelain. It is stated that purchases will be made on cash basis. Correspondence should be in French.

PROPOSALS.

WIRING SYSTEM AND LIGHTING FIXTURES.—Sealed proposals will be received December 22, for installing a new conduit and wiring system and lighting fixtures at the United States postoffice at Dover, Del., in accordance with drawings and specifications, copies of which may be had at office of the custodian, Dover, Del. Address James A. Wetmore, Acting Supervising Architect, Washington, D. C.

NEW PUBLICATIONS.

ADVANTAGES OF CENTRAL-STATION SERVICE.—The Edison Edectric Illuminating Company of Brooklyn has issued a handsomely-printed booklet entitled "Edison Power Pays." This contains fac-simile letters from many large manufacturers of Brooklyn, with illustrations of their plants, the letters giving evidence of satisfaction with the Edison company's service. Among the companies using more than 1,000 horsepower are the following: American Manufacturing Company, E. W. Bliss Company, Bush Terminal Company, Flinn-O'Rourke Company, Luna Park, Manhattan Bridge Three Cent Line, Morse Dry Dock & Repair Company, New York Dock Company, Robbins Dry Dock & Repair Company, Steeplechase Park, W. H. Sweeney Manufacturing Company, and the Tidewater Paper Mills.

NATIONAL ELECTRIC LIGHT ASSOCIATION PROCEEDINGS. — The Proceedings of the Thirty-Eighth Convention of the National Electric Light Association, which was held at San Francisco, Cal., June 7-11, 1915, have been published in four volumes. One volume is devoted to reports of the general sessions, executive sessions, celebration exercises and public policy session; this volume being embellished by a portrait of Holton H. Scott, twenty-eighth president of the association. Another volume contains papers, reports and discussions of the hydroelectric and transmission sessions and the technical sessions. The third volume contains papers, reports and discussions of the

Digitized by Google

commercial sessions, and one volume is devoted to the papers, reports and discussions of the accounting sessions. The volumes are published by the order of the Executive Committee and the entire proceedings embracing over two thousand pages of text and some one hundred and thirty pages of indexes, have been compiled and edited by the secretary, T. C. Martin, and his staff, to whom credit is due for a most praise-worthy achievement. The printing and binding are well handled, as usual, by the James Kempster Printing Company, New York.

FINANCIAL NOTES.

There has been admitted to the regular list of the New York Exchange $546,000 additional first-mortgage five-per-cent gold bonds of the New York Railways Company due 1937, making the total amount of said bonds listed at this date $4,271,000.

Consolidated Gas, Electric Light & Power Company of Baltimore has called for payment on January 7, 1916, at par and accrued interest all its $2,500,000 five-per-cent two-year notes due March 15, 1917. The right to convert these notes into common stock of the company at 115 will cease January 3, 1916.

Standard Gas & Electric Company has sold to H. M. Byllesby & Company $500,000 twenty-year six-per-cent notes, which are being offered on a 6.75 per cent basis. These notes are part of an authorized $15,000,000, of which $2,000,000 have been previously sold, the $500,000 now being offered making $2,500,000 outstanding. The sale of this amount of notes will retire substantially all the short-time obligations of Standard Gas & Electric, including the $1,778,300 serial six-per-cent notes due June 1, 1916.

Dividends.

	Term	Rate	Payable
Am. Cities, pf.	S	1.5 %	Jan. 1
Am. Pub. Util., pf.	Q	1.5 %	Jan. 1
Bell Tel., Canada	Q	2 %	Jan. 15
Brazil Trac., Lt. & Pw., pf.	Q	1.5 %	Jan. 1
Capital Trac.	Q	1.25%	Jan. 1
Cen. Sts. Elec., pf.	Q	1.75%	Dec. 31
Consumers Pw., Mich.	Q	1.5 %	Jan. 1
Duluth-Sup. Trac., pf.	Q	1 %	Jan. 3
East Pw. & Lt., pf.	Q	1.5 %	Dec. 15
El Paso Elec., pf.	Q	$3.00	Jan. 10
Manila Elec. R. R. & Ltg. corp.	Q	1.5 %	Dec. 31
Mohawk Valley	Q	1.5 %	Jan. 3
Narragansett Elec. Ltg.	Q	$1.00	Jan. 3
Narragansett Elec. Ltg.	—	66⅔c	Jan. 3
New Orleans Ry. & Lt.	—	0.5 %	Jan. 1
New Orleans Ry. & Lt., pf.	Q	1.25%	Jan. 1
New York State Rys.	Q	1 %	Jan. 3
New York State Rys., pf.	Q	1.25%	Jan. 3
Ohio Trac. & Lt., pf.	Q	1.5 %	Jan. 1
Penn. Water Pw.	Q	1 %	Jan. 3
So. Util., pf.	Q	1.75%	Dec. 31
Springfield Ry. & Lt., pf.	Q	1.75%	Jan. 1
Sub. Bell Tel.	Q	2.5 %	Jan. 3
Toronto Ry.	Q	2 %	Jan. 3
Twin Cities Rap. Tran.	Q	1.5 %	Jan. 23
Twin Cities Rap. Tran., pf.	Q	1.75%	Jan. 23
Union Trac.	S	3 %	Jan. 1
West India Elec.	Q	1.25%	Jan. 1
West. Union Teleg.	Q	1.25%	Jan. 15
West. Union Teleg., extra	—	0.5 %	Jan. 15

PERSONAL MENTION.

MR. B. M. ATKINS has been appointed district manager for southwest Washington of the Northcoast Power Company, Vancouver, Wash., and the district office has been moved from Kalama to Kelso.

MR. W. F. HOOVER, of Nashville, Tenn., president of the Tennessee Power Company, was elected president of the Industrial Association of the South, at a recent meeting held in Nashville for the purpose of organizing the new body, the purpose of which is to advertise the resources of the Southern states.

MR. ELLIOT COWDIN, the American aviator with the French Army, sailed for New York on the *Rotterdam* last week, and will enjoy a brief leave visiting relatives in New York. Mr. Cowdin is one of the most daring and successful of aviators, and is a nephew of Mr. H. Durant Cheever, president of the Okonite Company, of New York.

MR. F. W. DARLINGTON, consulting engineer in electrical, mechanical and hydraulic undertakings, has moved his main office from Philadelphia, Pa., to Chicago, Ill. He has entered into a close working arrangement with the firm of Berry & Roberts, consulting civil engineers, and with Mr. A. G. Shaver, consulting signal engineer, whereby matters pertaining to the engineering of these undertakings may be jointly or severally handled.

MR. GEORGE B. WOODWARD, who has been connected with Fairbanks, Morse & Company for nearly fifty years, and who since 1899 has been manager of the Louisville, Ky., branch of the company, has retired from service, owing to his advanced age. His retirement was marked by a cordial evidence of appreciation on part of the company. His successor is Mr. J. F. Snarenberger, who has had the title of assistant manager at Louisville for the past six years.

MR. H. H. BURTON has resigned his position in the legal department of the Utah Power & Light Company at Salt Lake City to accept one with the Electric Investment Company at Boise, Idaho, as office attorney. Mr. Burton is a graduate of Bowdoin College in 1909 and of the Harvard Law School in 1912. After leaving law school he entered the office of Gage, Wilbur & Wachner, of Cleveland. Mr. R. A. Wilbur of that firm later took the position of general attorney for the Utah Power and Light Company and Mr. Burton moved to Salt Lake City with him.

MR. W. D. LINDSEY, advertising manager of the Western Electric Company, is the author of an interesting article in the December issue of the *Western Electric News*, entitled "Our Advertising—The 'Why' and 'How' of It." Mr. Lindsey describes in detail the work of the advertising department of his company, including the preparation of copy, the maintenance of an information bureau, the handling of exhibits, window displays, etc. He also discusses the question of whether advertising pays, and shows why it does.

DR. MILLER REESE HUTCHISON, E.E., Ph.D., chief engineer to and personal representative of Mr. Thomas A. Edison, has been appointed by the Secretary of the Navy, a member of the Naval Consulting Board, and also as assistant to the chairman, Mr. Edison. Dr. Hutchison is well known throughout Europe and America. He has been granted several hundred patents, among the most universally used of which are the acousticon to enable the deaf to hear, and the Klaxon warning signal. After receiving a classical education from private schools of Mobile, Ala.; the Marion Institute, Marion, Ala.; Spring Hill College, Spring Hill (Mobile), Ala., and the University Military Institute of Mobile, he attended the Alabama Polytechnic Institute, Electrical and Mechanical Engineering, class of 1897. The degree of E.E. was conferred by this college. The degree of Doctor of Philosophy was conferred by

Miller Reese Hutchison.

Spring Hill College, in 1914. He was chief electrical engineer of the Seventh and Eighth Lighthouse Districts during the Spanish-American War, engaged in laying mines and cables in the southern harbors, etc. Dr. Hutchison became associated with Mr. Edison in 1910, in the development of the Edison storage battery for use in submarines. In 1912, he was appointed chief engineer to and personal representative of Mr. Edison, chief engineer of the Edison Laboratories and Thomas A. Edison (Inc.). For a time during 1912 he assumed the duties of advertising manager of the Edison Storage Battery Company—when the battery was little known. He conducted what has gone down in the annals as one of the most successful campaigns of advertising ever undertaken. It involved the dictation, by Dr. Hutchison, of ten thousand words of advertising matter per day for one hundred successive days, and appeared in two or more page spreads in 26 weekly and 16 monthly magazines, as a series of signed letters addressed to the public. His extensive experience and tremendous capacity for hard work make him a very valuable acquisition to the Naval Consulting Board.

MR. EDWIN G. BOOZ, former statistician of the Produce Terminal Corpora-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 13	Dec. 6
American Tel. & Tel. (New York)	128½	128½
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	242	240
Electric Storage Battery common (Philadelphia)	67	67
Electric Storage Battery preferred (Philadelphia)	67	67
General Electric (New York)	174¾	176
Kings County Electric (New York)	125	125
Massachusetts Electric common (Boston)	6¾	7
Massachusetts Electric preferred (Boston)	35	40
National Carbon common (Chicago)	150	150
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	131½	131
Philadelphia Electric (Philadelphia)	27¾	27⅜
Postal Telegraph and Cables common (New York)	79	80¼
Postal Telegraph and Cables preferred (New York)	66	65½
Western Union (New York)	88½	87⅝
Westinghouse commoon (New York)	67¾	76¼
Westinghouse preferred (New York)	76	68¾

Digitized by Google

tion of Chicago, has recently organized the Business Research Service and has been made its director. This service is the first of its kind in the Central West and is designed to meet the new demand on the part of manufacturers, sales and advertising managers and advertising agencies for a skilled research service in the field of business.

MR. OSCAR S. STRAUS, one of the most prominent citizens and most successful business men of the city of New York, has been appointed by Governor Whitman chairman of the Public Service Commission of the First District of the State of New York. Mr. Straus has filled several diplomatic and official posts, having three times been Envoy Extraordinary and Minister Plenipotentiary to Turkey. He was born in Bavaria, December 23, 1850; lived in Columbus, Ga., for several years before coming to New York and was graduated from Columbia University in 1871. Later he was graduated from the law school and took a degree of A. M. in 1874. He practiced law from 1873 to 1881 and then became a member of the firm of L. Straus & Sons, importers of pottery and glassware, staying in the firm until 1906. Mr. Straus was appointed Minister to Turkey in 1887 and served till 1889, and again from 1898 to 1901. He was appointed a member of the Permanent Court of Arbitration in The Hague in 1902 to succeed former President Harrison. President Roosevelt appointed him Secretary of the Department of Commerce and Labor on December 17, 1906. He went to Turkey as Minister for the third time soon after leaving President Roosevelt's Cabinet in 1909, and served until December, 1910. Mr. Straus ran for Governor of New York on the Progressive ticket in 1912. In 1914 he was appointed chairman of an arbitration commission to decide the wage dispute between the Eastern railroads and the engineers. He was formerly president of the New York Board of Trade and Transportation, also of the National Primary League and of the American Social Science Association. He was vice-president of the National Civic Federation and the International Law Association.

OBITUARY.

MR. WILLIAM ANDREW CONNER, of Plainfield, N. J., died suddenly Monday, December 6, at his office in Perth Amboy, N. J. He was born in Baltimore, September 12, 1859. He began his business career in 1876, in Pittsburgh, in the oil refining business, in which he reached the position of assistant manager for the Standard Oil Company. In 1885 he took charge of the first plant built by the Standard Underground Cable Company in Pittsburgh, and from then to the time of his death he was the head of the manufacturing business of that company, including large plants planned and built by him in Pittsburgh, Pa.; Perth Amboy, N. J.; Oakland, Cal., and Hamilton, Canada. He was a director for 10 years and first vice-president since 1909. He was vice-president of the Perth Amboy Trust Company, in whose inception he had an active part. He has resided in Plainfield since 1904. He leaves his widow, who was Miss Tupper, of Michigan; a brother, Edward Conner, of Orange, N. J., and a sister, Mrs. Roake, of Brooklyn, N. Y. He was a cousin to Mr. O. T. Waring, of the Standard Oil Company, Mr. E. J. Waring, of the Standard Underground Cable Company, and the late Richard S. Waring, who was the founder of the Standard Underground Cable Company and inventor of "Waring" cables.

DATES AHEAD.

American Association for the Advancement of Science. Annual meeting, Columbus, O., December 27-31. Secretary, L. O. Howard, Washington, D. C.

Pan-American Scientific Congress. Washington, D. C., December 27-January 8. Assistant Secretary, G. L. Swiggett, Pan-American Union, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, Wis., January 17-19, 1916. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, Ill., January 25-27, 1916. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago.

With the Electrical Manufacturers

Novelty Incandescent Lamp Company, Emporium, Pa., has completed its new plant at St. Marys, Pa. This plant is being devoted exclusively to the manufacture of tungsten lamps. Its capacity is 5,000 lamps per day.

Fancleve Specialty Company, Jamaica Plain, Mass., has issued a new bulletin describing its new tandem boxes. These fittings are very convenient where two or more outlets or switches are to be installed in a vertical gang.

A. Hall Berry, 97 Warren Street, New York, N. Y., has been appointed exclusive Eastern selling agent for the Macallen Company, to represent the latter in the New England States, New York, New Jersey and Pennsylvania.

Naugle Pole & Tie Company, 5 South Wabash Avenue, Chicago, Ill., is sending out folders calling attention to its excellent stocks of poles on hand. In view of the arrival of sleet storms, the advice to call on the company's superior shipping facilities is timely.

The R. Thomas & Sons Company, East Liverpool, O., has issued a booklet on the new Thomas suspension insulator No. 1141. This is of improved design and incorporates many features, giving added safety in long-distance high-tension power transmission. Sectional and perspective illustrations are shown.

The Minerallac Electric Company, manufacturer of insulating compounds and other electrical material, has moved its office and factory from 400 South Hoyne Avenue to 1043-45 Washington Boulevard, Chicago, where greater facilities have been provided to enable the company to handle its increasing volume of business.

Betts & Betts Corporation, New York City, has recently been awarded the contract for an extensive clock system for the Court of Appeals Building at Albany, N. Y. It is also stated that a self-winding time clock is to be installed for the Corsicana National Bank at Corsicana, Tex., which is expected to be one of the largest and most attractive installations of its kind in that section of the country.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has sent out copies of a folder on the Hubbell Signalite cap. This is a combined attachment-plug cap and small pilot lamp particularly suited to the connection of heating appliances, since it indicates when the current is on and reminds the operator to cut off the current on leaving the work. Copies of the folder can be obtained on application to the company.

The Esterline Company, Indianapolis, Ind., has issued a bulletin on its new type G H graphic recording voltmeters and ammeters. These are of simple but good construction and of sufficient accuracy for use on commercial circuits; they are less expensive than the company's well known high-grade type E B graphic meters. The bulletin describes the elements of these instruments and illustrates them. They are made for portable or switchboard use.

The Universal Motor Company, Oshkosh, Wis., has issued bulletin No. 20 on Universal generating sets for rural lighting plants. These are self-contained units comprising an internal-combustion engine direct-connected to a generator. The outfit is of very simple design so as to adapt it for use by those not highly skilled in electrical practice. The bulletin describes the equipment and illustrates it and applications of it.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., issued folder No. 4321, in which meters for automobile testing are described and their particular advantages pointed out. Issue No. 24 of "Small Motors," published by the Small Motor Department of the company, shows a number of illustrations of the fractional-horsepower motor and some of its numerous applications. A view of the large

Digitized by Google

building devoted entirely to the manufacture of this type of motor is also shown.

Monarch Refillable Fuse Company, Incorporated, Buffalo, N. Y., has issued catalog No. 2. This gives full data on the various sizes and types of Monarch refillable fuses of the cartridge pattern, and also of the Monarch refillable Edison fuse plug. The Monarch alternating-current buzzer is also briefly described; this is intended for use in connection with bell-ringing transformers. The last page of the catalog illustrates and describes the new Monarch electric soldering iron. This iron is of unique construction and was described in our issue of October 2, 1915.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued bulletin No. 1075-A on belted alternating-current generators, types AB and AH. The former type is made only in sizes up to 200 kilovolt-amperes and is of self-contained or bracket-bearing construction, especially adapted for high-speed machines. The type AH alternators are of the pedestal-bearing class and are built standard for ratings up to 625 kilovolt-amperes or still larger. The general construction of these machines is described and views shown of their parts and of the assembled units installed in various plants.

Fairbanks, Morse & Company, Chicago, Ill., has recently furnished and installed the complete equipment of a new power plant for the State School of Mines at Socorro, N. M. It consists of two semi-Diesel Fairbanks-Morse type Y oil engines. One of these engines is 50 horsepower and is direct-connected to a Fairbanks-Morse 37.5-kilovolt-ampere generator of 440 volts. This engine has sufficient power to operate all the machinery in the various buildings. The other engine is somewhat smaller and is used for generating direct current for light and laboratory purposes. The switchboard is supplied with the various instruments used in electrical measurements, and is perhaps the most complete of its kind in the Southwest.

Pettingell-Andrews Company, Boston, Mass., has issued a well illustrated booklet on indirect lighting fixtures, Curtis portable lamps and X-Ray show-window and direct-lighting reflectors. It shows typical units of pure indirect, luminous-bowl indirect and several forms of direct-lighting equipment, all including the mirrored-glass reflectors made by the National X-Ray Reflector Company, of Chicago, for which the Pettingell-Andrews organization is the New England agent. Quite a number of illustrations are shown of typical installations in a church, school, office, store, residence, show-window, industrial plants, etc., most of these being in New England. Principles and details of the indirect fixtures are also illustrated and briefly described.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has ready catalog No. 40, covering apparatus for measuring low resistances and conductivities. A large variety of apparatus is described, including standard low resistances, standard resistances for carrying fairly heavy currents, Kelvin double-bridge equipments, variable standard low resistances, Hoopes' conductivity bridge and auxiliaries. The catalog also gives useful information regarding the use of the Kelvin double bridge and the Hoopes' conductivity bridge. The company has also issued bulletin No. 710, which describes and illustrates the peak-reading voltmeter, built according to the design of the Simplex Wire & Cable Company. This instrument affords a practical means for determining the maximum voltage on any alternating-current system.

Record of Electrical Patents

Issued by the United States Patent Office, December 7, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,162,747. Insulated Support for Electrical Devices. A. W. Burke, Wilmington, Del. Switch insulator cap.

1,162,765. Holder for Crystal Detector. J. J. Ghegan, East Orange, N. J. Arrangement and mounting of electrodes.

1,162,773. Electric Furnace. C. Hering, Philadelphia, Pa. Method of treating molten metal of high conductivity, such as iron or steel.

1,162,782. Heater-Filter. C. Joerin, Jr., and A. E. Joerin, Detroit, Mich. Faucet and electric heater switch interlocked.

1,162,788. Grid Resistance. D. L. Linquist, assignor to Otis Elevator Co., Jersey City, N. J. Grids spring-pressed into contact.

1,162,793. Waterproof Switch-Joint. W. E. McEldowney, assignor to Miller Electric Switch Co., Denver, Colo. Stuffing box and gland with waterproof packing about switch shaft.

1,162,804. Spark-Plug Attachment. A. L. Penquite, Marshalltown, Iowa. Spark plug combined with priming device.

1,162,830. System for Signaling by Wireless Telegraphy Under the Quenched-Spark Method. G. von Arco and A. Meissner, assignors to Gesellschaft fiir Drahtlose Telegraphie M. B. H., Berlin, Germany. Arrangement, tuning, etc., of exciter, antenna and oscillation circuits.

1,162,831. Electrical Switch. O. S. Walker and I. F. Williams, assignors to O. S. Walker Co., Worcester, Mass. Pivoted switch controlling relative connections of coils.

1,162,837. Door-Indicator. F. Williams, assignor to Acme Register Co., Somerville, Mass. For registering when door is opened.

1,162,850. Pendulum Electrode for Spark Plugs. T. deRoode, New York, N. Y. Plug comprising swinging pendulum electrode having a fixed electrode spaced from it.

1,162,855. Lightning Rod. J. F. Goetz, Hartford, Wis. Branch-joint connection.

1,162,864, 1,162,865 and 1,162,866. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. First patent: push-button, snap switch with egg-shaped, two-part casing. Second patent: snap switch with special stamped metal contactors. Third patent; modification of second patent.

1,162,890. System of Train Control. G. P. Thurber, assignor to Automatic Train Control & Signal Co., Pittsburgh, Pa. Block system having each track section comprising main and local blocks with train-controlled cab circuit.

1,162,897. Dough-Raising Device. B. Ames, Lowell, Mass. Compartment heated by thermostatically controlled lamp.

1,162,899. Telephone-Indicator. H. E. Beane, Bowling Green, Ky. Electromagnetically operated rock shaft and pointer.

1,162,918. Electric Welding Apparatus. W. E. Haskin, Flushing, N. Y. Automatic control of arcing electrode.

1,162,919. Spark Plug. F. E. Hawkins, Deerfield, Kan., assignor of one-half to G. W. Barnes. Outer electrode formed by hollow, tapering, inward extension of casing surrounding central electrode.

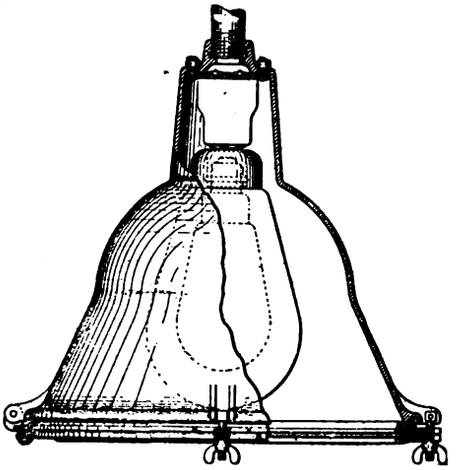
1,162,921. Attachment Plug. M. Herskovitz, Chicago, Ill. Manner of securing side contact to body.

1,162,931. Level. R. C. Kellogg and A. Johnson, New York, N. Y. Adapted to receive pocket flashlight to illuminate sight tube.

1,162,953. Combined Bell and Buzzer. O. H. Stuewe and L. M. Jansen, Milwaukee, Wis. Electromagnetic arrangement.

1,162,973. Insulated Rail-Joint. B. G. Braine, assignor to Rail Joint Co., New York, N. Y. Special arrangement of insulation.

1,162,974. Incandescent-Electric-Lamp Fixture. F. Buchanan, Syracuse, N. Y. Combined waterproof shade and socket for securing to conduit end. (See cut.)



No. 1,162,974.—Waterproof Fixture.

1,162,991. Dynamo-Electric Machine. J. B. Entz, Cleveland, O. Inclosed machine with rectangularly shaped frame.

1,162,992. Pole-Changer. C. J. Erickson, assignor to First Trust and Savings Bank Chicago, Ill. Electromagnetically vibrated pendulum closes circuit through two parts of divided battery alternately.

1,162,996. Train-Wire Conductor. A. J. Farrelly and G. B. Colegrove, Chicago, Ill. Details.

1,163,040. Centrifugal Switch. M. L. Severy, Arlington Heights, and G. B. Sinclair, Winthrop, Mass., assignors to Choralcelo Mfg. Co. Special provision for adjusting centrifugal contact spring and protecting from atmospheric interference.

1,163,063. System of Automatic Block-Signaling for Electric Railroads. G. H. Benjamin, New York, N. Y. Polyphase motor controls signal.

1,163,068. Electromagnetic Switch. C. W. Coleman and A. V. T. Day, assignors to Hall Switch & Signal Co., New York, N. Y. Polarized; for block-signal work.

1,163,069. Railway-Traffic-Controlling Apparatus. A. V. T. Day, assignor to Hall Switch & Signal Co. Car-controlling means responsive to potential difference between two contactors engaging stationary conductor.

1,163,070. Relay. A. V. T. Day, assignor to Hall Switch & Signal Co. Special structure for railway-signal work.

1,163,079. Synchronizing Device. L. Gaumont, assignor to Societe des Etablissements Gaumont, Paris, France. Differential between devices controls electric motor driving one of them.

1,163,084. Electric Snap Switch. M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Has special snap action.

1,163,092. Timer or Current-Interrupter. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Special contact structure in ignition device.

1,163,114. Insulator. L. Stahl, Carey, O. Reversible porcelain cleat.

1,163,132. Insulator Pin. C. G. Ette, St. Louis, Mo., assignor to St. Louis Malleable Casting Co., St. Louis, Mo. Has inclined openings for securing spikes.

1,163,139. Trolley-Retriever. R. E. Gearhart, assignor to More-Jones Brass & Metal Co., St. Louis, Mo. Trigger releases pole support when trolley jumps wire.

1,163,147. Individual Protective Arrangement for Interlocked Functions. W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. Prevents operation of signal in railway system by improper current.

Digitized by Google

1,163,150. Motor-Controller. A. J. Horton, assignor to Cutler-Hammer Mfg. Co. Comprises interlocked push-button starting and stopping switches.

1,163,153. Electric Interlocking Protective Device. W. K. Howe, assignor to General Railway Signal Co. Railway-signal system; signal operation by current from improper source prevented.

1,163,154. Electric Controlling Device. W. K. Howe, assignor to General Railway Signal Co. Modifications of above.

1,163,163. Primary Electric Battery. G. A. Lutz, Cranford, N. J. Element comprises iron container with slits, permitting passage of electrolyte but not of depolarizer.

1,163,165. Safety Device for Elevators. A. Mueller, New York, N. Y. Disarrangement of cable or broken strand stops motor.

1,163,171. Cross-Protection Device. W. J. Plogsted, assignor to General Railway Signal Co. Railway-signal-operating circuit cannot be made when wires are crossed.

1,163,180. Means for Strengthening Weak Electrical Impulses. W. Schloemilch and A. Leib, assignors to Gesellschaft für Drahtlose Telegraphie M. B. H., Berlin, Germany. Strengthened D. C. impulses converted to A. C., reconverted to D. C. and recorder operated.

1,163,181. Lightning-Rod Coupling. E. A. Schmitt, assignor to Cole Brothers Lightning Rod Co., St. Louis, Mo. Metal connector for lightning-rod sections

1,163,182. Automatic Block-Signaling for Electric Railways. O. E. Stevens, assignor to the General Railway Signal Co. For systems employing closed track circuits and normally de-energized relays.

1,163,190. Railway Signal. E. Woltmann, New York, N. Y., assignor to Automatic Train Stop Co. Train-stop block system operating by cutting out sections of power conductor.

1,163,191. Ship's Telegraph. F. W. Wood and H. Laning, Petersburg, Ill.; said Wood assignor to Charles Cory & Son, New York, N. Y. Mechanical and electrical signal-transmitting means combined in one structure and operated in common.

1,163,192. Light-Projecting Apparatus. W. P. Adams, Syracuse, N. Y. Comprises incandescent lamp having spaced terminals of incandescing material producing nucleate arc of light adjacent reflector focus.

1,163,199. License-Plate Carrier and Signal. R. B. Baker, Galion, O. Tail light and license plate illuminator carried on motor-actuated bar for winding and unwinding signal flag.

1,163,201. Mechanical Sounder for Telegraph Systems. P. P. Banholzer, Philadelphia, Pa. Telegraph sounder clamped to telephone standard to transmit vibrations to telephone transmitter. (See cut.)

1,163,208. Lighting Fixture. F. C. Burkhart, Omaha, Neb. Semi-indirect; adjustable bowl-supporting band having fingers engaging supporting chains and carrying lamp sockets.

1,163,226. Electric Meter. E. Evans and H. Ziemendorff, assignors to General Electric Co., Schenectady, N. Y. Records amount of energy consumed in excess of specified quantity during times consumption rate exceeds predetermined value.

1,163,265. Casing for Dynamo-Electric Machines. A. C. Rutzen, Cleveland, O. Globular casing enclosing dynamo and driving motor mounted above it.

1,163,268. Means and Method for Varying the Voltage of Alternating Currents. E. H. Schwarz, assignor to General Electric Co. Connections are taken from either ends or mid points of delta-connected windings.

1,163,272. Spark Plug. G. T. Simmons, Janesville, Wis. Casing has at inner end an apron having series of concentric grooves.

1,163,274. Tracking Device. L. W. Southgate, Worcester, Mass., assignor to Auto Pneumatic Action Co. Adjustment between tracker and note-sheet in pneumatic musical instrument is electromagnetically controlled.

1,163,280. Long-Distance Water-Stage Recorder. J. C. Stevens, assignor to Leupold, Voelpel & Co., Portland, Ore. Float-controlled circuit operates controller at a distance.

1,163,281. Spark Plug. M. P. Sullivan, assignor to L. F. Benton Co., New York, N. Y. Casing divided into three superposed sections and special structure of central electrode.

1,163,286. Process of Recovering Zinc From an Acid Sulphite Solution. C. S. Vadner, Salt Lake City, Utah. Solution is electrolyzed, acid neutralized, and continuously electrolyzed to recover zinc and eliminate SO_2.

1,163,306. Regulating System. R. W. Armstrong, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Variable-resistance potential-regulating apparatus for car lighting.

1,163,321. Electrical Water-Purifying Appliance. H. Clark, Kansas City, Mo., assignor of two-thirds to J. R. Green and T. T. Bathurst. Special structure of electrodes suspended from cover of tank.

1,163,326. Telephone Attachment. D. Y. Donaldson, Denver, Colo. Receiver and transmiter mounted on crank arm, normally face downwardly, and are simultaneously moved to operating position.

1,163,329. Filament for Incandescent Electric Lamps. T. A. Edison, assignor to General Electric Co. Tungsten vaporized by electric discharge *in vacuo* and deposited on surface, from which film formed is afterward separated.

1,163,337. Production of Cathode-Forming Sheets. E. A. Guggenheim, New York, N. Y. Special structure of blank for forming the sheets.

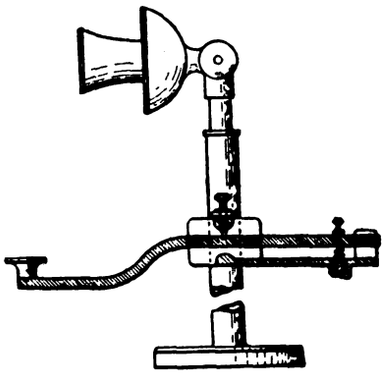
1,163,342. Method of Drying and Impregnating Electrical Conductors. D. Hurley and J. E. O'Shea, New York, N. Y. Covering heated externally and internally by passing current through conductor, under atmospheric pressure, pressure reduced and impregnated compound forced into cover while heated.

1,163,346. Signal System. C. H. Johnson, Boylston, and G. E. Johnson, Worcester, Mass. Series push-button control for elevator, etc., signals.

1,163,349. Combined Push-Button-Controlled Door Bell and Illuminating Sign. G. Kimball, Ouray, Colo. Particular structure of door plate carrying lamp, sign and push-button controlling lamp and bell.

1,163,353. Globe for Street Lighting. O. G. Luyties, Sharon Springs, N. Y. Particular arrangement of translucent and transparent portions.

1,163,371. Fastening Device for Electrical Conductors. J. Schade, Jr., assignor to Fahnestock Electric Co., New York, N. Y.



No. 1,163,201.—Telegraph-Telephone Sounder.

Spring-grip connector for joining conductors.

1,163,372. Spring Fastening Device. J. Schade, Jr., New York, N. Y. Modification of above for binding-post.

1,163,388. Switch Box. J. H. Williams, East Cleveland, O. Has universal engaging plate with buttons stopping plate in one of two operative positions.

1,163,390. Automatic Telephony. W. M. Bruce, Jr., assignor to International Automatic Telephone Co., Springfield, O. Arrangement of terminals and wipers in automatic switch.

1,163,412. Pool-Table Pocket Light. H. Jorstad, Stanhope, Iowa. Lamp lighted when ball is in pocket.

1,163,424. Alternating-Current Motor Starter. J. C. Lincoln, assignor to Lincoln Electric Co., Cleveland, O. Comprises transformer and oscillating switch biased to central "off" position.

1,163,434. Process for Making Mica Plates. M. Meirowsky, Porz, Germany. Mica sticking machines fed with aid of aspirated air.

1,163,444. Hanger for Electric Lamps. H. L. Newell, Paris, Tenn., assignor of one-half to E. S. Wiggins, Paris, Tenn. Comprises spring-actuated ratchet reel for suspending cord for incandescent lamp.

1,163,446. Lamp Socket. T. O'Donnell, Ironwood, Mich. Special two-part structure of key socket.

1,163,468. Process for Determining the Nature of the Subsoil by the Aid of Electricity. C. Schlumberger, Paris, France. Difference of potential applied to two points of surface of tract and distribution of potential compared with that for homogeneous soil.

1,163,469. Location of Ores in the Subsoil. C. Schlumberger. Ores which conduct electricity similar to metals located by observing differences of potential at surface of soil upon passing current through it.

1,163,473. Synchronizer. M. L. Severy, Arlington Heights, Mass. Friction drive automatically varied by electromagnetic means.

1,163,474. Life Boat. T. F. Shanahan, Jersey City, N. J. Special provision for storage battery, propellers, fans, signals, etc.

1,163,498. Manufacture of Metallic Amides, Cyanamides and Cyanides. E. A. Ashcroft, London, England. Cyclic, electrolytic process for producing nitrogen compounds of alkali and alkali-earth metals.

1,163,501. Electric Generator. J. Bell, Cincinnati, O., assignor of one-half to G. W. Eisenhohr. Field and armature on separate crank shafts are driven in opposite directions from same crosshead.

1,163,502. Train-Stopping Apparatus. V. E. Bock, Pharr, Tex. Mechanism of motor-operated valve.

1,163,514. Supply of Energy to Electric-Railway Systems. C. H. Douglas, Patcham, England. Sectional-conductor system; potential in a section controlled by train in preceding section.

1,163,515. Money-Receiving Apparatus. H. A. Drew and G. M. Mazza, Weehawken, N. J., assignors to Coin Device & Signal Co. For telephones, etc.; distant signal controlled by coin denomination and distant means for controlling coin deposit.

1,163,536. Electric Water-Heater. L. C. Henriksen, Portland, Ore. For connection to water system; heating element connected by impact of water when valve is opened.

1,163,539. Telegraph. A. Hjort, New York, N. Y., assignor of one-fourth to H. Japp. Generators of different frequencies selectively connected to line; receiver comprises electromagnet operating vibrators having frequencies corresponding to generators.

1,163,543. Rotary Blower. R. A. Ilg, Chicago, Ill. Mounting of motor in special structure.

1,163,565. Automatic Web-Handling Apparatus. L. H. A. Schwartz, Brookline, Mass. Tentering machine; selvage-operated device controls electric motor-driven adjustment of carrier.

1,163,568. Electric Spark Gap. F. G. Simpson, Seattle, Wash. Particular structure of air-tight spark gap.

1,163,595. Track Apparatus for Signal or Stop Systems. A. Gollos, Chicago, Ill. Connection to contact rail is broken if rail is displaced.

1,163,605. Gyroscopically Controlled Torpedo. H. W. Shonnard, assignor to Crucible Steel Co. of America, Pittsburgh, Pa. Steering mechanism of automobile torpedo controlled by electric motor gyroscope.

1,163,607. Automobile Torpedo. H. W. Shonnard, assignor to Crucible Steel Co. of America. Launching tube has conducting elements for closing circuit through electric mechanism of torpedo.

Patents Expired.

The following United States electrical patents expired on December 13, 1915:

615,669. Thermostat. I. F. Beers and C. Beers, Rochester, N. Y.

615,673. Method of and Apparatus for Electrically Transmitting Power. C. S. Bradley, Avon, N. Y.

615,686. Electric Lamp. N. S. Doe, Jersey City, N. J.

615,699. Electroplating Apparatus. J. E. Hartley and H. E. Hartley, Birmingham, England.

615,731 and 615,732. Dynamo-Electric Machine. W. M. Mordey, Loughborough, England.

615,762. Railway-Crossing Signal. J. D. Taylor, Chillicothe, O.

615,814. Electric Firing Device for Ordnance. A. T. Dawson and G. T. Buckham, London, England.

615,896. Vacuum Insulator for Electric Conductors. J. A. Poche, New Orleans, La.

615,904 and 615,905. Electric-Lighting Apparatus for Railway Cars. W. F. Richards, Buffalo, N. Y.

615,927. Electric Arc Headlight. W. G. Wagenhals, Dayton, O.

615,940. Apparatus for Depositing Metal on Tubes or Pipes. W. Wright, Acocks Green, England.

615,952. Alternating-Current Generator. C. S. Bradley, Avon, N. Y.

615,953. Controlling Alternating-Current Motors. C. S. Bradley.

615,954. Changing Period and Phase of Alternating Currents. C. S. Bradley.

615,966. Trolley Replacer for Electric Railways. L. A. Cowles, Randolph, Mass.

616,035. Electric Motor. J. L. Thoma, Kansas City, Mo.

616,046. Telephone Switchboard. T. F. Ahern, Detroit, Mich.

616,061. Trolley-Wheel Replacer. G. E. Mittinger, Jr., Cleveland, O.

Digitized by Google

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVII. No. 26. CHICAGO, SATURDAY, DECEMBER 25, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer. A. A. Gray, General Manager.

C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.
E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS:
System in Inspection Work....1135
Improving Drawbridge Lighting....1136
Electric Garage Versus Stable....1136
A Lesson in Co-operation....1136
Using a Flywheel to Equalize the Load....1137
Capitalizing the Advertising Value of Electric Trucks....1137
Merry Christmas! 1137
DEPARTMENTS:
Commercial Practice 1143
Electrical Construction 1146
Public Service Commissions....1150
Questions and Answers....1151
New Electrical and Mechanical Appliances....1166
Latest Approved Fittings....1170
Current Electrical News....1171
Record of Electrical Patents....1175
LEADING ARTICLES:
Electricity in Soap Manufacture....1139
Notes on Interior Wiring.—By Terrell Croft....1146
Business Hints for Dealer and Contractor.—By G. D. Crain, Jr....1148
Economic, Social and Political Conditions in Europe Which Influence Government Ownership of the Telephone.—By James P. Duncan....1153
System of Keeping Records of Current Work in Electrical Inspection Department.—II.—By Washington Devereux 1156
BOOK REVIEWS 1165
MISCELLANEOUS:
American Electric Railway Association to Hold Midyear Meeting in Chicago....1138
Research Fellowships in the University of Illinois....1138
Forester's Report Says There Is No Market for Water Power 1138
Electrical Toy Display Shows Wide Range of Suitable Gifts 1143
Chicago Grocer Buys 11 Electric Trucks and Sells 300 Tons of Coffee as Result....1143
New Form of Street-Lighting Contract Proposed for Racine 1144
St. Louis Company's Customers Reach 65,000 Mark.—Rates Are Reduced....1145
Portable Floor Lamp.—By William T. Estlick....1147
Exposed Work Barred in Louisville....1149
Among the Contractors....1149
Program of Pan-American Congress....1152
Gigantic Bridge Built by Aid of Telephones....1158
Water-Power Auxiliary for Street-Railway System....1159
The Hamilton Electric Incline Railway....1160
Bureau of Standards Reports in Case Concerning Fire and Accident Hazard of Economy Refillable Fuse....1163

Copyright, 1915, by Electrical Review Publishing Company, Inc.

SYSTEM IN INSPECTION WORK.

The consideration of first importance in the work of the electrical inspector is to see that an installation complies with the rules and regulations, since this is the accepted criterion of safety. Given competent inspectors and assuming that good judgment is exercised in appraising the quality of the work under inspection, there may yet be vast differences as to its satisfactoriness, both to the inspection department and to the electrical contractors, property owners and others who may be interested in the result of the inspection.

The electrical contractor is usually interested in getting a prompt report upon the approval of his work. If an installation has passed inspection he wishes to know it, and if for any reason it has not passed inspection he wants to know the reason, so that any defects may be corrected and the job classified as finished. Prompt reports of inspection are therefore of considerable assistance to him. If the installation is to be connected to central-station lines, the officials of the electric company want to be informed so that the service may be connected as soon as practicable and the customer made an actual consumer.

An article which was begun in the last issue and is concluded this week will be of interest to electrical inspectors in showing the methods employed and the forms used in electrical inspection work in Philadelphia. There is one feature of the work in that city which will, however, be of wider interest, and that is the method of promptly notifying contractors and others interested of the results of an inspection. The inspector is provided with postal cards which are mailed to the interested contractor immediately upon inspection. This card indicates by an abbreviated notation any element of the work which is found to be at fault and which has prevented its approval. This notice will be received by the contractor either upon the same day or the following day, so that any additions or corrections to the work may be made at once. A similar method has just been adopted by the inspection department in Louisville, Ky., and it is probably in vogue elsewhere. It is one that proves very popular with the electrical contractors.

A very great aid in the practical application of this system is the abbreviated notation above referred to. This consists in effect of code letters which are interpreted by means of a key which is supplied to

Digitized by Google

every contractor and to other interested parties. The necessity for writing out in full the points which are at fault is thus obviated and the possibility of dropping postal-card notices in the mail box before returning to the office is made practical. The use of such a key by other inspection departments would no doubt be found to be of great assistance.

This code consists of the letters of the alphabet and a series of numbers, each of which represents a sentence or paragraph to be found in the key. Letters represent general conditions found upon inspection, while numbers indicate specific recommendations for correcting faults. The list covers most of those defects which experience has shown are likely to be found upon inspection of an electrical equipment.

IMPROVING DRAWBRIDGE LIGHTING.

A recent accident which cost one life and jeopardized others at a drawbridge on the Cape Cod Canal, in Massachusetts, emphasizes the importance of adequate illumination on such structures. In the case in point the drawtender appears to have started the motor drive of the lift, which was of the rolling type, without realizing that an automobile was on the bridge. The night was very dark and the increasing upward slant of the roadway naturally brought the car to a stop and then caused it to roll backward down the bridge into the water, there being a ten-foot gap between the hinge and the shore when the bridge was raised. It is entirely within the province of electricity to insure that no such accident as this ever occurs again. The gas-filled, projector-type lamp, properly placed, would show the drawtender whether or not the bridge was clear before any step should be taken toward raising the leaf, and both bell signals and illuminated semaphores should be utilized to warn persons approaching such a structure that it is about to be operated. The cost of operating such an installation of projector lamps in a situation like that in Massachusetts, where plenty of electricity is available from adjacent central-station lines, would be a small outlay in view of the increased safety thus secured.

Such incidents as this point out how electrical applications may advance to safeguard fields where negligence or carelessness need to be overcome by modern equipment and stricter discipline.

ELECTRIC GARAGE VERSUS STABLE.

The English Electric Vehicle Committee, in pursuance of its schemes for boosting the "electric" at every opportunity, has made good use of an anti-horse-stable action on the part of the Manchester city authorities. The Manchester corporation has served notices upon a large number of tenants in the city, ordering them to abate an alleged nuisance by discontinuing to keep horses on their premises. It is expected that this action will be followed by similar measures in many other progressive towns and cities in England, since it is admitted by all qualified to judge "that the presence of stables in urban areas is harmful to public health."

The Electric Vehicle Committee has circularized all town clerks, borough surveyors, chief constables, fire brigade officers, tramway managers, medical officers of health, refuse-disposal departments, gas and water engineers, and electricity works engineers in reference to the above policy. It gets home with a word or two concerning the ideal character of the electric for town use and recommends municipalities to make special efforts to encourage the use of such vehicles in the areas under their control by setting examples in their application to the public service. It is pointed out in the circular that not only will the adoption of electric vehicles in such directions have the effect of doing away with stables, but it will, in addition, bring a handsome revenue to the electric supply undertakings. The Electric Vehicle Committee is about the most live and energetic electrical committee in the United Kingdom in these days.

A LESSON IN CO-OPERATION.

Returns from many sections of the country indicate that the electrical industry has profited very greatly from the celebrations and sales campaigns incident to Electrical Prosperity Week. Central stations, contractors and dealers all report exceptional sales and while, of course, the domestic electrical appliance was affected most by the impetus given the industry, in so far as actual sales transactions are concerned, nevertheless all branches of the business seem to have been benefited.

It is fitting that the electrical appliance should be given consideration as a suitable Christmas gift, and one of the encouraging features of Prosperity Week activities has been the marked stimulation in sales of this character. In analyzing the results which have been achieved, however, it seems that the greatest benefit which will accrue to the electrical industry is because of the fact that co-operation between the various branches has been proven practical and beneficial. In a number of instances many of the little differences which have prevented co-operation in the past were permanently eliminated and the foundation laid for continuous harmony hereafter.

Another important result has been the justification of special sales campaigns. Many special street-lighting installations, electric signs, window and store-lighting equipments originally intended for the week have been made permanent because of the pleasing results which were experienced. There were, of course, many features of Prosperity Week activities which must be reserved for an occasion of this kind, but most of the special effort expended could well be carried on throughout the entire year.

Digitized by Google

USING A FLYWHEEL TO EQUALIZE THE LOAD.

In a number of applications of electric power there is met a condition where peak loads are high while the intervening loads are small or even drop down to zero. In some cases the load goes through a cycle of values which recur with fair regularity, corresponding to a series of industrial operations. Typical instances of this form of load are to be found in steel rolling and in hoisting equipment.

A common method of meeting this condition is to install a motor-generator set with a flywheel mounted upon its shaft. The motor is connected to the supply line and draws from it a fairly uniform amount of power. The generator supplies to the motor which is doing the work an amount of power which varies with the requirements, while the flywheel serves to alternately store energy received from the supply line when it is not required and deliver it up to the generator when the demand is made upon the latter. This is accomplished through its variations in speed, and control apparatus is available to make the equipment function in the desired manner.

This arrangement of apparatus is always desirable from the standpoint of the central station which is supplying power, since it limits the big demand upon that station. It is desirable from the standpoint of other customers supplied from the same station since a constancy of load assists the maintenance of constant voltage. It is usually desirable from the standpoint of the consumer in question, since he has the assurance that the necessary power will be available at any instant; moreover, the charge for power will usually be less when supplied under these conditions.

In certain cases, however, such as small mines operating hoisting equipment, it may be very questionable whether it is advisable from the financial standpoint for the mine owner to install a flywheel equipment. The alternative is to pay a high charge for the required electrical energy, but this may be more economical, since it may be overbalanced by the saving in fixed charges upon the initial investment. These fixed charges frequently involve not only interest, but a sinking fund necessary to wipe out the investment during the life of the mine. From the central-station standpoint the high rate charged to the mine owner may make it feasible to install apparatus, such as voltage regulators or synchronous condensers, which will maintain the desired voltage and at the same time improve the power-factor. Which course is most desirable from the standpoint of either mine owner or power company will depend upon the local conditions. In the case of a small mine the peak load might not be objectionable if a number of equally large loads were supplied over the same feeders, as diversity among the different loads would tend to equalize the total, and moreover, variation of one element of load on a line of large capacity would not so greatly affect the voltage drop.

CAPITALIZING THE ADVERTISING VALUE OF ELECTRIC TRUCKS.

One of the significant selling arguments which is advanced for the electric truck by the alert salesman is the advertising value to the merchant who uses them. Undoubtedly this feature of electric delivery has been given some consideration by the prospective purchaser but the possibilities in this direction have only in a comparatively few instances been fully realized. Of course every electric vehicle, because of its attractive and dignified appearance, its quiet running and its dependable performance is an advertisement for the user. Seldom, however, is this value fully capitalized.

A wholesale grocery establishment in Chicago, after a careful consideration of various transportation methods, decided upon the electric truck as best suited to its needs and thereupon decided to purchase an initial fleet of eleven vehicles. With a full realization of the advertising possibilities of this move, the company inaugurated a selling campaign, basing its selling arguments on the modern facilities for delivering which the electric vehicle offers. The culminating feature of this campaign was to be a parade of the company's new vehicles, through the downtown district of Chicago, loaded with coffee ordered during the campaign. It is interesting to note that instead of eleven vehicles originally intended for this purpose, 74 additional electrics had to be borrowed for the occasion, as over 300 tons of coffee were sold.

This is a noteworthy example of what can be done by taking advantage of the advertising value which presents itself by the adoption of electric vehicles. In addition to the direct benefit to the manufacturer, which in this case was beyond the most optimistic expectations, the electric-vehicle industry is directly benefited from the publicity which it receives. With this instance as a stimulus, vehicle salesmen could well afford to devote greater time to impressing this advantage of the electric vehicle upon the prospective purchaser.

MERRY CHRISTMAS!

Christmas Day is the earliest possible date which can be carried on the last issue of the year of any publication which appears every week. The vagaries of the Gregorian calendar have brought it about that the last message which goes from us to our readers in this year of grace will reach them December 25.

We take this opportunity to wish every reader a Very Merry Christmas and a Happy and Prosperous New Year. The year has been one of uncertainty and of variegated prosperity. That is to say, some elements have prospered, while with others the conditions have been somewhat dubious. An era of general prosperity is promised, however, for the coming months, and it is our hearty wish that every element of the industry may participate to the fullest extent that individual and co-operative effort may make possible!

Digitized by Google

American Electric Railway Association to Hold Midyear Meeting in Chicago.

The seventh annual midyear meeting of the American Electric Railway Association will be held in Chicago on February 4, 1916. The joint dinner with the American Electric Railway Manufacturers' Association will be held on the evening of the same day.

Although the program for the two events has not as yet been definitely decided upon, it is probable that the meeting will be given over to the discussion of two subjects, "Valuation" and "Rate of Return." The Committee on Subjects is making arrangements for the presentation of papers by three men of national prominence, who are thoroughly informed upon the subjects, and for discussion of the papers by other leaders in the electric railway field.

It was decided that both the meeting proper and the dinner should be held at the Congress Hotel and Annex.

Illumination Discussed by Manufacturers.

The Safety Committee of the Illinois Manufacturers' Association held a dinner and meeting at the Grand Pacific Hotel, Chicago, on the evening of December 15. This meeting was under the direction of W. C. Berry, claim agent of the Commonwealth Edison Company, and was devoted to the subject of factory illumination. The speakers were all members of the Illuminating Engineering Society and the program was arranged under the direction of E. W. Lloyd, chairman of the Chicago Section. Exhibits of illuminating devices were made by a number of manufacturers, and short talks on factory lighting were given by J. J. Kirk, of the Commonwealth Edison Company; George C. Keech, of the Cooper-Hewitt Electric Company; O. L. Johnson, of the Benjamin Electric Manufacturing Company; Ward Harrison, of the Nela Lamp Works; and William A. Durgin, of the Commonwealth Edison Company.

Engineer Goss Addresses Western Society on Railroad Electrification.

At the meeting of the Western Society of Engineers in the Monadnock Block, Chicago, on the evening of Monday, December 20, W. F. M. Goss, chief engineer of the Association of Commerce Committee on Smoke Abatement and Electrification of Railway Terminals, gave an illustrated talk on the electrification of Chicago railway terminals.

Dean Goss's remarks and lantern slides were largely from the committee report which was recently submitted, and which was abstracted in the issue of December 11. He indicated what had been the basis of the committee's studies, pointed out the reasons for the figures which had been found for the cost of complete electrification, indicated the savings and the resultant deficit. He also pointed out the advantages of electrification, which cannot be measured in money.

William B. Jackson presided at the meeting, and there was considerable discussion and a number of questions. The general attitude of those speaking was that electrification involved an unjustifiable expense and that the result would be inconsiderable with respect to the elimination of dirt from the air. Dean Goss emphasized that the worst offenders in this respect were the high-pressure power plants.

Research Fellowships in the University of Illinois.

To extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains 14 research fellowships in the Engineering Experiment Station. These fellowships, for each of which there is an annual stipend of $500, are open to graduates of approved American and foreign universities and technical schools. Appointments to these fellowships are made and must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the Master's degree will be granted. Not more than half of the time of the research fellows is required in connection with the work of the department to which they are assigned, the remainder of the time being available for graduate study.

Nominations to fellowships, accompanied by assignments to special departments of the Engineering Experiment Station, are made from applications received by the director of the Station each year not later than February 1. These nominations are made within the month of February by the Station staff, subject to the approval of the faculty of the Graduate School and the president of the University. Appointments are made in March, and they take effect the first day of the following September. Five vacancies are to be filled this year.

Additional information may be obtained by addressing The Director, Engineering Experiment Station, University of Illinois, Urbana, Ill.

Coming Conventions of Electrical Engineers.

At the meeting of the Board of Directors of the American Institute of Electrical Engineers, held December 10, it was decided to hold the usual midwinter convention in New York City, on February 8 and 9, 1916.

At the same meeting a Pacific Coast convention, to be held in Seattle, Wash., in 1916, under the auspices of the Seattle Section, was authorized.

Forester's Report Says There Is No Market for Water Power.

The annual report of the Forester of the Department of Agriculture comments on the government ownership of water power sites and timber, as exemplified by the National Forest system. Facts and figures regarding the water-power situation are given to prove that more rapid development of water power in the west is mainly prevented by the lack of consumers, rather than by the absence of suitable laws.

Water-power permits taken out for National Forest projects involve a total of 1,261,560 horsepower. Free permits cover 70,628 horsepower and the plants actually constructed or operating up to June 30 had an output capacity of 341,276 horsepower, the rentals paying $89,000 during the year. The report comments on the water-power situation as follows:

"New legislation permitting the Government to grant a more secure tenure for the lands used, through the issuance of 50-year leases, would, without doubt, make the financing of power developments on the public lands both easier and cheaper, and is very desirable, but the main obstacle to more rapid development than that which is now taking place is not lack of a new law, but lack of a broader market for power. It is at least doubtful if either an amended law or private ownership of the public power sites would result in any general or material increase in power development in the western states in the immediate future. With rare and minor exceptions, existing power developments in these states are far in excess of market demands. The Forest Service is being constantly importuned to extend periods of construction on power permits on the plea that there would be no market available for the power if the project were developed. The per-capita use of water power in electrical development in the three Pacific and the eight mountain states is far in excess of that in any other section of the United States, and more than five times the average for the United States, as a whole. The development of the Pacific states is about 180 horsepower per thousand of population, and in the mountain states 120 horsepower, with a balanced average of 160 horsepower. New England, which is next in order, has less than 40 horsepower per thousand of population, and the whole United States about 30 horsepower."

Digitized by Google

Industrial Power Series—Article No. 148

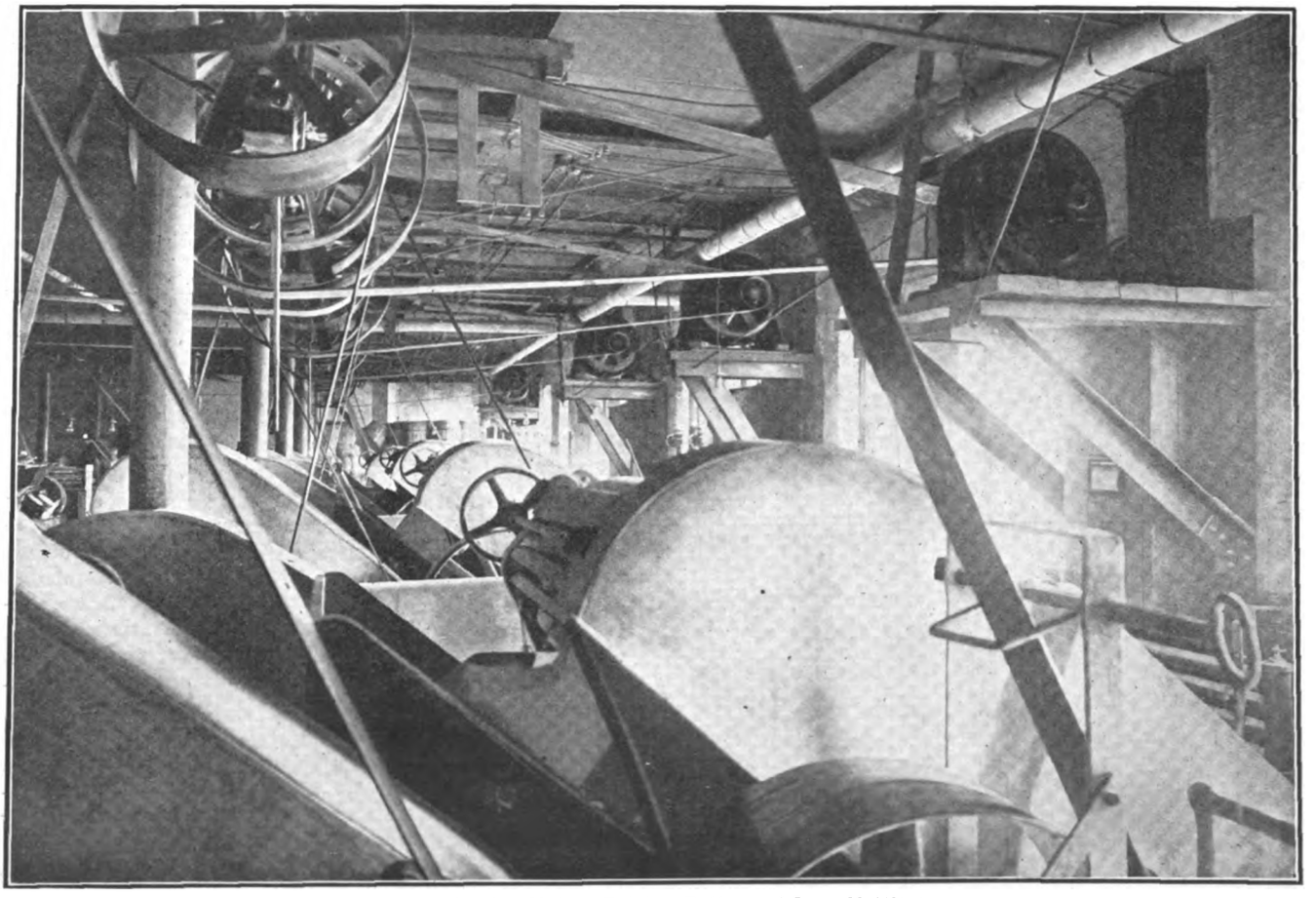
ELECTRICITY IN SOAP MANUFACTURE.

A modern soap factory affords many opportunities for the profitable introduction of electricity as a power distributing and lighting medium. This article describes the processes involved in manufacturing soap with particular reference to power applications, and gives a table of approximate horsepower requirements for the machines used in the industry.

Soap is probably one of the oldest and most common of necessities and the enormous demand for it has created modern methods of power applications in its manufacture. Electric motor drive is now used to a large extent in soap manufacturing plants, where it has many advantages which are in common with other kinds of plants. Both group and individual drive are used and as a rule the machines have small power requirements, with the exception of one or two types. The following paragraphs describe the various processes required for soap making, and the machines used. Power requirements are also given in an accompanying table. The first consideration is the chemical changes that take place in the preparation of the ingredients and later the mechanical processes that are necessary to complete the product.

When tallow, lard, palm oil, corn oil, or other fatty material is treated with a solution of sodium hydrate or potassium hydrate, a chemical change takes place, resulting in the formation of a product soluble in water, and possessing properties different entirely from the original fat or oil employed. Although there are many substitutes for tallow which are employed in soap making, they all require caustic for saponification and all act in the manner described. There are, however, some substances, such as rosin, with which, when used in the production of soap, the action as described is modified. Rosin is an acid and unites directly with the caustic soda to make a salt. During saponification glycerine, the sweet principle of fats, is set at liberty, and the fat acids combine with the base forming soap, or are set at liberty. By this process potassium and sodium hydrates produce soluble soaps, while calcium, magnesium, zinc, barium and lead oxides, and the like bases, produce insoluble soaps. As a rule soaps formed by a sodium base are hard soaps, while those produced from a potassium base are soft soaps.

Saponification takes place slowly in the cold, much more quickly by the aid of heat, and the presence or absence of air is immaterial. The result depends upon the nature of the fat or oil as well as on the base. For example, if the fat is complex, containing stearine, palmitine, oleine, etc., then as many new salts are formed as there are fatty acids to combine with the base. The operation is not attended by the production of acetic or carbonic acid, but a small por-

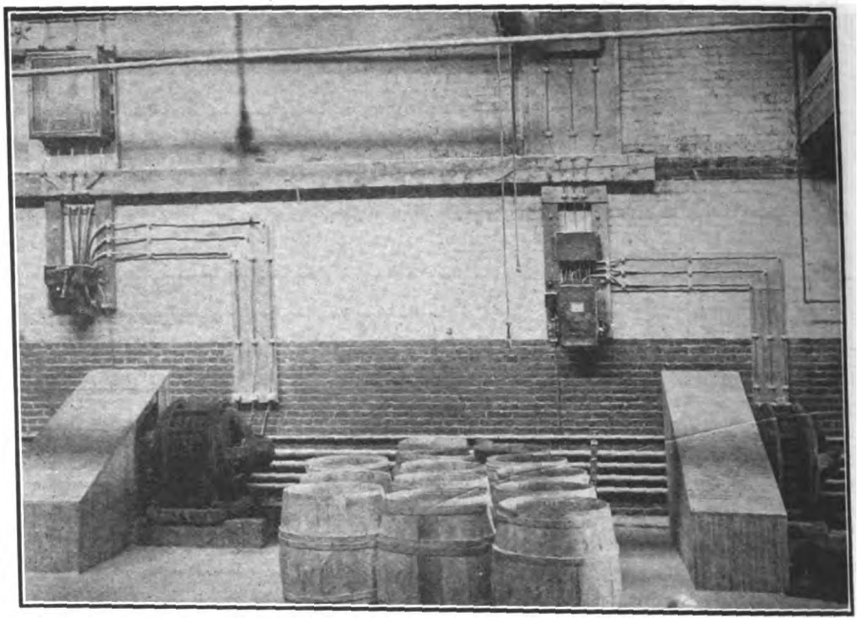


Four Induction Motors Driving Battery of Soap Mottlers.

Digitized by Google

tion of nitrogen is set free in the saponification of hog's lard, due probably to the impurities in the fat. Hog's lard, 100 parts, digested with 60 parts of potassic hydrate and 400 parts of water for two days, at a temperature of 70 to 90 degrees centigrade is converted into mother liquor and soap. The mother liquor contains free potash, with carbonate and acetate of potash, an odorous principle, and glycerine; the soap contains stearate, palmitate, and oleate of potassium, a small quantity of acetate and yellow coloring matter. The carbonic acid and the greater part of the acetic acid in the mother liquor were previously formed in the potassium hydrate.

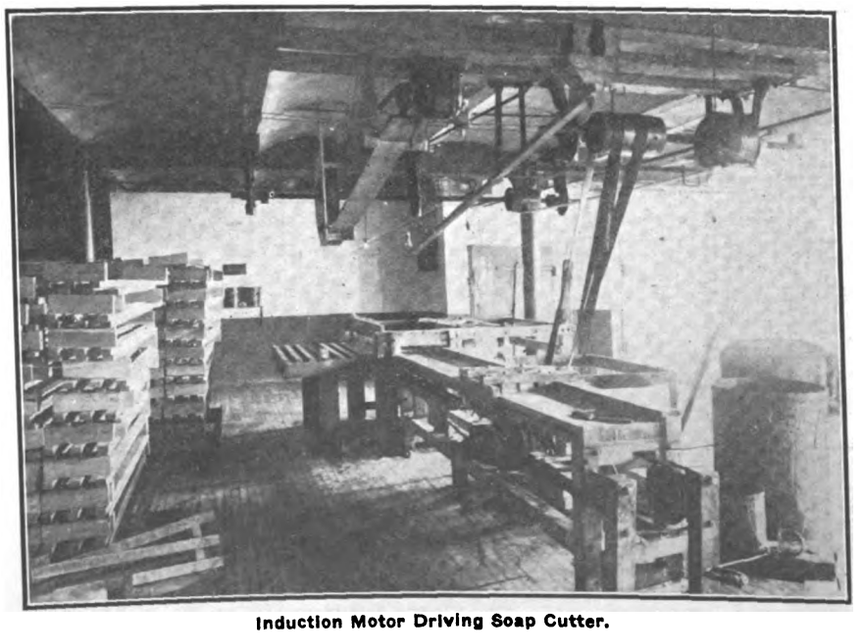
The manufacturer of hard soap, having provided a stock of alkaline liquors of various strengths, charges his soap pan or kettle with a quantity of neutral fat or oil, and adds weak liquors of about 1.050 degrees density. As the temperature rises, and the oil and alkali liquor mingle, a uniform milky emulsion is formed, in which neither oily globules nor water are visible on cooling a portion of the fluid. The operator watches for this change, and adds more solution of alkali or water, as the case may require, until the emulsion forms and all alkaline taste has disappeared, using the tongue as a test. Stronger liquors are now added gradually to complete the displacement of the glycerine, which was commenced by the weak liquors, and the boiling continues until a strong alkaline taste is detected. The workman then adds more fat or oils, and repeats the use of the stronger lyes until gradually the soap pan is nearly filled, taking care at the last that there shall be no excess of alkali. During this series of operations he often adds a portion of rosin which, by virtue of its constitution, undergoes a species of saponification with alkalies and adds to the product more than its value in weight and volume. Now comes the next important stage of soap-boiling operation, in which, by the addition of salt, the emulsion of oils and alkali is decomposed, the salt taking the water and causing the precipitation of the newly-formed soap in a curdy or granulate stage, floating on the dense spent lyes in which is found the glycerine and salt but no alkali.



Two Motors for Driving Soap-Powder Machines.

This mother liquor, after the separation of the soap is complete, is withdrawn and rejected as having no value. The imperfectly developed soap is now for a second time subjected to a like series of operations as at first; it is brought by boiling to a homogeneous state, more oils or fats and strong alkaline liquors are added until the whole has a decided alkaline taste, and more salt is then added to cause the separation of the soap from the alkaline solution, and the whole mass is kept boiling for some time until all of the fats are completely saponified.

This completes the chemical part of the operation if the soap contains no rosin, and after allowing time for the subsiding of the dregs, the curd is transferred to the frames, where it cools and becomes solid, preparatory to cutting up for use. If, however, the soap contains rosin, it requires a further treatment before framing. The curds, after the removal of the spent liquor and dregs, are melted with more water and boiled. A homogeneous compound results, containing an indefinite quantity of water, which is permitted to rest for two or three days, when it separates into a definite compound containing about 65 per cent of fat acids, 6.5 of soda, and 28.5 of water and, resting on a lower stratum of an indefinite compound containing much more water and the dregs or sediments of the operation.



Induction Motor Driving Soap Cutter.

Rosin soap is allowed to cool in the kettle or pan to about 280 degrees Fahrenheit, then run into the crutcher, a cylinder provided with a shaft bearing a paddle. This paddle revolves and thoroughly mixes the soap, uniform in color and texture. In this operation it is also customary to make various additions such as carbonate of soda to soften the hard water, silicate of soda to harden the soap and prevent too rapid wasting, and many other substances, some of double utility. After crutching, the warm mixture is removed to large iron frames or molds and allowed to cool. When the soap is hard the sides of the frames are removed and it is cut into slabs and bars with a steel wire. After a short drying operation, the soap is pressed and is ready for use.

Settled toilet soap is not crutched, but run at once into frames. When hard, the

Digitized by Google

Motor-Driven Wrapping Machine.

soap is cut by steel wires into thin bars and dried on racks in a warm, well ventilated room, and when the moisture is reduced to about 10 per cent, is cut into fine chips and dried once more. The proper perfume and coloring matter having been added, they are fed into a roller mill, coming out in crepe-like sheets. The material then passes through the roller mill several times and then into the plodder; a revolving screw press, which is gently heated, and delivers the soap in long slender bars. These bars are cut into short lengths and pressed into suitable cakes by dies.

Having given a general outline of the process of making soap, it remains to describe briefly the various machines used in the manufacturing of this commodity. The raw materials, consisting of oil or tallow, are delivered to the soap factory in drums and the material has to be melted and transferred to a tank for storage. The drums are run on rails into the melting room, which is divided into compartments, with a steam line so constructed that taps can be connected to the bung holes of the drums. The material melts and runs through a trough and a pipe to the storage tank.

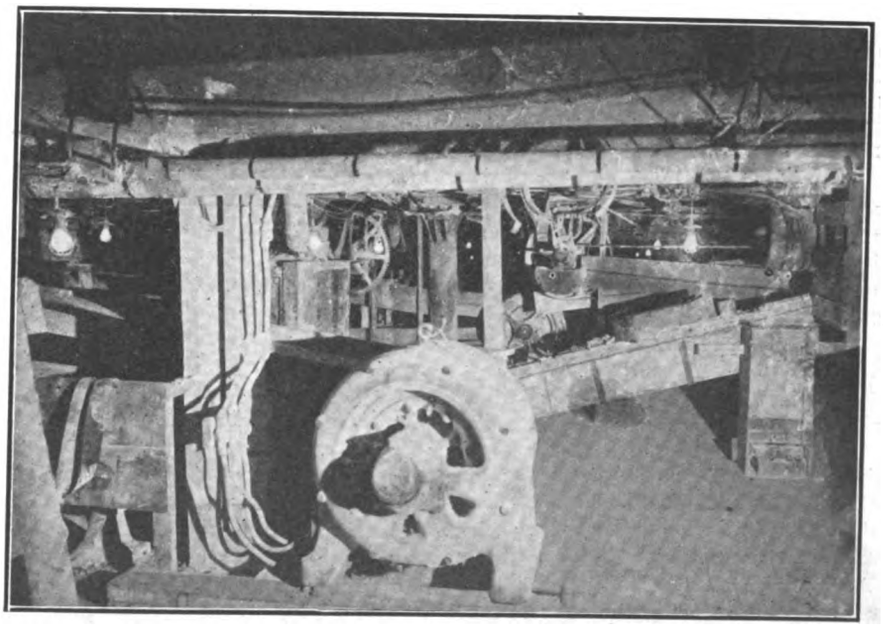
Boiling kettles or pans are constructed of sheet iron and provided with steam coils drilled with small holes which allow the steam to escape in small jets having the double function of heating the material and agitating it. Crutchers consist of a steam-jacketed kettle in which there is a revolving worm for agitating the contents. The coils in the jacket may be used for steam to heat the material or for water to cool it. The frames are boxes large enough to contain a charge from the crutcher and are mounted on trucks. The solidified soap may be taken from the frame by removing its sides. This process is called stripping. The slabber is provided with a cutting head to receive a whole slab from the frames and cuts it into the thickness of bars by means of steel wires. The cutting machine further reduces the size to that of cakes. The wrapping machine, as the name implies is used for wrapping the soap in proper wrappers for packing and shipment. The chipper is provided with a revolving wheel to which knives are attached that chip the soap as the bars are fed in the machine. The amalgamator is used for mixing perfume with the chips.

Whether the soap has been dried by the modern method or the slower method of chipping, it is placed in a mixing machine for the addition of necessary ingredients and then fed into the mills. These mills consist of two or more rollers between which the soap passes, thereby causing the added material to be incorporated. The milled soap is placed in the hopper of a machine known as the plodder, where it is subjected to great pressure by means of a compression screw. In the nozzle of the plodder is a forming plate having an opening the size of the cake desired. The flaky condition of the soap as it comes from the mills is converted into a continuous bar, which may be cut to any length and stamped or pressed as desired.

A modern soap factory affords many opportunities for the profitable introduction of electricity as a power distributing and lighting medium. Few industries have need for so many comparatively small amounts of power applied in widely separated departments as does a large soap factory. In meeting these conditions electricity is being employed and is an ideal means of transmission. It is clean, simple, positive and flexible, allowing extensions and additions to be made to the various buildings, or the construction of new departments extending over a wide area; it makes power application in such developments possible at low cost for transmission system and increases greatly the efficiency of the whole etablishment.

In soliciting the adoption of central-station service for soap factories, a great proportion of success depends upon the ability of the salesman to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far in demonstrating definitely and convincingly to a prospect the flaws and waste and general field for improvement in his power layout.

The selection of motors for drive in soap factories presents no especial difficulty. Where alternating current is available, the polyphase induction mo-



Motor-Driven Powder Machine.

Digitized by Google

tor with squirrel-cage windings is, of course, to be preferred. This motor is extremely simple and may be built to withstand hard usage and to run continuously in exposed locations and under the adverse conditions of temperature and moisture usually inherent in soap factories. The high efficiency obtained in this motor over wide load ranges and the minimum amount of attention it requires while running, make it compare favorably in cost of operation with motors of any other type.

In the case of soap-power machines, or grinders, etc., the slip-ring motor should be specified due to the heavy starting torque of these motors.

Compound-wound motors will be found the most desirable where the supply source is direct current. In tank rooms, mixing rooms and other locations where the motors would be subjected to dampness, acids, etc., it is found desirable to suspend them from the ceiling. In fact, this method of installation is advantageous throughout the plant since in addition to protecting the motors it has the advantage of economizing on space.

The accompanying table gives the approximate horsepower requirements of the usual machines found in the typical soap factory. In determining upon the size of motor to be used, however, local operating conditions must always be taken into consideration.

POWER REQUIRED TO DRIVE SOAP-MAKING MACHINERY.

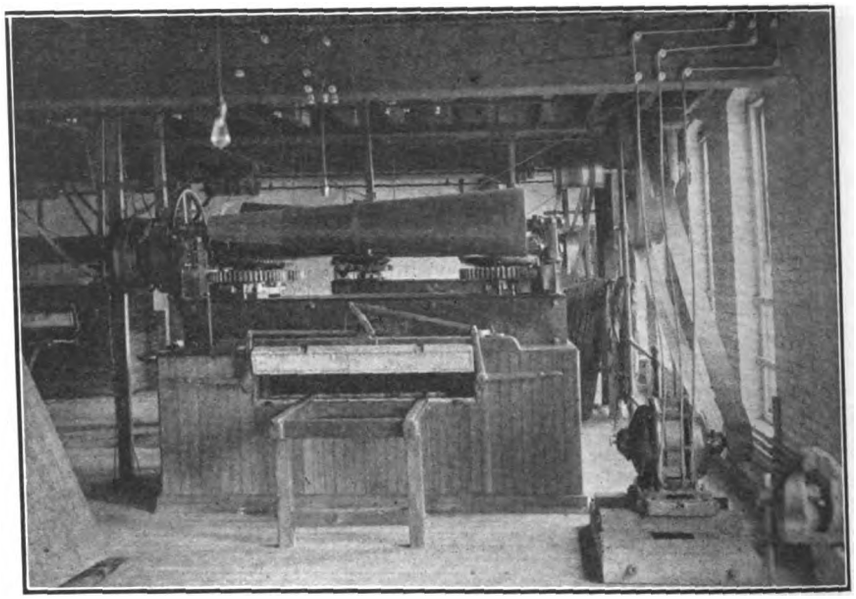
Machine	Horsepower
Soap Melter	3
Large Soap Grinder	5
Small Soap Grinder	3
Roller Soaping Grinder	3
Large Soap-Clipping Machine	3
Small Soap-Clipping Machine	0.75
Soda Ash Mixer	0.5
Soda Mixer	4
Soap Slabber	1
Soap Press	1
Large Soap Mill	35
Medium Soap Mill	27
Soap Plodder	7.5
Cutting Table	0.75
Color Mixer	0.5
Soap Clutch	2
Horizontal Plodder	1.5
Perfume Mixer	0.75
Tallow Mixer	4
Large Soap Clutch	20
Small Soap Pump	1
Large Soap Pump	5
Drum Washer	3

From tests in a large number of soap manufacturing plants it has been determined that the average kilowatt-hour current consumption per month per horsepower is 64 and the load-factor for group drive 24.6 per cent.

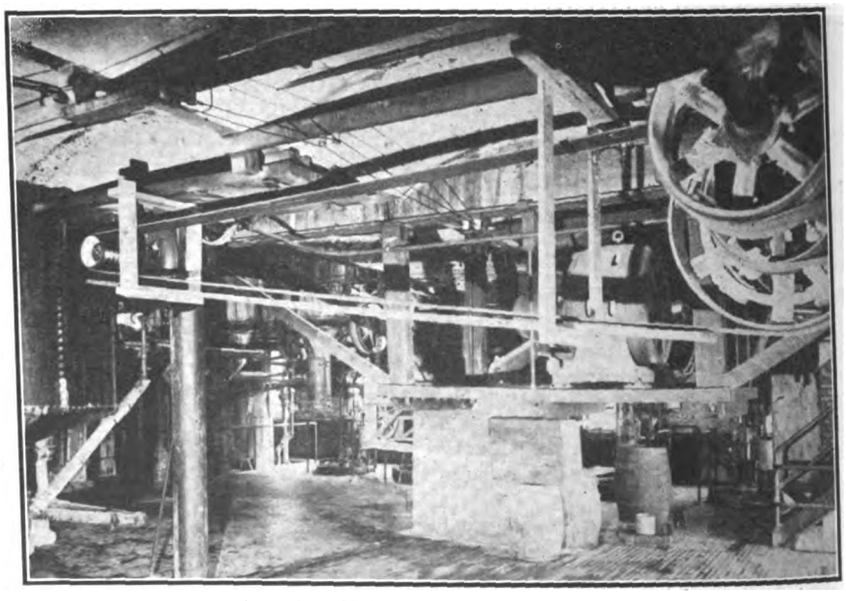
Possibilities of Electric Piano-Player Shown.

At a recent joint meeting of the New York Electrical Society and the National Electric Light Association a demonstration was given of an electrically operated piano-player. Elmer A. Sperry, president of the society, in an address preceding the concert made a number of pertinent remarks concerning the possibilities of this device as a central-station load builder, from which the following extracts are taken:

"The importance of the new art of the electrically-driven player-piano is not at all appreciated. It may be said that the entire piano industry is now devoting its attention and energies to the subject. On the assumption that there are 300,000 pianos made yearly in this country, a figure which is somewhere near the actual fact, and that the average piano remains in use at least ten or fifteen years, it will be seen that there are some four million pianos in actual service in the United States at the present time. Assuming that only one-half the population of the country is within reach of central-station circuits, it appears at once that at least two million pianos could be electrified. Going one step further and allowing that each piano requires a motor of about one-tenth horsepower, and the average may be higher, this would represent a possible demand for 200,000 horsepower of central-station energy some time during the day steadily for two or three hours at a time. Such a new demand is not to be despised, and this is one reason why the Commercial Section of the N. E. L. A. has been investigating the subject with the idea of placing an electrically-driven player-piano in every electrical showroom in the country. The subject, however, goes far beyond this, and interests the entire electrical industry, not only in its electrical and scientific aspects, but because of the enormous new demand that it opens up for motors, switches, wire, control apparatus and other elements and apparatus."



Oil Presses Driven by 7.5-Horsepower Motor.



Induction Motor Driving Soap Crutchers.

Free energy will be supplied by the Topeka Edison Company to all exhibitors at the electrical show to be held in Topeka, Kans., January 17 to 29.

Digitized by Google

Commercial Practice
Management, Rates, New Business

Electrical Toy Display Shows Wide Range of Suitable Gifts.

The accompanying illustration shows the special Christmas window display of the New York Edison Company, in which an effort was made to show the innumerable electrically operated toys suited to boys and girls of all ages. A prominent feature of the display is the Christmas tree showing the effects secured by the use of an electric tree-lighting outfit.

Toy Display of New York Edison Company.

In attracting publicity to electrical toys and Christmas appliances, the New York Edison Company is laying special emphasis on their absolute safety, as well as on the educational value of operative toys.

The Hot Springs (Ark.) Street Railway Company has placed in operation permanent auto bus transportation between that city and the Golf and Country Club. While it is possible the street car lines will be extended in the course of the year to care for this traffic the street railway company inaugurated the bus service because of the increasing traffic, which made necessary some permanent and satisfactory form of transportation.

Chicago Grocer Buys 11 Electric Trucks and Sells 300 Tons of Coffee as Result.

After a careful study of transportation methods, covering a period of two years, Reid, Murdoch & Company, wholesale grocers, of Chicago, decided upon the electric vehicle as best suited to its needs and consequently purchased a fleet of 11 Walker trucks of three and five tons capacity. Coincident with its decision to use the electric, the company, which operates a large electrically driven coffee-roasting plant, conceived the idea of capitalizing on the advertising value of an electric delivery system by inaugurating a coffee-selling campaign based on its modern equipment for producing a meritorious article and on its improved delivery system.

Numerous circulars embodying these thoughts were distributed, and although the present time is said to be the dull period in the coffee business, over 600,000 pounds were sold during the campaign, which lasted less than 30 days. Officials of Reid, Murdoch & Company state that at no other time in the history of the company has such a volume of business been done with so small an advertising expenditure.

The culminating feature of the campaign was a parade of the company's new electric vehicles loaded with coffee, bought during the campaign, which was held in the business district of Chicago on Wednesday morning, December 23. It was originally thought that the company's fleet of 11 vehicles could handle the sales, but this was soon seen to be impossible. The Commonwealth Edison Company therefore was called upon for help, and loaned 60 of its electric trucks for the parade. Fourteen additional electrics were secured through the Walker Vehicle Company, making the total number in line 85, each loaded with about two tons of coffee.

The parade led by a police squad and band, attracted considerable attention, and undoubtedly will result in stimulating interest in electric delivery. One of the features of the parade which had an influence of the enormous sales made was the offer of the company to send photographs of the event to every purchaser with his name prominently displayed as contributing to its success.

Wichita Show-Window Contest Stimulates Window Lighting.

As a result of the unusual publicity accorded electricity during Electrical Prosperity Week many central-station companies are reporting exceptional sales of appliances and a continuation of the marked activity that was inaugurated during the week. In many instances special electrical decorations or interior lighting installed for the week has been so satisfactory that many of these installations ar remaining intact at least until after the holidays and in an appreciable number of instances the installation will be made permanent.

Wichita, Kan., perhaps was as active in celebrating as any city in the country and as a result T. Harvey, sales manager of the Kansas Gas & Electric Company reports an unusual amount of business. One particularly noteworthy result has been the marked improvement in window lighting. During Electrical Prosperity Week a prize window contest was held in which over 100 business houses entered. As a result of this the window lighting in practically every instance was improved and made permanent.

Digitized by Google

New Form of Street-Lighting Contract Proposed for Racine.

What is said to be the first "indeterminate" street lighting contract ever offered a city in the country has been submitted to a committee of the Racine common council by S. B. Way, vice-president and general manager of the Milwaukee Electric Railway & Light Company. The terms permit the electric company to make expenses and 6 per cent interest on the money invested, prevents it from making any profit beyond that, and guarantees it against loss. The price of lights is determined by the actual cost of operating the service. The price of service will be adjusted every year. If the city has ordered numerous extensions and costly underground work, the average charge per lamp will be increased to meet the expense in excess of the average cost under present conditions. If no material changes are made in the equipment, the tendency will be to reduce the cost through more efficient operation. If lamps are ordered installed at points where the expense is not heavy it will reduce the average cost.

To begin with, the company estimated its special investment devoted to street lighting to be worth $62,294.60, and there has been set aside a replacement reserve of $10,084.44. On this basis Racine will get street lights the first year more cheaply, it is claimed, than any city of its size in the country. The proposed and the present prices follow:

	New	Old
Arc lights, overhead circuit	$53.52	$72
Arc lights, underground circuit	78.70	90
Mazda lamps, overhead circuit	20.16	21
Mazda lamps, underground circuit	28.06	21

In case underground conduits are laid, the street lighting department of the company is charged up with only a proportionate share of the cost, according to the proportionate amount of the conduit space used for exclusively street lighting purposes. The city guarantees the company that it will receive each year five per cent of its investment in special equipment for replacement reserve; one-half per cent for insurance; one and a half per cent for taxes; six per cent for interest; direct operating expenses and its share of joint operating expenses. The city guarantees a return only upon a proportionate share of the cost of equipment installed for joint use of the street-lighting service, commercial-lighting department or street-railway department.

The city can terminate the contract at will by paying to the company the difference between the accumulated replacement reserve plus the scrap value of special equipment, and the actual cost of that equipment. The cost of fixed charges and operating expenses on joint investment for public lighting and commercial service is subject to review by the state Commission. The costs of new special equipment and operating expenses for street-lighting alone are to be reported to the city each year, the books always being open to city officials. Provision is made in the contract for payment to the city in case lamps contracted for are not lighted during the hours required.

Electric Service A La Carte.

"Service—à la Carte" is the human-interest caption of an interesting article which the Philadelphia Electric Company is bringing to the attention of its patrons through the medium of its house organ known as the *Bulletin*. The author tries to impress on the minds of the readers the tremendous organization and equipment which must be necessary to "keep electricity always on tap, as electricity isn't a commodity which can be manufactured far in advance and stored away indefinitely until needed. It must be manufactured as used."

The ability of a customer to always have service available, at the snap of a switch, day or night, is pointed out and this is contrasted with the conditions encountered in the use of other commodities.

"About every so often, the milkman gets caught in a snowstorm and you drink your coffee black and eat your cereal without cream. Or, the baker is delayed on the route and you miss your favorite rolls at breakfast. You realize, of course, that such things are bound to happen, more often than not through no fault of the tradesmen but because of adverse conditions over which they have no control. Yet, suppose a thunder-shower should come up, in about ten or fifteen minutes, as they often do in the summer, and every store, office, factory and home in Philadelphia using electricity should decide within five minutes that it was getting dark and that, a little light would be desirable. Suppose we did not have the capacity and facilities to take care of such an enormous and instant demand, and the pressure of your finger on the switch wouldn't bring the desired light!

"There are probably more complications and what seem to be almost unsolvable problems involved in the distribution and delivery of electric current than in any other industry. The general public, of course, isn't in position to realize it. To the average person, we dare say, it seems like a very simple proposition to have electricty instantly available at any hour of the day or night.

"We're not in business because of altruistic motives. But we *are* engaged in a business where the greatest thing we have to sell is 'service.' And by service we do not mean merely delivering to your home, store, factory or office a given number of kilowatt-hours of electric current every month for a stated amount. Service to us means an earnest desire on our part to co-operate with the great general public in making the most out of the electricity for which they pay. It means, also, that we, as a public service company, must go farther than almost any other kind of business in popularizing our product; for not only is electricity, in the final analysis, a commodity to be merchandised like any other necessity, but it is the common denominator of the many problems and operations incident to the routine of the business world and the home."

Electric Cooking Prospects in Boston Encouraging.

The campaign of the Boston Edison Company for the promotion of the electric cooking business, which was started several weeks ago with the slogan: "One thousand electric ranges within a year," is developing with marked success. The demonstration held during Electrical Prosperity Week resulted in many sales and multitudinous inquiries.

According to General Superintendent W. H. Atkins, there should be no less than 10,000 new apartments built in Greater Boston during the next ten years. Under present cooking rates at least 50 per cent of these should be procurable as customers. An average income of $20 per year would represent a total of $100,000.

There are about 1,400 tailors in Boston, all using gas irons. An electric iron would be much more efficient and economical. Its average consumption would be 75 kilowatt-hours a month, or $1.50 on the 2-cent rate.

Estimating three irons per tailor shop, the income from this source alone would amount to $76,000 a year.

Pertinent Christmas Advertising.

The Cumberland County Power and Light Company, Portland, Me., in a large display advertisement in local newspapers, pertinently asks: "Why not make a present to the whole family this year by having the house wired for electric lights?" What it means to mother is outlined as follows:

"She can use an electric iron.

"She can use an electric toaster, coffee percolator, and 996 other appliances."

What it means to the children:

"A cheerful home; electric warmer for baby's milk; soft, steady light to study by; easy operation; absolute safety from fire."

If elderly people are in the home, the convenience is just doubled. The company says the average time taken to wire a house is three days.

Digitized by Google

St. Louis Company's Customers Reach 65,000 Mark.—Rates Are Reduced.

On December 1 the number of customers served by the Union Electric Light & Power Company, St. Louis, Mo., reached the imposing figure of 65,000. Coincidently, in accordance with an offer previously made, the company reduced its primary residence rate from 9.5 cents net per kilowatt-hour for the first four kilowatt-hours per active room to 8.55 cents.

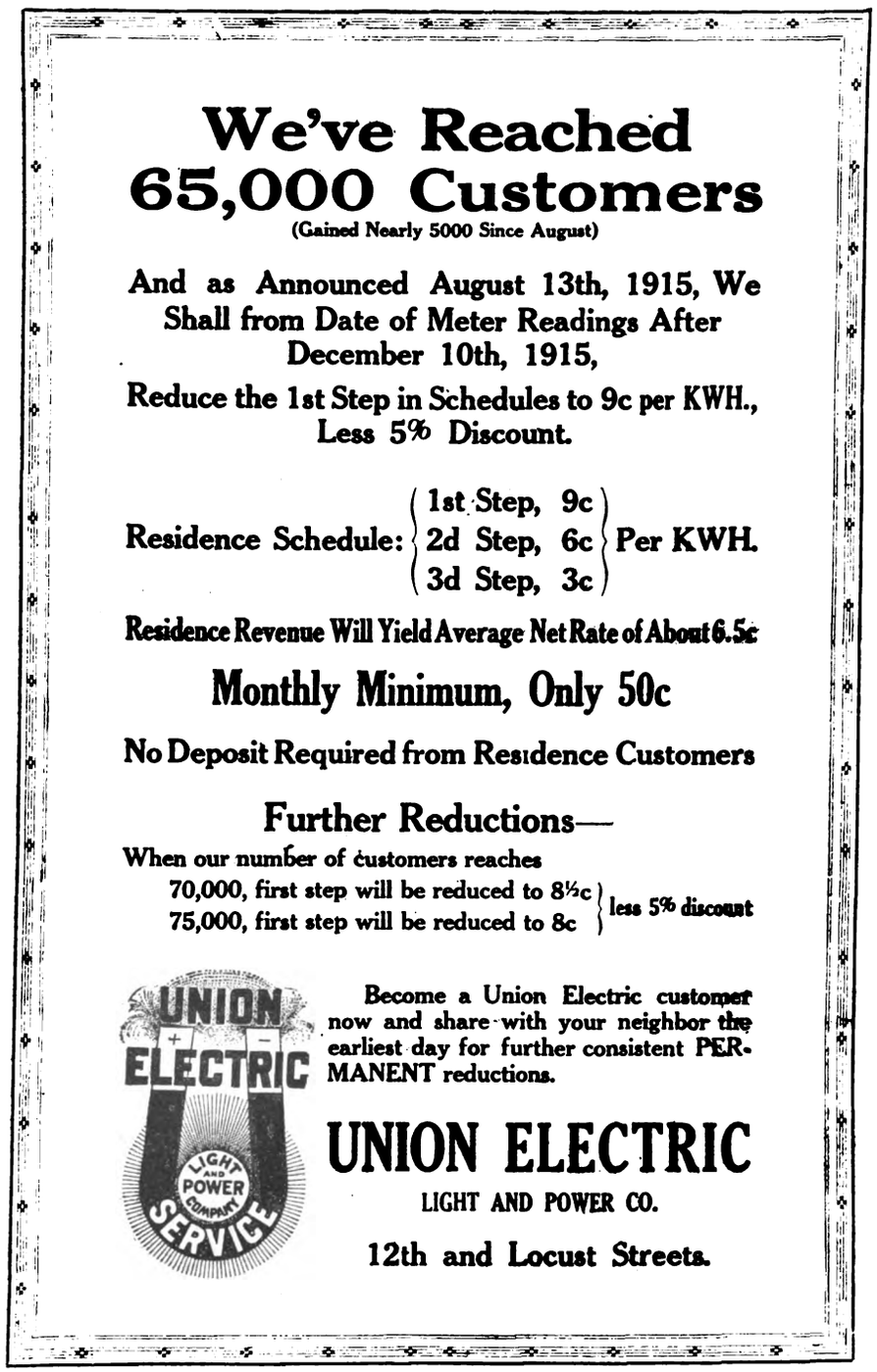
Some time ago the Union company adopted the commendable policy of encouraging customers to take a personal interest in the growth of the company by offering to reduce rates as the number of customers increased. In an advertisement published at this time the following reductions were offered.

When the total number of customers reaches 65,000 reduction to 9 cents per kilowatt-hour.
When the total number of customers reaches 70,000 reduction to 8.5 cents per kilowatt-hour.
When the total number of customers reaches 75,000 reduction to 8 cents per kilowatt-hour.

It was predicted that if sufficient activity was taken by existing customers the company would reach the 65,000-mark on December 1 and this prediction has been borne out. In order to reach this mark, 4,300 customers had to be secured in a period of four months. On August 1 the company had 60,700 customers.

In its advertisement urging the co-operation of customers in increasing the business of the company so as to make further reductions possible the company says:

"The supplying of electricity to the entire population of a city such as St. Louis involves a very large investment and plant, each customer is also an element of not only investment cost, but service expense, in addition to the cost of operation to generate the electricity and its delivery—with the increased use and growth of the business, lower operating costs are made possible."


We've Reached
65,000 Customers
(Gained Nearly 5000 Since August)
And as Announced August 13th, 1915, We Shall from Date of Meter Readings After December 10th, 1915,
Reduce the 1st Step in Schedules to 9c per KWH., Less 5% Discount.
Residence Schedule: 1st Step, 9c
2d Step, 6c
3d Step, 3c
Per KWH.
Residence Revenue Will Yield Average Net Rate of About 6.5c
Monthly Minimum, Only 50c
No Deposit Required from Residence Customers
Further Reductions—
When our number of customers reaches
70,000, first step will be reduced to 8½c
75,000, first step will be reduced to 8c
less 5% discount
UNION
ELECTRIC
LIGHT AND POWER COMPANY
SERVICE
Become a Union Electric customer now and share with your neighbor the earliest day for further consistent PERMANENT reductions.
UNION ELECTRIC
LIGHT AND POWER CO.
12th and Locust Streets.

Advertisement of St. Louis Company Announcing Rate Reduction.

Electrically Driven Waterworks Plant Recommended for Nashville.

In a report on the Nashville waterworks, presented to the City Commission by James C. Cameron, who is conducting an audit and efficiency survey of the municipality's affairs, the recommendation is made for a combination of the city's power plant and the waterworks. The city's electric plant is not a public station but is used for generating power for municipal works and lighting only.

It is advised that new electrically driven centrifugal pumps be installed at the waterworks to supplement the present system, particularly in case of emergency. The cost of the combination will be $111,500 and will save $28,000 annually.

Boston Company Secures 2,605 House-Wiring Contracts in Two Years.

During the two years in which the Boston Edison Company's house-wiring plan has been operated, 2,605 contracts have been made, aggregating $225,000. The added load is 260 kilowatts, representing a yearly income of about $60,000.

For the whole time, the number of contracts secured averaged about 100 a month, while for the last 2.5 months the average was about 200.

The largest number of contracts executed outside of the city of Boston was in Newton, where 244 houses were wired. The next largest number was in Somerville, with 190 houses wired.

Municipal Christmas Tree for Louisville.

Under the direction of the Woman's Outdoor Art League, a municipal Christmas tree will be set in Lincoln Park, on Fourth Street, Louisville, and serve as the center about which various ceremonies will be held during holiday week. The Federal Sign System (Electric) which maintains a large sign immediately back of the park, has volunteered to look after the wiring on the tree, and will supply the current to keep it illuminated at night.

Digitized by Google

Electrical Construction

NOTES ON INTERIOR WIRING.[1]

By Terrell Croft.

Underground Entrances.

Underground entrances to buildings should be installed very carefully because frequently no fuses are provided in the entrance conductors where they connect to the mains in the street. Consequently a short-circuit between the entrance conductors within the building or an accidental earth connection between one of the conductors and ground within the building could create a dangerous persistent arc which might originate a fire, particularly if combustible material were in its vicinity.

Underground conductors must be so arranged that they cannot shunt the current around a catch-box through a building. A "catch-box" is a junction box of an underground system at which the underground mains or conductors are fused as shown in Fig. 1. Fuses were, it is said, in the pioneer days of the industry called "safety catches." Hence, a catch-box is a sort of fuse box. Consider the conditions of Fig. 1. This illustration shows the distribution panel in a building in the block in the center of the picture which is served from underground mains. This distribution panel is fed by two services, one from *D* and one from *B*. They both connect to the busbars of the panel at *C*. If it happened that the fuses in box *A*, at F_1 or F_2 were blown, current from the source of energy *G* would feed toward *E* through the building via the route *B C D*. Now, if it happened for any reason that the entrance cutouts at *H* and *I* failed to operate, the conductors *B C D* might carry a current far in excess of that they were designed to serve, and a fire might, under these conditions, be started.

Another dangerous feature of the arrangement shown in Fig. 1 is that a person unfamiliar with the fact that the building shown had two entrances, might open one entrance switch, that at *I*, for instance, thinking that he had disconnected service from the building, whereas voltage might still be impressed on the busbars via the entrance *B*.

Underground entrance tubes to buildings should be closed at their ends in the buildings with asphaltum or cement, so that the gases that frequently exist in subways in underground systems cannot enter the buildings and cause explosions. Underground subways for electrical conductors are often "gassy," that is, gas leaks into them from gas mains and it may, and frequently does, mix with just the proper proportion of air to form a very explosive mixture. Manhole heads are frequently blown off in cities due to this condition, the gas becoming ignited, by an accidental electric arc between the underground conductors or by some other means.

Carrying Capacities of Conductors.

The allowable or safe carrying capacities of conductors are determined by the currents which these conductors will carry continuously, that is, for an indefinite period, without becoming so hot that they will injure their insulations or materials adjacent to them. Whenever a current of electricity flows through a conductor, heat is developed in the conductor. If the square of the current in the conductor be multiplied by the resistance of the conductor, the rate of heat development in watts will be the result. Note that the heat developed varies directly as the *square* of the current, that is, if the current in any conductor be doubled, the heat developed in that conductor will be increased four-fold.

The safe current-carrying capacities as given in tables, for example, in Rule 18 of the National Electrical Code, must not be taken as values which *cannot* be exceeded. Such values should not, however, be exceeded, hence they are safe values rather than ultimate values. For example, the safe current-carrying capacity of No. 14 wire (rubber insulation) is 15 amperes. Now, if a current of 20 amperes, for example, be forced through No. 14 wire, nothing will happen except that the No. 14 wire will become warmer than it would with 15 amperes flowing through it. The chances are that if a current very much greater than 15 amperes were forced through it continuously the heat thereby developed would injure the insulation on the wire. Beginners frequently assume that the safe current-capacity values of Rule 18 indicate the currents which will fuse or melt the conductors of the different sizes to which the values apply. This impression is, or course, erroneous, inasmuch as it requires currents many times as great—possibly 10 or 12 times—as those shown in Rule 18 to melt in two or fuse copper conductors of the sizes there given. For example, it requires a current of about 180 amperes to fuse or melt a No. 14 copper conductor, whereas the safe carrying capacity for this wire is, for rubber insulation, 15 amperes.

Safe current-carrying capacities of aluminum wires are smaller than those for copper wires because an aluminum wire of a certain size has a greater resistance than a copper wire of the same size. Hence the heat developed in an aluminum wire by the passage of a current is greater than that product in a copper wire of the same size by the passage of the same current. Since, as stated in Code Rule 18, second paragraph, aluminum wire may be assumed to safely carry currents 84 per cent as great as those allowable for copper wire, a No. 3, B. & S. gauge weatherproof-insulation aluminum wire has a carrying capacity of 0.84 x 100 or 84 amperes. Note that a No. 3 weatherproof insulation copper wire has an allowable or safe carrying capacity of 100 amperes.

The basis of the determination of the allowable carrying capacities of rubber-

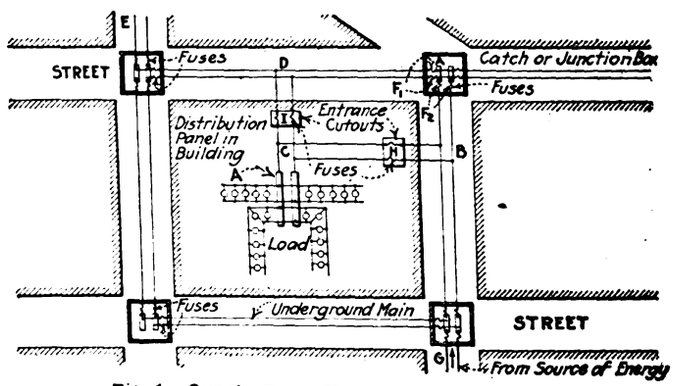


Fig. 1.—Supply From Two Underground Mains.

1 All rights reserved. Reprint forbidden.

Digitized by Google

insulated wires is outlined in the Associated Factory Mutual Fire Insurance Companies' book of rules. It has been demonstrated that if maximum life is to be obtained from rubber its temperature should at no time be permitted to exceed 150 degrees Farenheit. The carrying capacities listed in Rule 18 are based on experiments performed in 1889 by A. E. Kennelly. The allowable current values listed in Table A (rubber insulation) are about 60 per cent of those which were found to produce a final temperature of 150 degrees in wires of the sizes tabulated. Note that if an average temperature of 75 degrees be assumed, the rise in temperature for the final temperature of 150 degrees is 75 degrees. To provide a working margin, only 60 per cent of the current that the experiment showed would produce this 150 degrees final temperature was taken as the safe value. As the situation really stands, then, if the currents given in Table A flow in conductors of the sizes indicated the temperatures of the conductors will rise about 30 degrees Farenheit above the surrounding air.

The basis of the determination of the allowable carrying capacities of conductors with insulations other than rubber is essentially similar to that used for the rubber-insulated conductors. Insulations other than rubber will probably withstand, without damage, somewhat higher temperatures than will rubber, and furthermore, "other insulated" conductors should never be concealed but should always be supported in the open on glass, porcelain, or other non-combustible insulating materials. Rubber-insulated conductors must often, for example in conduit or in metal molding, depend wholly on their rubber coatings for their insulation. For these reasons the safe carrying-capacity values of Table *B* (insulations other than rubber) were taken as about 90 per cent of the currents which were found by experiment to heat the wires to an ultimate temperatures of 150 degrees Farenheit with a room temperature of 75 degrees. Hence the working margin for the conductors with insulation other than rubber is 10 per cent as against 40 per cent for the rubber-insulated wires.

The current that will cause the insulation on a conductor to smoke is stated in the Factory Mutual rules to be (approximately), for all ordinary insulations, three times the safe values given for the conductor sizes specified in Table A of Code Rule 18.

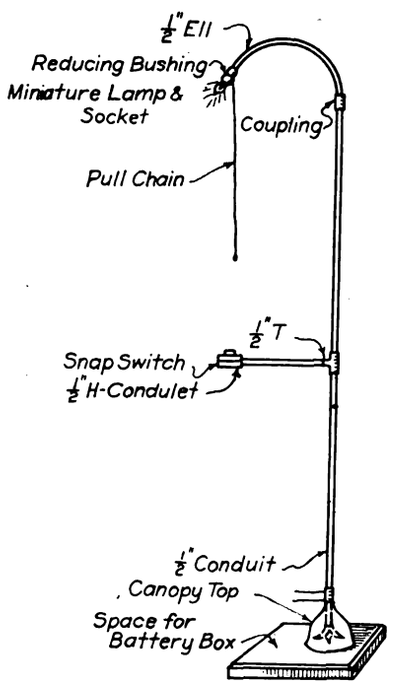
The allowable capacity for wires for temporary exposed work is frequently taken in practice as equal to twice the allowable capacities as specified in Rule 18. For example, if a No. 3 wire were used for temporary connections for making the test of an electrical machine it can be counted on to carry, without excessive heating, twice the tabulated value (100 amperes) that is, 200 amperes. It should be understood that the information in this paragraph merely recites what is sometimes done without authority and which is considered safe in practice. The rules of the Code do not permit allowable capacities tabulated under Rule 18 to be exceeded.

The allowable carrying capacities of outdoor wires are not specifically indicated in the Code. The values of Rule 18 inasmuch as this rule falls within Class C of the Code, apply specifically to inside work. It is the usual practice, however, to so select conductors for outside wiring that the carrying-capacity values of Table B Rule 18, will never be exceeded.

Portable Floor Lamp.

The illustration herewith shows in detail a portable bedside light, which I have made use of myself.

It is simple in construction and is portable, easy to handle, and of great use in sick rooms, where the regular service is not used, and also where a light is needed only for a short time to attend to children or a sick person. It is clean and takes very little room. If coated with gold paint it makes a nice looking fixture.



Portable Floor Lamp.

Only the pull socket is needed, the snap switch can be left out, while if only the snap switch is required a regular keyless socket can be used.

The wooden base is made of heavy wood to prevent it from falling over.

William T. Estlick.

Considerable deposits of tungsten ores have been found in the Province of Tacna, Chile, and at Llallagua, Bolivia.

What the Operator Should Know About Slotted Commutators.

The slotting or grooving of commutators by cutting away the mica below the surface of the copper is a practice that seems to be effective in the prevention of some commutator and motor troubles. Advocates of this practice claim that during the last eight years since commutators have been so treated about 70 per cent of annoying motor troubles, such as flash-overs, grounded and burned-out armatures, have been reduced or effectively handled with a saving of commutator wear and increase of brush life. Slotting has been most extensively practised in the electric-railway field and is now being applied to other motors where commutating conditions are severe, as with crane and elevator motors, and to some extent to the commutators of direct-current generators and rotary converters, where the speed is high enough to prevent dirt from collecting in the grooves between the bars.

When operating machines with slotted commutators certain precautions must be observed to secure the best results. By blowing out frequently with compressed air, the slots should be kept free from oil, dirt, carbon and copper dust to prevent short-circuits between bars. Oil or grease forms a gummy deposit when mixed with carbon or copper and can not be blown out of the slots, so that a careful inspection should be frequently made to see that oil from bearings is not leaking into the motor case and getting on the cummutator. The use of high-grade carbon brushes is advised for slotted commutators. Brushes that wear away rapidly and cause a considerable carbon dust should not be used. The brush tension with slotted commutators is usually less than a non-slotted commutator. For railway work the brush pressure usually varies from 4 to 7 pounds per square inch of surface contact, while for stationary machines the pressure varies between 1.5 and 3 pounds per square inch. The determining factors in slotted commutators are the peripheral speed of the commutator, the percentage of mica, and the grade of the brush used. The size of the machine has little or nothing to do with it, except that the conditions—high speed, large percentage of mica and high-current-density brushes—are usually found in large machines.—*Southwestern Electrician.*

New Zealand Telephones.

The telephone system of New Zealand is being rapidly developed by the National Government with up-to-date material and appliances, much of which is now coming from the United States.

Digitized by Google

BUSINESS HINTS FOR DEALER AND CONTRACTOR.

By G. D. Crain, Jr.

Motion in Window Displays.

The value of motion as an attention-getter can hardly be overestimated. If a thing is still the eye passes over it without being held, unless there is something out of the ordinary to say "Halt!" But there is never any question about the moving display getting the undivided attention of the passer-by, even for a brief interval. He wants to find out what is moving, and why it is moving; and he stops and looks.

During the holidays a good many electrical dealers are resorting effectively to motion to assist in making their window displays more successful. The idea is easy enough to carry out; simply have a revolving table geared up, with a motor providing the power, so that the goods displayed move around at a low rate of speed, slow enough to enable individual items to be studied, and rapidly enough to make people look twice.

And that, after all, is the problem! Getting the second look. The first glance tells only generalities; it is only when the possible customer looks with his mind as well as his eyes that he is likely to be impressed. And motion is undoubtedly a powerful factor in forcing that second look, which furnishes the opportunity to sell.

Advertising on the Job.

A novel and interesting way of advertising "on the job," which is one of the most common methods of publicity among contractors, is to co-operate with other concerns, all obviously non-conflicting, to advertise the job as a whole, as well as the individual houses having the various features in charge.

Often the electrical contractor contents himself with tacking a paper sign on a scantling and letting it go at that. A good many people may see the sign, but the number who see it is much smaller than the total number of passersby, while the method in which the announcement is presented is not calculated to get the maximum amount of "good-will advertising"—the object of putting up the sign in the first place.

Where the work is of real consequence, and especially if it is being done in the congested district, where the number of people passing is great enough to make advertising to them of consequence, the following plan will pay in increased effectiveness for the time and trouble taken with it.

The idea is to erect a large painted signboard on the work, big enough to be seen easily from the street and at all angles. It should be illuminated at night.

"This Is a Quality Job—Quality Firms are Doing the Work," is the caption which it may carry, furnishing an introduction to the houses which are handling the various details. Below will follow the name of the general contractor, if there is one, and then the names of the electrical contractor, the concern putting up the brickwork, the structural-iron work, etc. The list, as presented in this way, is impressive, and the grouping of the contractors gives a dignity to the announcement which it could not have, considered as the individual expressions of the various concerns.

Fixtures and Architecture.

The fixture dealer has got to know something about architecture, or, at least, have a feeling for architectural propriety that will enable him to advise his customers along the right lines.

Of course, if he is going after the cheap work, where stock designs are easily suitable, and where the amount involved does not justify extensive study of the details, there is nothing more to be said, but if he wants to capture the really high-class fixture contracts of his community, and break into the field where the competition is less keen and the margin of profit is more liberal, he must know his business in reference to architecture.

A mere slap-dash, superficial knowledge will enable the dealer to "get by" occasionally, and to impress the uninitiated, but if he wants to make a favorable impression on those who know, and who demand expert, and not merely pseudo-expert opinion, he must be equipped to meet the requirements of the situation.

The leading fixture dealer in a city of 300,000 is a man, who, it is true, is an aggressive business-getter, but he has established his concern at the top of the heap not merely through being aggressive, but through knowing so much about fixtures in relation to house-building that people who want to get information on that subject go to him for it—and then buy from him as a matter of course.

Architects are traditionally conservative about asking the dealer or the business man handling any class of material for information; yet this fixture expert is constantly called on to make suggestions for special jobs where something out of the ordinary is required. Not long ago an architect was designing a Gothic church, and before he laid out the plans for the fixtures he called this merchant into consultation and got his opinion. The result was a special job, because the fixture concern could not supply the goods out of stock, but it was given the business, and placed the order with the manufacturer on a profitable basis.

There is a real-estate man in that town who does an immense amount of home-building. He is not technically trained, architecturally speaking, but he knows how to work attractive features into a home. He never dares to specify fixtures, however, without taking the dealer referred to in his automobile to the building, and getting his ideas on the sort of goods which should be installed to be in keeping with the general character of the house, and to make the best impression on possible purchasers.

Perhaps those who are getting fixture business without having even the most remote idea about the status of their goods, considered as an architectural detail, may imagine that all this is merely an embellishment, rather than a business necessity. Perhaps so, but the main thing about it is that it gets results. And anything which pulls business in the difficult field of building construction is worth considering, aside from the value of being able to render real service.

The Factor of Time.

Every dealer and contractor who has had to buy printing knows how irritating delays in making deliveries of the work may be. The average printer is a good mechanic, but there are so many loose ends of his business that he always has trouble getting out the work at the time he promised it.

By remembering how he feels when concerns upon which he relie. for goods or service fall down on the job, the electrical contractor can appreciate the sentiments of those who are waiting for him to get out of a building. Those who are the last in, and hence the last out, are always the ones to feel the pressure from the owner and architect. While the building is in its early stages, nobody pays any attention to the amount of time consumed in getting the work done, but when it is under roof and the final touches are being put on, every concern which has anything to do with the job feels the prod of the sharp stick used by those who are anxious to begin getting a return on their investment in the form of use or rents.

Of course, the electrical contractor who says that his work will be finished at a certain date and is through at that time may disregard the attempts to rush him, but if he has not kept his promise in that respect, he may expect to be harried until his life is made miserable by everybody who has anything to do with the work, and to have to put on steam to an extent that makes his men and everybody connected with his organization uncomfortable. It's bad business all around, and doesn't make for the best of work, either.

The contractor who gets through

Digitized by Google

when he says he will develops a reputation for doing that sort of thing—and those are the people the architects are likely to put on the preferred list. Another item in the same connection is getting out estimates for work to be done in good time. Even if there is no formal closing date, you may nevertheless find it to advantage to have your estimate in early, and thus save the architect or owner the trouble of making many telephone calls and delaying the game generally.

Time is valuable, and usually the time of the contractor has a bearing on the time of a good many other people. That is why it is so important to save as much of it as possible.

Exposed Work Barred in Louisville.

Notice has been given to contractors, property owners and others, that beginning July 1, 1916, the Louisville (Ky.) City Building Inspector's department will extend to all parts of the city the requirement that all electrical wiring shall be inclosed in metal conduits. Last July the department put the metal-construction rule into operation in the district between the river and Broadway and Preston and Twelfth Streets, and the time is now ripe, according to W. J. O'Sullivan, inspector, to extend the requirement to cover the entire city. His statement, in part, said:

"Aside from the elimination of the fire hazard from crossed wires, it has been found that metal construction is very little, if any, more expensive than exposed wire construction. Running the wires in flexible steel conduits means shorter lines, a safer job, in many instances a lowered cost and almost certain inspection. Hidden defective joints that increase the fire hazard are impossible in metal construction. Electrical contractors with a stock of single-braid wire on hand no longer need fear financial loss from a metal-construction rule, for single-braid wire may now be used in metal construction. Many contractors have told me that, although they have bid on exposed wiring, they have found it cheaper to substitute metal construction, so as to shorten their lines and preclude the possibility of having to do part of the job over again, so that it would pass inspection."

In this connection it may be noted that the Louisville department has adopted a new type of condemnation notice. Each city inspector is now supplied with a blank book with a form which he can fill out on the spot. Previously it has been necessary to make use of special forms kept at the city hall, a form for every kind of condemnation. The new blanks will cover condemnation for any violation.

Construction Started on New Hydroelectric Plant in Tennessee.

The Tennessee Power Company has begun engineering work in preparation for hydroelectric development at Great Falls, on the Caney Fork River, for the purpose of adding 10,000 horsepower to its transmission lines. It is said that the development can be increased to 30,000 or 40,000 horsepower whenever this is needed. The E. W. Clark Management Company, of Columbus, O., which directs the operations of the Tennessee Power Company, is in charge of the construction, M. S. Hopkins, vice-president, being personally in charge. The offices of the Tennessee Power Company are at Chattanooga, but the office of F. W. Hoover, the president, is located at Nashville.

Ground has already been broken for the dam to be built across the river at the top of the falls. This dam is for the purpose of backing up the water, and a tunnel will be made through the bluff at the side of the falls to divert a stream of water to operate turbines. The construction of the dam and plant will cost, it is estimated, $500,000. The E. W. Clark Company, it was first announced, would undertake the work itself, but it is now probable that it will be done by contract.

The Tennessee Power Company now obtains 65,000 horsepower from two river plants at Ocooe, Tenn., and at various steam plants in a number of smaller cities. It now supplies Chattanooga, Knoxville and Nashville—supplementing a steam plant at the latter place—together with a large number of smaller towns in Tennessee and northern Georgia. With the new development several other towns will be entered. It is planned to begin work January 1, and to complete it in five months.

Use of Steel in Electrical Fittings Is Voted Down.

At a conference held in the Hotel Biltmore, New York, last week between the Underwriters' Laboratories and manufacturers of electrical fittings, it was decided to rigidly restrict the use of steel for electrical purposes. The Underwriters' Laboratories called the conference in order to obtain the sense of electrical manufacturers on the subject. After a thorough discussion of all the reasons for the use of iron and steel as a substitute for copper or brass in certain electrical fittings it was unanimously decided "that for wiring supplies steel or iron, plain or plated, shall not be used for current-carrying parts or for movable binding screws or for binding screws and nuts where cable lugs are not used."

It was also unanimously decided that for panelboards, switchboards and knife switches "steel or iron, plain or plated, shall not be used for current-carrying parts or for movable wire-binding screws or for wire-binding screws and nuts where cable lugs are not used. Hinge bolts, spring washers and nuts of knife switches are considered as not being current-carrying parts."

Among the Contractors.

The Touhey Company, Springfield, Mass., has opened a branch store, called The Electric Shop, at 406 Main Street, in the center of the shopping district. A complete line of high-class electrical appliances is shown. The window and counter displays are such as to attract the women shoppers who trade at the large dry-goods stores near by.

Contract for wiring the new Moose lodge home in Decatur, Ill., has been awarded to R. W. Trotter, a contractor of that city.

The Childers & Waters Electrical Company, previously the Childers & Waters Company, Louisville, Ky., has filed a second amendment to its charter, making a second change in the name, which now becomes the Childers Electrical Company. Those wso signed the petition are C. C. and Lula B. Childer, William Zeigler and A. G. Renau, Jr.

The company is completing a contract for installation of four motors in a new box factory which is being constructed at Twentieth and Tyler Streets by the Ben B. Ott Manufacturing Company. The plant will have a capacity of 1,000 boxes daily.

The Peerless Electric Company has opened at Providence, R. I., a new appliance shop, known as the Electric Store, opposite the Union Station. Christmas lines of appliances are at present the leading features, but the company announces that it will carry a full line of all things electrical.

The Martin Electric Company, of Des Moines, Ia., has purchased the business and assets of the Martin & Smedes Electric Company and will hereafter be located at 320 Hubbell Building, Des Moines. One of the first important contracts announced by the new company is that for wiring the Highland Apartments which will be the most modern and complete building of the kind in the city. Each apartment will be equipped with a house telephone as well as a city telephone and modern electrical equipment will be installed throughout. J. H. Martin is president and general manager of the new concern.

Digitized by Google

Public Service Commissions

Conducted by William J. Norton

COLORADO.

Colorado Springs Light, Heat and Power Company. The Public Utilities Commission ordered a reduction in the rates of the Colorado Springs Light, Heat and Power Company for electric service. The company is operating under a franchise from the City of Colorado Springs, in which maximum and minimum rates are fixed, but the Commission took the position that such a franchise does not exempt a public corporation from state regulation. On the theory that the "state merely loans to the city the right to enter into contracts with such corporations until it decides to exercise its police power and intervene," the rates fixed by the franchise are set aside and a new schedule ordered.

The Commission fixed a final valuation of $2,315,453 on all the properties of the company. Upon this valuation an eight-per-cent return is allowed in the electric and gas utilities. The Commission held that it has not been given jurisdiction over the steam property.

At the present rates for gas, the Commission found that the return on a fair valuation of the gas property is only 1.16 per cent. The present schedule of rates is $1 per 1,000 cubic feet net, with a minimum of 50 cents per month per meter. No increase in those rates has been requested by the company, but the Commission stated that it would entertain a motion to such effect.

In this connection the Commission ruled that each unit of a utility must pay for itself and that one unit cannot be permitted to lose money which the utility regains by making a higher profit than warranted on another unit.

The company's rate for residence and commercial electric lighting was a straight meter rate of 11 cents per kilowatt-hour, with 10-per-cent discount for prompt payment and a minimum charge of $1.35 with 15-per-cent discount for prompt payment. The rates prescribed by the Commission are as follows:

For commercial lighting, 9 cents per kilowatt-hour for the first 30 hours' use of the customer's demand, 4 cents for the next 60 hours' use, and 2 cents for all excess, with 10-per-cent discount. The minimum is reduced to $1 a month.

For residence lighting, 10 cents per kilowatt-hour with a 15-per-cent discount and a minimum bill of $1.

The former power rate was made up of a fixed charge of 50 cents per horsepower and a charge of 7 cents per kilowatt-hour for current consumed, with a minimum of $1 per horsepower. The rates fixed by the Commission are 6.66 cents per kilowatt-hour for the first 30 hours' use of the customer's demand, 3 cents for the next 60, and 1 cent for all excess, with a 10-per-cent discount. The minimum charge is reduced to 75 cents per horsepower.

IDAHO.

Southern Idaho Electric Companies. After conferences with representatives of all the electric companies operating in southern Idaho, the Public Utilities Commission has issued an order fixing rates for electric power used for irrigation pumping purposes. Uniform rates, terms, and conditions are prescribed, which apply to alternating-current power service for use in irrigation during the season, from April 1 to October 1. The service, not in excess of the irrigation demand, may be used by the consumer throughout the balance of the year for general power purposes on the farm, the point of delivery being the same.

The new rates are a demand charge of $12 per year per horsepower of maximum demand, plus an energy charge. The energy charge varies with the size of the installation. For installations of less than 10 horsepower the energy charge is 5 cents per kilowatt-hour for the first 45 kilowatt-hours per month per horsepower of maximum demand, and 0.5 cent per kilowatt-hour for all excess. For installations of 10 horsepower to less than 25 horsepower, the energy charge is 5 cents per kilowatt-hour for the first 30 kilowatt-hours per month per horsepower of maximum demand, and 0.5 cent for all excess. For installations of over 25 horsepower the energy charge is 0.5 cent per kilowatt-hour for all current consumed. The rates for installations up to 25 horsepower are subject to a prompt-payment discount and the rates for larger installations are subject to quantity discounts.

INDIANA.

Terre Haute Water Company. The Commission has issued an order fixing rates for water service in Terre Haute. The value of the property was placed at $1,200,000, which included $80,000 for going value. Upon this value the rate of return allowed was 6.5 per cent. In giving a reason for the low rate of return, the Commission says: "When consideration is given to the fact that a large part of the investment in this property is surplus earnings it is our judgment that 6.5 per cent is remunerative. It is not only remunerative, but a reasonable and fair return."

WASHINGTON.

Pacific Power and Light Company. The Commission has ordered reductions in residential lighting rates in North Yakima and Walla Walla and a number of smaller cities served by the Pacific Power and Light Company.

The new rates in North Yakima and Walla Walla are: 8.5 cents per kilowatt-hour for the first 60 kilowatt-hours, 6 cents per kilowatt-hour for the next 60 kilowatt-hours, and 5 cents per kilowatt-hour for all excess. Power rates were not considered by the Commission in its order.

The Commission says that under the new rates the company will earn a return of 5.7 per cent, which may be increased to 6 per cent when business becomes better.

WEST VIRGINIA.

Uniform Rules and Regulations adopted by the West Virginia Natural Gas Association have been approved by the Public Service Commission. It is believed that practically all companies of consequence in the state will adopt the uniform contract form. The standardizing of company practice will undoubtedly lead to less confusion and misunderstanding between the companies and their customers.

WISCONSIN.

Ray W. Clark has been appointed law examiner for the Railroad Commission. Mr. Clark has recently been connected with the law firm of Aylward, Davis and Olbrich.

The hydroelectric plant of Compania Agricola y de Fuerza Electrica, at Boquilla, Chihuahua, Mexico, has been completed and put in operation. About 1,000 horsepower of the output is supplied to a mining company at Parral for the operation of a cyanide-ore-treating plant.

Digitized by Google

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 321.—Co-operative Meter Reading.—In one of the large cities I have observed that both the gas company and the electric company send out their inspectors to read meters in several districts on identically the same day. Both these companies are active competitors, although there is a community of interest among them. The electric company has been proclaiming that it practically serves its residence customers at a loss, due to the high cost of meters, meter reading, billing, etc. It seems to me that by uniting the meter-reading work in a single crew the cost of meter reading would be materially reduced. Now what I would like to know is whether any state utility commissions have passed on this point, namely, allowing competing utility companies to co-operate on meter reading for the joint benefit of both the companies and of their customers, most of which are in common.—A. Z., Spokane, Wash.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

No. 323.—Electric House-Heating in the South.—Where electric radiators are especially suitable for taking the chill off rooms on some cool mornings, as is the case in the South, is the expense of the special heating circuits required by some inspectors warranted by the comparatively little use these radiators would receive?—L. S. M., Galveston, Tex.

No. 324.—Circuit-Breakers for Motors.—In some cities the use of circuit-breakers in place of fuses, or without auxiliary fuses, is permitted where there is efficient supervision. What constitutes "efficient supervision" under these circumstances?—C. E. U., Chicago, Ill.

Answers.

No. 315.—Motor-Driven Motion-Picture Machines.—About what percentage of our large cities having over 100,000 population permit the use of motor-driven motion-picture machines?—S. P. L., Topeka, Kan.

There are several types of motor-operated motion-picture machines which are now approved by the Underwriters' Laboratories after being subjected to rigorous tests. Any of these types may be used in cities where the National Electrical Code is in force.—B. W. C., Detroit, Mich.

The office of the writer is not at present supplied with the necessary detailed information to make an accurate and comprehensive reply to this question. It might not be out of place, however, to trace the evolution of the standard motor-driven motion picture machine. At the outset, it is well to note that no well regulated district permits the old hand machine to be equipped with motor drive because it is not provided with safety devices calculated to effectively prevent fires.

In the old days, these machines were surreptitiously equipped with motors and, in many instances, were left to run while the operator in charge of same turned his attention to other duties either inside or outside of the booth. This practice resulted in a number of disastrous fires. In those days, the booths were of poor construction and few, if any, of them were properly ventilated. This condition permitted fires originating in the booths to spread to the theater building in which the machines were operating, causing considerable damage. The steady quality of the service which the motor drive provided, caused the manufacturers of motion-picture machines to set about designing a special machine which could be safely operated by means of a motor. These machines were equipped with cut-offs and other safety devices calculated to prevent fires from starting within these machines, or at least to prevent fires from escaping from the machines in case of accident. Following the advent of this type of machine upon the market there was considerable discussion as to whether or not such devices should be given blanket approval and permitted for general use This discussion resulted in the establishment in most up-to-date cities of license regulations and other supervisory legislation which tended to give the local inspector a much better control of the situation. Better booths and better vents were also provided and frequent inspection tended to keep the apparatus in good order, and soon established a much better grade of discipline among machine operators.

Under these circumstances, the modern motor-driven machine was in many respects safer than the old-fashioned machine which was hand-driven, but where such supervision is entirely lacking, operators have been known to vitiate the protective character of many of the devices upon these new machines, by interference with them, or the removal of them. This came to the notice of insurance rate-making bureaus, and it was decided that insurance rates should be increased where motor-driven machines were in service, unless some form of municipal supervision covering the operators was maintained.

The use of the motor-driven machine is quite general and extends to most cities having a population of over 100,000, and to quite a number of smaller cities. The need for supervising motion-picture machine operators is quite generally appreciated and much more attention is paid to this feature of public safety than was formerly the case. As a result, we find that cities which supervise operators effectively have almost eliminated the motion-picture film fire.

There is no really good reason why even the smallest city, town, or village, which can support a motion-picture theater, should not provide adequate protection for the patrons thereof, through the establishment of an adequate supervisory service.—W. S. B., Chicago, Ill.

No. 320.—Distribution Losses.—I have noted the article in your November 13 issue, giving the distribution losses of the Pacific Power & Light Company. In the average town of from 5,000 to 15,000 population, with three-phase distribution at 2,200 volts primary to 220-110 volts secondary, about what distribution loss, in per cent, does good practice call for? In actual practice, what *are* the average small-town distribution losses in per cent?—F. A. G., Columbus, Neb.

The lost and unaccounted for energy (that is, the energy supplied to the distribution system which does not appear at the consumers' meters) in the case of towns of the size mentioned is from 20 to 30 per cent in well managed systems. In some cases where a large amount of energy is sold for power purposes this figure goes as low as 16 per cent, but such small losses are unusual. Where there is a considerable amount of residence business and relatively little power business losses are usually between 25 and 30 per cent. The percentage which represents good practice will also depend so much on the relative number of small consumers and the scattered or compact nature of the distribution system that the only way to get close figures is to compare systems having about the same characteristics of load. The foregoing figures are not actual averages because no one knows what the real averages are. They are simply taken from the inspection of the actual annual distribution loss figures of a considerable number of plants of that class in my files.—J. R. Cravath, consulting engineer, Chicago, Ill.

In noting the cost of central-station service, we have at one end of the system

Digitized by Google

the present low generating costs and at the other the almost fixed charges per customer's service. Between these and somewhat illy defined by them is a large expanse, generally covered by the term "distribution costs." In the average central-station system of a large city, the fixed charges and operating expenses of the distribution system are nearly three times the fixed charges and operating expenses of the power house. This is a matter of statistical record. The ratio varies in a small place in accordance with local conditions; good practice demands a ratio of less than three to one.

Most central stations meter the output of their generating or substations and also sum up the total of customers' meter registrations, and compare the two. There results a discrepancy of from 10 to 50 per cent. This is put down as distribution loss (with the exception of a little, accounted for as transformer core loss). From 15 to 20 per cent distribution loss is within the limits demanded by good engineering practice, though in many actual cases these figures are departed from, mostly toward and beyond the upper limit.

As extreme examples in actual operation might be cited the following two cases gathered from data secured during the earlier part of 1915 by the Engineering Experiment Station at Ames, Iowa, which sent out inquiries to ascertain what distribution losses central-station companies in the state of Iowa were experiencing. One of the lowest records was accredited to a small town of less than 1,000 population with alternating-current supply and distribution from a substation at 220/110 volts on a three-wire system of good line construction without service transformers; a light load was carried at all times throughout the 24 hours; 23,000 kilowatt-hours of the 25,000 supplied from the substation in 1913 were actually delivered to consumers, thus giving the remarkably low loss of 8 per cent. The other extreme came from another town of about the same population served by a substation also and having some thirty service transformers; during one month of 24-hour service the distribution loss amounted to 40 per cent.

The loss of energy on a circuit during a year is dependent upon the annual load-factor of the load carried. For purpose of calculation, load curves for the quarterly months of March, June, September and December should be available. The energy losses will evidently vary for different months, being less during the summer than during the winter months. The annual loss on a circuit may be computed with sufficient accuracy for practical purposes in the following way: Compute the I^2R loss for each hour of an average day in March, in June, in September, and in December. Then multiply by 91 (the number of days per quarter-year) the sum of the losses on the four average curves; the resulting product is the annual loss in kilowatt-hours.

Further details and an excellent bibliography are given in Section 12 of Fowle's "Standard Handbook for Electrical Engineers."—P. B. W., Verbena, Ala.

The distribution losses in a three-phase 2,200 220/110-volt system are composed of two parts, one the ohmic losses, due to heating in wires, cables and transformer windings which is proportional to the load, the other part occurring in the magnetization of the transformers, due to hysteresis and eddy currents, which is practically independent of the load and only dependent on the size and quality of the individual transformers and the total rated output of distribution transformers installed. So of the 7,500,000 kilowatt-hours lost in the distribution of the Pacific Power & Light Company, probably 6,000,000 to 7,000,000 will be accounted for by the magnetization losses in the transformers. The reason for this is obvious. Though in modern transformers the iron loss rarely exceeds 1.25 to 1.5 per cent, this energy is required for 24 hours of the day, while the ohmic losses, though perhaps four to ten times as large during the time of maximum demand, only occur to any great extent at the peak-load time.

To state absolute figures for the losses in a distributing system for an average town of between 5,000 to 15,000 inhabitants is nearly impossible without knowing the character of the load to be expected, if lighting, whether for business, shop, office or residence, if power, whether small industrial or factory or perhaps tramway, as all these factors will greatly influence the power requirements and the time the installation is in use.

Using average figures, towns of that size use about 15,000 kilowatt-hours per 1,000 inhabitants and with a mixed load the time every installed kilowatt is used may be taken as 300 hours. From this we find the total installation of a town of 15,000 inhabitants to be 750 kilowatts; the annual sale of energy would amount to 225,000 kilowatt-hours. The transformers required for distribution of 750 kilowatts would amount to about 375 kilowatts, half the consumers' maximum possible demand. We find the energy lost in transformers' magnetization to be $375 \times 1.25\% \times 8{,}650$ hours $= 40{,}500$ kilowatt-hours. Taking the ohmic loss to another 5 per cent of the energy sold, equal to about 11,500, the total loss would be about 52,000 kilowatt-hours per year or 23 per cent of the energy sold. For a town of 5,000 inhabitants the figures would be proportionally slightly worse, as the diversity-factor might require a larger transformer installation. In actual practice 23 per cent is quite obtainable, but about 35 per cent has been observed in several towns, where the sizes of transformers or their position were chosen without proper consideration of the conditions. A rearrangement of transformers, provided the consumers contain a good proportion of offices, industrials and other equally desirable installations, will reduce the losses to 25 per cent of the energy sold.
—J. J. W., East Liberty, Pa.

Program of Pan-American Congress.

The second Pan-American Scientific Congress is to be held in Washington, D. C., from December 27, 1915 to January 8, 1916. Section V of the Congress is devoted to engineering and the chairman of this section is W. H. Bixby, formerly brigadier general in the United States Army. Sub-section 3 is devoted to electrical engineering, with J. B. Whitehead as chairman and J. H. Finney as alternate chairman. These gentlemen, together with F. L. Hutchinson and Percy H. Thomas, are the official representatives of the American Institute of Electrical Engineers. Other sub-sections are devoted to civil engineering, marine engineering, mechanical engineering, reclamation, sewage and water supply.

The first general session of the engineering section will be held on Tuesday morning, December 28. Sessions of the electrical sub-section will be held on succeeding days with program as follows:

Wednesday morning, December 29: "Electrochemical Industries," by G. A. Roush; "Present Status of Water-Power," by H. W. Buck.

Wednesday afternoon, December 29: "Industrial Applications of Electricity," by Philip Torchio; "Hydroelectric Utilization at Niagara and Elsewhere," by Maurice Deutsch.

Monday morning, January 3: "Electric Power Transmission and Distribution Systems," by Percy H. Thomas; "Aluminum Conductors for Electric Transmission Lines," by Theodore Varney; "Underground Cables," by H. W. Fisher.

Monday afternoon, January 3: "Electrification of Transportation Lines," by N. W. Storer.

Tuesday morning, January 4: "Recent Telegraph and Telephone Development," by F. B. Jewett.

Tuesday afternoon, January 4: "Electrical Codes and Standards," by Edward B. Rosa.

On Wednesday evening, December 29, there will be a reception at the National Museum tendered by the Smithsonian Institution. On Thursday evening there will be a smoker at the Raleigh Hotel. on Saturday afternoon a reception by the Cosmos Club, and on Saturday evening a reception tendered by the Governing Board of the Pan American Union. On Tuesday evening, January 4, there will be a reception by the trustees of the Carnegie Institution. On Thursday evening, January 6, there will be an address by the President of the United States, and on Friday evening he will give a reception at the White House.

Digitized by Google

Economic, Social and Political Conditions in Europe Which Influence Government Ownership of the Telephone.

By James P. Duncan.

Origin and Causes of Government Ownership in Europe.

Before the invention of the telephone every telegraph system of importance in Europe was owned or controlled by the governments. They had been led into this by military and governmental necessity. It seems that England had been influenced by political motives; although the argument given to the public was that government ownership of the telegraph would result in lower rates, better service and wider extension of the service. Switzerland appears to have been animated by a genuine public service motive. Governmental necessity, either as a military or an administrative measure, was generally the reason for government ownership of the telegraph in Europe.

After the telephone was invented it was regarded for a time as a scientific toy and as unfit for general use. American genius devoted itself to perfecting the delicate instrument it had devised. Each improvement in the instrument made it more serviceable and made friends for it from the ranks of those who had regarded the telephone only as a curiosity. The officials who were in charge of the telegraph systems of the various countries, one by one, adopted the telephone.

Prussia.—In Prussia, Heinrich von Stephan, the manager of the Imperial Telegraphs, took the idea and applied it to the telegraph service as a means of extending its usefulness. The Prussian government had for some time developed the electrical telegraph as a military measure, and von Stephan hoped to extend the telegraph into hitherto inaccessible places by means of the new invention. Ownership of the telephone by the German government was for the purpose of extending and making more useful its military telegraph system.

Austria-Hungary.—The first telephone in Austria was installed in 1879 in Cracow, the great military post, to facilitate the transmission of orders. Then this government allowed private enterprise to develop the telephone for a few years, but in a short time the authorities perceived that further development in private hands would affect the revenue from the government-owned telegraphs, and they assumed ownership of all the systems. The impelling motive in Austria's assumption of public ownership of the telephone system was protection of the government funds already invested in the telegraph. The same cause influenced Hungary.

France.—The French government pursued a different policy. It was unwilling to assume the task of building a telephone system, and so permitted private enterprise to develop it, imposing such restrictions upon this private enterprise that the policy equalled one of repression. For example, the franchises were limited to five years' duration and 10 per cent of the gross revenue was to be paid to the government as a royalty. Such conditions were not advantageous to telephonic development, for they furnished neither the incentive nor the possibility of developing more than the cream of the territory. The rival companies which were granted franchises soon amalgamated. The government built the long-distance lines when they became necessary in order to avoid competition with the government telegraph lines. Finally, to avoid complications and competitions, the entire system was purchased.

Switzerland.—In Switzerland, since the telegraphs were state-owned, as soon as the usefulness of the telephone was demonstrated the officials sought to control this instrument, which was supposedly a further application of the telegraph. Their intention was to extend the telegraph system by means of this new invention. The isolated situations which the majority of the towns and villages in Switzerland occupy, emphasized the need of some means of rapid intercommunication, consequently the officials have always had great interest in the telegraph and telephone systems. Again, there is not in Switzerland that concentration of capital by a minority of the people that exists elsewhere. The railroads were privately owned when the state built the telephone system, and these absorbed much of the capital available for investment. For, while the great majority of the people are industrious and producers of wealth, Switzerland, above all other lands, lacks the capitalist with large amounts of money ready for investment. To some extent this has compelled the government to undertake the building of the public utilities.

Great Britain.—Great Britain was the last country to adopt the policy of government ownership of the telegraphs and telephones. In both acquisitions the Postmaster General promised that public ownership would improve and extend the service at decreased rates. In the case of the telegraph the system is operated at a loss. The telephone has not yet had time to show what effect government ownership will ultimately have, but from the number and seriousness of the complaints, it is evident that government ownership has not improved the service. Jealousy of the telephone on the part of the postal authorities caused the government to acquire the long-distance lines, to establish local competitive exchanges, and to enfranchise municipal exchanges. This dual control was full of complications and was finally settled by the government purchasing the system.

Norway.—In Norway the telegraph officials have been unwilling to decide whether or not they would make an absolute public monopoly of the telephone. The local exchanges were at first largely built up by private companies. Today there is both government and private ownership of the systems. Although Norway has a monarchial form of government, in reality a spirit of equality and fraternity exists there. This, combined with the isolated situation of the villages, and the freedom allowed to individual initiative, has permitted a considerable development of the telephone.

Sweden.—In Sweden early development was similar to that in Norway. Finally, by reserving to itself the right to build long-distance lines, the Swedish government absorbed practically all the telephone business of the country, except in Stockholm. The government absorbed the long-distance lines in order to protect its telegraph revenue. The reason for its competition with the Stockholm Company is probably the innate jealousy of the telegraph officials of a similar private enterprise.

Denmark.—In Denmark the government leaves the actual management to individuals, regulating rates and service quite strictly. A fair development has been secured.

In all three Scandinavian countries private enterprise has been allowed some freedom, and although hindered by government restrictions and competition, private enterprise has secured

Digitized by Google

for these countries the greatest telephonic development in Europe.

Conditions Influencing Telephone Development in Europe.

Germany.—The economic, social and political conditions prevalent in Germany are very different from those of the United States; for the German government is not a popular government like ours, where the desires of the citizens as expressed in the elections are carried out by temporary officials. The sole purpose of the German representative body is to indicate to the ministers what the people need. This is considered and acted upon or not, as it is in accordance with the policies of the empire. There is not in Germany the public review of official acts by the newspapers, as we have it. Centuries of training as members of guilds and chambers of commerce have accustomed the Germans to acting as a unit. In the United States the highest unit is the individual. The two years' military training which every man received during the formative period of his life accustoms the German to implicit faith in, and obedience to his superior officers. As a result of this universal respect the government has at its disposal the brainy and ambitious men of the country. These officials are appointed for life, on account of merit, are promoted for merit; not, as with us, dependent on political favor, elected for short terms, intent upon accomplishing political aims, and in general not the best of our citizenship. In these and other respects the German government has an organization and efficiency which make it resemble that of a private corporation in the United States. This organization originated with Frederick the Great, and about 20 years ago was modified by the studies of the officials of the wonderful efficiency of P. T. Barnum's circus—an American private enterprise touring Germany and impressing all with its facility of moving, the perfectness of its commissary and its control. In its organization and management today the German military system, which includes the telephone, is comparable with and molded upon an American private business concern.

Even with these economic, social and political conditions in Germany, which favor government ownership of the utilities, public ownership has not procured for the telephone the same development and usefulness to the public as private ownership in the United States. For in the German Empire today there are only 2.1 stations per 100 of population, compared with 9.7 in the United States, or 21.6 per cent of our development. The German Empire has only 6.7 miles of telephone wire per 100 of population, compared with 22.6 in the United States, or 29.6 per cent. Figures as to the financial operation of the telephone system cannot be obtained, but it is believed that the system is operated at a loss. Considerable dissatisfaction exists with the rates and service. For example, service is suspended after 9 p. m. in places having as many as 30,000 inhabitants; 30 per cent of the exchanges are closed during the lunch hour, 12 m. to 1 p. m. Such a condition would be justly deemed intolerable in this country. The question of rates requires separate treatment, but when all factors are taken into consideration—the value of money, urgent rates, smaller development, shorter lines, smaller exchanges, the fact that some exchanges are open only during business hours and many other factors—rates are higher in Germany than in the United States.

Higher rates, poorer service and lesser development than the United States under private ownership, is the result of the operation of the government-owned German telephone system —where the economic, social and political conditions favor government ownership. This German telephone system cannot be a precedent and example for the American people for government ownership; there, with the conditions favorable, it has not produced the economies and development that private ownership has produced in the United States.

Austria.—The economic, social and political conditions which exist in Austria closely resemble those of Germany and each day the likeness is increasing. Government ownership of the Austrian telephone system has produced results similar to government ownership in Germany. For in Austria there are only 0.6 stations per 100 of population, compared with 9.7 in the United States, or 6.2 per cent. Likewise they have only 1.2 miles of wire per 100 of population, compared with 22.6 in the United States, or 5.3 per cent. What has been said before about German rates and service could be repeated for Austrian rates and service. The telephone is an insignificant part of their national life. The government-owned system has high rates, poor service and small development compared with the privately owned systems in the United States.

France.—In France many of the economic, social and political conditions are very similar to those existing in the United States. The present French government and ours were formed on the same basis and dominated by the same political thought. The intimate relations that existed between France and ourselves, when our government was in its beginning, have profoundly influenced both. Both are individualistic and popular governments, where the real makers of the laws are selected by the people and the representatives control the purse. Political influence is equally potent in both. Government ownership of the telephone has failed miserably in France, as all recognize. Rates are very high, service poor, and development small. They have only 0.8 telephone per 100 of population, or 8.2 per cent of the United States. They have only 3 miles of wire per 100 of population, or 13.3 per cent of the United States. No exact figures are obtainable, but it is reasonably certain that the French system is a losing financial proposition. In France, where economic, social and political conditions resemble those in the United States, government ownership of the telephone system has resulted disastrously. The probabilities are strong that government ownership would have a similar tendency here.

Switzerland.—Switzerland is a very small country; its population is only one and one-half times that of Chicago, and it has but slightly more than one-fourth the number of telephones in Chicago. On January 1, 1914, the population of Switzerland was about 3,870,000, compared with 2,420,000 in Chicago; Switzerland had 96,629 stations and Chicago 348,879. The natural features of the country make some form of rapid intercommunication imperative. The central government is best fitted financially for building the public utilities and owns and operates the majority of them. Each year the country has had an invasion by tourists. These use and stimulate all the means of communication greatly. Their government is socialistic in tendency, while ours is democratic. These conditions combine to assist government ownership of the utilities, especially of the telephone. Even with these advantages, which do not exist for government ownership in the United States, the development of the Swiss telephone system is poor relatively to the United States. They have only 2.5 telephones per 100 of population, or 25.8 per cent of the United States, and only 6.4 miles of wire per 100 of population, or 28.3 per cent of the United States. It is not just to urge Switzerland as a precedent for us to follow in considering the advisability of government ownership of the telephone, for the smallness of that country and the differing, but favoring, conditions, make the comparison inappropriate.

Great Britain.—In Great Britain the economic, social and political conditions are very similar to ours. The American government is largely a revision of the British. The character and hab-

Digitized by Google

its of the people are much alike, and many of us trace our descent from the people of the British Isles. Government ownership has not yet had time to show fully what effect it will have on the telephone system. Already, however, the attitude of the telephone employees has apparently changed from that of an employee striving to please his patron to that of an official obeying the commands of his superiors, regardless of the public. From the reports it seems that complaints are now practically ignored and service is much less dependable than in the days when the privately owned company operated. We would expect that there would have been a development similar to that of the United States before the government purchased the system. The fact that postal (telegraph and long-distance telephone) officials were so hostile and jealous of the local exchanges and that the policies of the government were usually that of passive, if not active, opposition to the telephone company, stunted the growth of the system. The long expected purchase by the government tended also to retard construction and stop all but absolutely necessary building. The number of telephones per 100 of population is 1.7, or 17.5 per cent of the development of the United States, and the wire mileage per 100 of population is 5.6, or 24.8 per cent of the United States. Government operation is not, in the mind of the British public, as serviceable to them as private ownership. Certainly the prospect of it continually overshadowed the telephone and hindered its growth. The impetus expected after the government should purchase it has failed to arrive. The telephone is not permitted to give to the British public all the usefulness which it is capable of rendering.

Scandinavian Countries.—In Scandinavia the telephone in its beginning was practically free from political control. Private enterprise was allowed to develop the new invention. Various conditions assisted in this development. The people are practical, and such a simple and direct method of communicating, free from outside assistance, was attractive to them. Other means of communication were not highly developed. The country consists of many small, well scattered villages and residences; labor and material were reasonable; foreign interferences—such as high-tension currents—were few. All these and other conditions assisted in this development. Many of the conditions were true also of the United States. The telephone system in Scandinavia and the United States has accordingly developed in the same way and in each country a larger and more perfect development has been produced than in those places where government ownership exists. In Sweden especially, and in Norway to a lesser extent, the government has attempted to control the telephone, and actually owns and operates part of the system in each country. Denmark has a very strict regulation that amounts to the same condition. This feature has influenced the development, making the sum total less than that of the United States, where there is only a reasonable regulation. Likewise, the absence of any central advisory authority, such as the American Telephone & Telegraph Company, to guide the development and assist in every part of the work, has undoubtedly contributed to the inferior development. But, compared to the rest of Europe the development is superior. For in Denmark there are 4.5 stations per 100 of population, or 46.4 per cent of that of the United States and 12 miles of wire per 100 of population, or 53.1 per cent of the United States. In Norway there are 3.4 stations per 100 of population, or 35.1 per cent of the United States, and a wire mileage of 7.4 per 100 of population, or 32.7 per cent of the United States. In Sweden there are 4.1 stations per 100 of population or 42.3 per cent of the United States, and a wire mileage of 9.1 miles per 100 of population, or 40.3 per cent of the United States. Rates in the Scandinavian countries have always been low, for materials and labor are low in price; the equipment is generally simple; many party lines prevail, and a great part of the system was built with the general assistance of the subscribers.

Résumé.—The reasons that have led to government ownership of the telegraph in Europe are primarily military. The telephone was considered either as a rival or an assistant to the telegraph. One country after the other absorbed and built the telephone systems, either to stop its competition or further their military efficiency. Perfection in a telephone system has never been attained; but, since the United States shows the greatest development its system is generally regarded—even in Europe—as the best in the world, and the telephone system of the United States can be used as a standard by which to measure the relative success of the other systems. In Germany, where apparently every economic, social and political condition is favorable, government ownership of the telephone has not produced as perfect a system as the privately owned system of the United States, or even as the partially privately owned systems in the Scandinavian countries. The situation in Austria resembles that in Germany, except that it has a smaller development. In Switzerland, where these conditions are dissimilar to those of the United States, government ownership has not developed the telephone system as in the United States. In France, where some of these conditions are similar to the ones in the United States, government ownership has failed to produce the results that have been attained in the United States privately owned systems or in the Scandinavian partially privately owned systems. In Great Britain, where these conditions are similar to the ones in the United States, government ownership seems doomed to produce the stunted development and defective service and unsatisfactory rates that it has produced everywhere; certainly government interference and the prospects of government ownership have retarded its growth. In the Scandinavian countries, while they show better results than any of the European systems, governmental interference and partial ownership has to some extent hindered their development.

Conclusion.

The fundamental function of government is to render harmless those who have harmed or seek to harm others. It is primarily and necessarily based on force. This is reflected in almost every department. The judge's edict is law. Taxes must be paid. Apparently telephone systems, like telephone instruments, are not suitable for control by force. The unchangeable and invariable character of government is no more suitable for control of the telephone system than a sledge or a pile driver for constructing the instrument. The instrument demands light and delicate machinery and the ablest human fingers and brains. The system demands human treatment, each condition must be met and handled in the ablest, most tactful and most skillful way. Inflexible edicts that go throughout the land and have no changing are out of place in the telephone system. Each instrument, each user, each conversation, requires individual care and consideration that can only be attained when the system is left to individuals to develop and operate as the relative failure of the government-owned systems in Europe testify, and the expansion of the telephone system under private ownership in the United States proves.

The Illuminating Engineering Society will celebrate the tenth anniversary of its organization by holding a midwinter convention in New York City on February 10 and 11. At this time honorary membership will be conferred on Thomas A. Edison.

Arthur Williams is chairman and Clarence L. Law is secretary of the Convention Committee.

Digitized by Google

SYSTEM OF KEEPING RECORDS OF CURRENT WORK IN ELECTRICAL INSPECTION DEPARTMENT.—II.

By Washington Devereux.

This article, begun last week, describes the methods and record forms used in electrical inspection by the Philadelphia Fire Underwriters' Association, of whose Electrical Department the author is director. He is also vice-president of the National Association of Electrical Inspectors. A number of the forms used are reproduced.

Reports on Work in Progress.

Reports on work in progress (Fig. 5) are noted on the Suspense Cards. The cards are then filed in what is known as the Progressing Work File. The cards are filed according to location. The file is gone over daily for the purpose of ascertaining if the inspectors are following up the concealed work and reporting on same with sufficient frequency. The inspectors are required to visit and report on concealed work in progress daily, unless for special reasons a longer period may be allowed to elapse between visits. If such be the case, they report to that effect and the card is so noted. If, on going over this file, cards are found which do not show sufficient number of visits, a note is made of the same, and the matter is referred to the inspector for a report and reason for the delay.

Defective or Unfinished Work, Etc., Requiring Letters.

The conditions as reported on work of this class are noted on the Suspense Cards. The cards are then filed in what is known as the Unfinished Work File, according to their location. The reports are then gone over by the chief clerk, who reads the reports carefully, and then instructs the stenographer as to the kind of letter required, dictating same if necessary. The greater number of the letters can be copied verbatim from the reports, using a form letter on the first inspection. Letters of this kind, however, are only required in instances where the Electrical Key has not provided for the existing conditions. The Suspense Cards are noted as to date of communication. Communications are followed up every five days. This is accomplished by going over the Unfinished Work File and removing those cards which show that communications five days previous have not been acknowledged. These cards are given to a clerk who takes the folders out of file, placing the Suspense Card in the folder. The chief clerk then examines the contents of the folder and decides as to the character of the follow-up letter to be sent. If, for instance, only one letter has been sent, form letter shown in Fig. 7 is sent. If electric current is in the risk, and no reply has been received, letter shown in Fig. 8 is sent. Another form letter is always sent the assured with copies of the correspondence with the contractor, in this way fully informing them of the delay and negligence on the part of the contractor. Fig. 8 is sent to the contractor. After the chief clerk decides to send a letter, he notes on the Suspense Card the date the follow-up letter is sent. The Suspense Cards are then re-filed in the Unfinished Work File.

Reallotment of Reports.

Reports are reallotted to the inspectors for revisits only on receipt of a written request from the applicant for inspection. The majority of such requests are received through the mails in the form of letters or postal cards. They are given to a clerk, who ascertains the file number applying to the location by referring to the Certificate Record Cabinet. He notes the file number on the upper right corner of the notice and takes the folder from file. The folders are then gone over by the chief clerk, who decides what action is to be taken. If the report is to be reallotted the inspector's report is stamped "Reallotted," with the date. The notice is then stamped "Reallotted" with the date, and placed in the folder. The Suspense Card is stamped with date of reallotment and placed in the Inspectors' Allotment File. Postal cards are then made out and attached to the report, and placed in the inspector's compartment in the cabinet provided for Outgoing Work.

Explanation of the Key.

For the convenience of the inspector, when making out his report, a Key has been prepared. The inspector refers on his report to the Key number describing the condition as found at the time of inspection. The stenographer, when writing the letter, refers to the Key number as given on the report and copies the recommendations verbatim, as given in the Key. Two carbon copies are made of letters of this kind, in order that one of them may be attached to the report when same is reallotted to the inspector. The inspector then knows exactly what recommendations were made to the contractor.

The Electrical Key is designed for the convenience and accommodation of electrical inspectors, electrical contractors, and the public service corporation. The conditions covered by this Key are those which experience has shown to be largely misunderstandings or violations of the Code. The use of the Key in conjunction with the postal-card system previously referred to, greatly facilitates the work of the Inspection Department, and by its use the time elapsing between the receipts of an application or the receipt of notice for inspection and reports of conditions to the contractor, is cut down to a very great extent, at least ten working hours. We have found that it has also reduced the number of telephone calls relative to inspections at least 75 per cent, and has also reduced the number of letters sent out. To confirm the above statement, we give the following example:

An inspector when reporting on the electrical equipment in a given risk refers on the postal card to the Key number describing the condition which it is desired to remedy. He makes a similar notation on his report. For instance, suppose the mains in a risk are not heavy enough to carry the connected load; the inspector will mark 312 on postal card in space provided for Key numbers or letters, Key 312 reading "Mains to be re-inforced." If the equipment is installed in accordance with the National Electrical Code, inspector will mark letter "L" on the postal card, Key "L" indicating "Certificate issued for introduction of current." Two postal cards are sent by the inspector, one to the applicant for inspection and the other to the public service corporation. In this way, as previously stated, an installer or contractor is quickly advised of the conditions as found by the inspector. This enables him to make corrections the same day. Advices to that effect are received by the Inspection Department in the first mail the following morning. Inspector is notified immediately, a report is reallotted to him and he revisits the risk to ascertain if corrections have been properly made. If so, certificate is issued. If otherwise, the installer or contractor is again advised of existing conditions as above explained.

Follow-up Certificate Receipts.

The Suspense Cards for the reports on which permanent certificates have been issued, after having been stamped "Electrical Certificate Issued (date)," are filed in a date follow-up file, under the date on which the certificate was issued. When a receipt is returned by the recipient of a certificate, properly signed, the Suspense Card for that certificate is removed from the follow-up file and destroyed, as it has served its final purpose and is of no further use. The file is gone over every five days and those cards for which no re-

Digitized by Google

ceipts have been received are removed, the folders on the risk are secured, and examined to make sure that the receipt has not been received. A letter is then sent to the recipient of the certificate requesting them to return the receipt at once, or, if lost or mislaid, to so advise the Department. If no reply is received to this letter, another letter is sent stating that if the receipt is not returned immediately, no certificates will, in the future, be sent to the delinquent contractor. After a period of five days, if the receipt has not been received, the name of the contractor is posted on a list in a prominent location in the office, and no certificates are sent to him. If on this action he returns the certificate receipts, he is put on probation for a period of several months. If, during that time, he should fail to return a receipt promptly, certificates are discontinued without notice. We find that this treatment usually has the desired result and the difficulty of securing receipts for certificates has almost entirely disappeared.

Fig 9 shows the form used for weekly reports of inspectors. This report is self-explanatory. A weekly report is made up by the chief clerk and given to the chief of the Department on Wednesday morning of each week. This report indicates to the chief of the Department the condition of the Department more or less; the number of inspections made by each inspector for each day of the week and the total of the week; number of applications received, number of certificates issued, number of letters mailed. This report is valuable in compiling the annual report, and if placed on file can readily be referred to in order to compare the work of the present year with that of previous years, months or days.

To provide for emergencies which may arise at the time office is closed, Sundays, holidays or at night, inspectors are named for emergency duty. A letter indicating name, address and telephone number of the inspectors who will be on emergency duty for the months of the coming year, is sent in the month of December to the public service corporation and electrical contractors. Men on emergency duty, however, only pass on equipment where all wiring is in plain view. This service usually is requested where there has been a breakdown of some kind, and temporary wiring or equipment is necessary to tide over until permanent repairs are made.

Meetings of inspectors are held on the evenings of the first and third Thursdays of each month. At each meeting various electrical subjects are discussed, short papers are read by the inspectors, discussions on methods of wiring and the National Electrical Code. The object of these meetings is principally to inculcate in the minds of the inspectors Code requirements, so that throughout the entire jurisdiction opinions on the method of electrical installations will tend to become uniform, thus reducing to a minimum the liability of an inspector in one section of the city interpreting the Code to mean one thing and an inspector in another section of the city interpreting the Code to mean something else, which would be most annoying to a contractor who operated in all sections of the city. On the fourth Thursday of each month an Electrical Conference is held, with the exception of the months of July and August. The Conference consists of inspectors of the public service corporation, representatives from the Electrical Bureau, inspectors of the Electrical Department of the insurance interests, electrical contractors, superintendents, foremen, and any mechanic who desires to attend. This Conference proceeds much along the same lines as the inspectors' meetings, except that a Question Box is provided into which questions have been placed since the previous meeting. These questions are answered in detail by a committee apopinted for that purpose. Sections of the National

D

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION

131-141 SOUTH FOURTH STREET

CHAS. A. HEXAMER, SECRETARY
JOHN H. KENNEY, ASSISTANT SECRETARY
WM. McDEVITT, CHIEF ELECTRICAL CLERK

ELECTRICAL DEPARTMENT

TELEPHONES { BELL / KEYSTONE

PHILADELPHIA,

File No.

DEAR SIR:

We are without acknowledgment of our letter of the referring to the electrical equipment installed by you in premises located and would thank you to advise us what disposition you have made of the matter

Yours truly, PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION,

Per

Fig. 7.—Form of Follow-Up Letter.

C

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION

131-141 SOUTH FOURTH STREET

CHAS. A. HEXAMER, SECRETARY
JOHN H. KENNEY, ASSISTANT SECRETARY
WM. McDEVITT, CHIEF ELECTRICAL CLERK

ELECTRICAL DEPARTMENT

TELEPHONES { BELL / KEYSTONE

PHILADELPHIA,

File No.

DEAR SIR:

The electrical equipment recently installed in premises located is not in accordance with the "National Electrical Code" and therefore unapproved by this Association. We respectfully refer you to our letter of and would request you to give the matter immediate attention as further delay may affect the insurance.

Washington Brunner

Chief Electrical Department.

Fig. 8.—Follow-Up Letter for Use Where Repairs or Additions Are Not Approved.

Form 1484. 1000-1-14-8.

Philadelphia Fire Underwriters' Association.

ELECTRICAL INSPECTOR'S WEEKLY REPORT.

Week ending 191

Decorative work removed
Electric wires better protected
Flexible cord restricted or removed
Lamps protected
Motors changed
Number of visits (total)
Reinspections—visits
Rheostats and heating devices protected
Safety devices changed
Switches changed
Useless visits
Wood moulding removed
Wires and devices in windows removed
Wires over roofs removed

Remarks

Inspector.

Fig. 9.—Form for Weekly Report Covering Inspector's Work.

Digitized by Google

Electrical Code are read and discussed; slides are thrown on a screen which indicate forms used by the various inspection bureaus, how they should be properly filled out in order to facilitate work in the Inspection Department. Short talks are given on methods of electrical construction, certain devices should be used because of their adaptability, etc. The meetings are usually well attended, attendance ranging from 100 to 200 engaged in the practical application of electricity. Notices of these meetings are mailed on Monday preceding the Thursday upon which the meeting is to be held. Expense for stationery and mailing is divided between the public service corporation and the Fire Underwriters' Inspection Bureau. The meetings are held in the large auditorium of the public service corporation. On the evenings of inspectors' meetings and also the Electrical Conference, the financial expense of the inspectors is borne by the respective departments.

An Expense Sheet is used by the inspectors in making up their expense account for the week, such as car fares or any other legitimate expense which they have incurred.

All inspectors are provided with a badge indicating that they are employees of the Inspection Bureau. This badge bears coat of arms of the city, surmounted by a spread eagle, and reads: "Philadelphia Fire Underwriters' Association," and is also numbered.

All inspectors are provided with electric pocket lamps in order that there be no necessity for striking matches when inspecting equipments where artificial light is necessary and light is not otherwise provided.

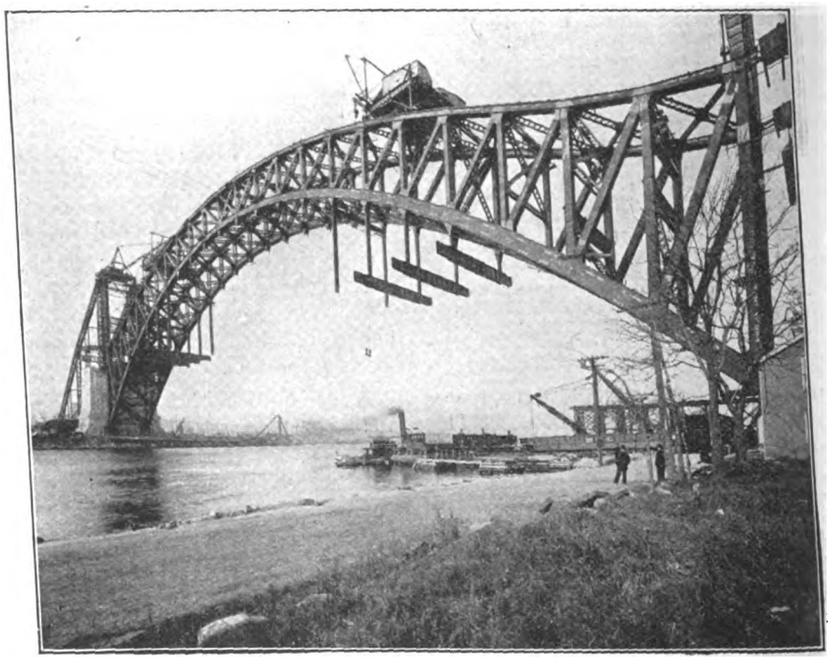
No man is engaged by the Bureau as an inspector who is less than 30 years of age and who has not had ten years' practical experience as an electrical mechanic, three years of which he has served as foreman.

Salaries are in keeping with those of a similar type in first-class cities. Two weeks' vacation is allowed to each inspector and all legal holidays are granted them. The hours of employ are nine a. m. to four p. m. in summer; nine a. m. to five p. m. in winter. Full pay is allowed on sick leave.

Gigantic Bridge Built by Aid of Telephones.

The New York, New Haven & Hartford Railroad is planning to enter New York City by way of Long Island City and the Pennsylvania Railroad tunnels. To achieve this result necessitated a structure several miles long that winds around on stone piers all the way from upper New York to Ward's Island, then over Hell Gate to Long Island, across which it goes to meet the Pennsylvania Railroad.

The greatest problem that confronted the engineers was the bridging of treacherous Hell Gate, as that part of the East River between Ward's Island and Long Island is called. A huge arch of steel, designed to carry on its four tracks the heaviest weight ever carried by a similar structure was designed to meet the contingency. The work was started last January, and in October of this year the steel arms that have been insistently creeping over the river from shore to shore were joined with the aid of a telephone system that in itself was a fitting climax to one of the greatest engineering feats the world has ever seen.



Completed Arch of Hell Gate Bridge.

From the day the two concrete piers, each resting on opposite sides of the river, were completed, telephones governed the driving of practically every rivet, the hoisting of every beam and the final junction of the completed arms in midair.

The arms started with four gigantic steel shoes, two of which were fastened on each of the concrete piers. On these shoes the first girders were hinged in a saddle-like arrangement that allows for contraction and expansion in the steel occasioned by climatic conditions. As gradually the girders took the form of the ultimate arch a steel false work reared itself perpendicularly on each of the concrete piers. On the tops of these steel columns four gigantic hydraulic jacks were placed, two for each column. Connected to each jack were I beams, to which in turn were connected girders that stretched themselves landward and riverward. The girders that stretched over the river were fastened to that part of the arch that was completed while those girders that stretched themselves landward formed a balancing arm. Thus a balance was struck and maintained, without which the weight of the steel arms would have tilted the concrete piers and precipitated the entire steel mass into the river. The hydraulic jacks under the I-beams served as hoists. By a slight twist these jacks would lower or raise the steel arms by virtue of their sheer force of 4,800,000 pounds pressure and the balancing action of the arms that stretched over the islands with a weight kept equal to the weight of the steel arms connected to the other end of the I-beams. As the traveling erecters slowly crept out over the river, putting girder after girder into place, these jacks kept pace by lifting the arms inch by inch.

The movements of the jack attendants, as were the movements of every man on the job, were controlled by a telephone system as clever as it was simple. Standard Western Electric telephones were located in the power houses, the offices, in the erecter cabins, at the jacks, at the compressor house and on the structure in close proximity to the boss riveters. All the stations on the Ward's Island side were connected to one line, and all the stations on the Long Island side to another. A central telephone was put into the Long Island power house and a submarine cable run from there to Ward's Island. When any station on either side wanted to communicate to any station on the opposite shore, it could do so by signaling the Long Island power

Digitized by Google

house, where the engineer in charge by the use of a special key could make the desired connection. All the telephones were thrown across their respective lines and any station called from any other by code signal. The system operated perfectly, and so ex-

Telephone Installed on Job.

pedited the work that it was not necessary for the chief engineer to leave his desk to receive or deliver messages and orders.

The climax of the work of the telephone came on the day when both arms were completed and were ready to be lowered into alinement. The completed arms hung in midair exactly 22.5 inches out of alinement. The traveling erecters had been shoved out to the last eight of an inch; another shove and they would have tipped over the whole structure and a year's work, to say nothing of some $12,000,000 in steel and countless human lives would have been dashed into the river. It was necessary that the erecters be out to the last possible inch on the arms, so that the riveters and the bridgemen would have something to work on and with when they fastened in the last girder, welding the arms together in one continuous link of steel. Nothing could be left to chance, for if one side went too fast and the other side jammed or the weight of one arm rested on the other unevenly, everything might have gone to the river bottom.

Gauges were affixed to the sides of the final beams marked off to the thirty-second of an inch, and at the exact spot the foreman stood with the telephone attached to a girder directly in front of him and with every station cut in and open. His was a particular job, for on him everything rested. He knew that the Ward's Island arm had to be lowered 12 inches and the Long Island side 14 inches, which meant that while one arm traveled one inch the other would have to go seven-eighths of an inch. Next to the foreman in responsibility came the men who operated the jacks, for a twist too much on the valve that admitted the water to the pumps would spell disaster. Every man knew his job, and every man repeated back his telephonic order. It was a gigantic and responsible task to put up to the telephone, but it was equal to the occasion, and faultlessly carried the orders of the foreman over steel girders and under the East River to the men who stood at the pumps, the erecters and the riveting machines.

It was no small task to lower these steel arms into alinement, each of which weighed 13,000 tons. Three hours after the foreman took his place like a human fly on the topmost girder, the two arms gently settled into place and the riveters welded them into one piece for all time.

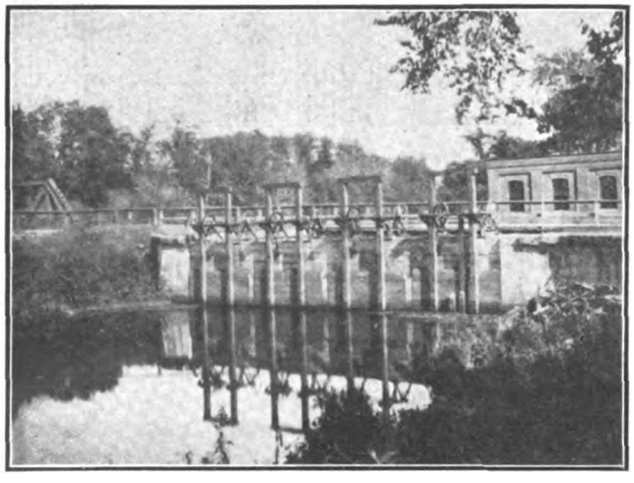
Now that the two arms are joined together in a mighty arch there is no need for further support, and the steel falsework is being taken down. So cleverly has the bridge been designed that no piece of steel is wasted. Every girder that formed the falsework was designed to fit into the approaches to the arch from both sides. Accordingly, as soon as each girder is removed from the falsework, it is swung into place in the approaches, where it remains permanently.

In this steel arch, stretching 1,017 feet from support to support the United States has not only the largest arch in the world, but has accomplished what is believed to be the greatest engineering feat of its kind ever known.

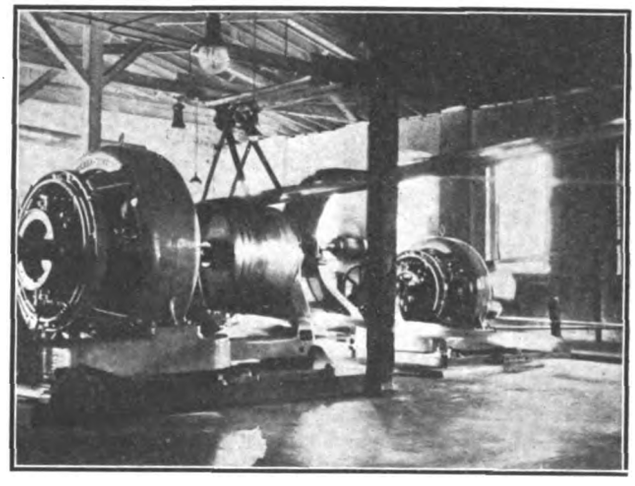
Telephone in Office.

Water Power Auxiliary for Street-Railway System.

The utilization of a low-head water power as an auxiliary power source for street-railway operation has been found practicable in eastern Massachusetts, where such power sites are generally few and expensive to acquire. Several years ago the Fitchburg & Leominster Street Railway Company bought an abandoned mill site and water privilege on the Nashua River in Shirley, and constructed a concrete dam, replacing an old masonry dam that had furnished a water power for manufacturing purposes from early days. Due to the confined character of the stream, with



Headgates and Station of Fitchburg Company.



Interior of Fitchburg Generating Station.

Digitized by Google

high banks, little farming land was overflowed even with flashboards on top of the dam. A working head of about 20 feet was made available during the greater part of the year.

In a brick building that had previously been a mill were installed a 300-kilowatt 550-volt direct-current generator operating at 500 revolutions per minute, and a second unit of the same type and make, of 150 kilowatts.

Each machine is belted to a shaft which extends from the generating room into the wheel house, where it is geared to three Rodney Hunt water wheels.

The station is operated from 6 a. m. to 11:30 p. m. daily, and from 1 to 5 a. m. the smaller generator alone is operated to provide lighting for the car barns. The lessened demand on the wheels gives opportunity for the pondage to fill up preparatory to the full operation during the day time.

A part of the station equipment is a storage battery, which acts as a compensator and booster. The principal source of power for the railway system is a steam plant.

THE HAMILTON ELECTRIC INCLINE RAILWAY.

Recent Installation Embodies Many Interesting Features.

Complete electric-hoist equipment has been recently installed by the Hamilton Mountain Park Company, Ltd., Hamilton, Ont., Canada, to operate its incline railway for transporting passengers, freight, automobiles, trolley cars, teams, etc., up the "Mountain," as it is called. The railway was formerly operated by a steam hoist equipment, but this had become inadequate to handle safely and quickly the rapidly increasing traffic. The incline gives ready access to a large tract of land the company has acquired at the top of the mountain and to the fertile country beyond. The "mountain" is really the Niagara escarpment, the high bluffs behind Hamilton being a prolongation of the heights at Queenstown, over which the Niagara River originally flowed before cutting back the gorge to the present falls. The difference in elevation between the general level of the city and the plateau back of the bluffs is 325 feet; and as the roads leading up the bluffs are necessarily steep, the incline railway handles a very extensive miscellaneous traffic. All the electric hoist equipment was furnished by the Canadian General Electric Company, Ltd., and involves many novel features and numerous automatic safety devices.

Electric Hoist.

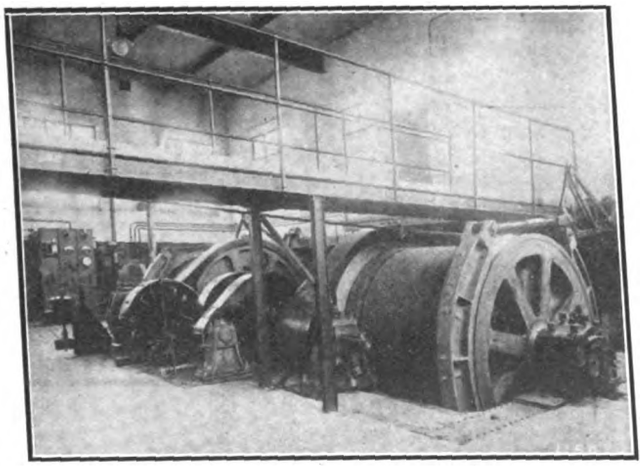
A special double fixed-drum, double-geared electric incline hoist operates two large platform cars in balance on an incline 800 feet long with a grade of 40.27 per cent. Each car weighs 30,000 pounds and runs on tracks having a gauge of 12 feet 1.5 inches, the center to center of the tracks being 20 feet 3 inches. The average load on the cars will be about 20,000 pounds, with a maximum load of 30,000 pounds; and the hoist arrangement is suitable either for hoisting the maximum load with an empty car descending, or for lowering the maximum load with the empty car ascending.

The time required for making a single trip is 1.5 minutes, and the rest period between trips is 3 minutes. Attached to each car are two ropes of 1.6-inch diameter, each rope weighing 4.15 pounds per foot. One of these ropes is used for hauling the car, and the other for the purpose of safety. The average rope speed during the run is 585 feet per minute.

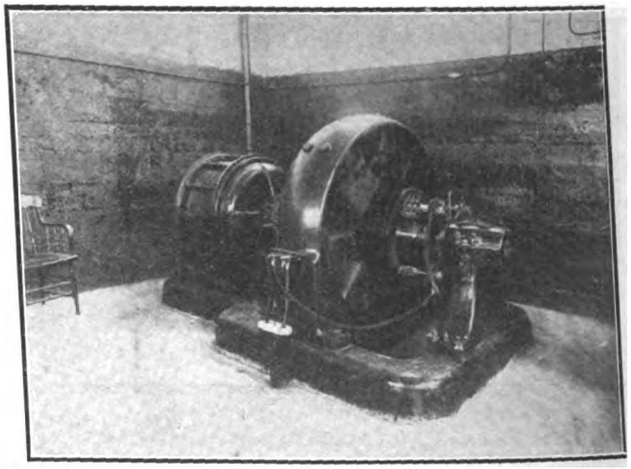
Incline Arrangement.

The hoist is located in a house 106 feet from the knuckle between the incline and the level of the summit. The main rope from the right-hand car is wound over the top of the right-hand hoist drum. The main rope from the left-hand car is wound underneath the left-hand hoist drum. The safety rope from the right-hand car is led over suitable deflecting sheaves to the top of the left-hand drum, and that from the left-hand car is wound over suitable deflecting sheaves to the bottom of the right-hand drum. Each of these sheaves is 7 feet in diameter to the bottom of the rope groove and weighs 3,500 pounds. There are four head sheaves and four deflecting sheaves. The former are arranged vertically so as to carry the hoist ropes and safety ropes in a direct line either to the top or bottom from the cars; the deflecting sheaves are placed horizontally at such an angle that the rope will be led in a direct line either to the top or bottom of the hoist drums, as the case may be. Floating sheaves are also furnished to guide the ropes and are placed in the rope tunnels between the head sheaves and the hoist drums.

The reason for reeving the safety ropes as outlined above is that in case of an accident to the left-hand side of the hoist, the safety rope on the left-hand car would take care of it properly, being wound on the right-hand drum. The same thing would apply if the other drum of the hoist should become disabled; that is, the main ropes and the safety ropes from each car lead to opposite drums. Further advantage is gained by the fact that each drum is equipped with an independent double-acting brake; and in case either of the main ropes should break, the safety



Hoist Equipment of Hamilton Incline.



Motor-Generator Set Serving Hoist.

Wisconsin Electrical Association to Meet in March.

Announcement has been made that the next annual convention of the Wisconsin Electrical Association will be at the Hotel Pfister, Milwaukee, Wis., on March 16 and 17, 1916, instead of in January which has been the custom for a number of years. There will be a joint session with the Wisconsin Gas Association on March 16, the latter organization holding its annual convention in Milwaukee at the same time.

George Allison, First National Bank Building, Milwaukee, is secretary of the Association.

The Russian production of naphtha during the first eight months of the present year amounted to 6,050,000 tons, against 5,600,000 tons for last year.

Digitized by Google

rope will hold the cars. Furthermore, the safety rope, if called upon to take the load, will be controlled by all the automatic brake features in exactly the same manner as when the load is being handled by the main ropes. In actual operation the length of the safety ropes will be slightly more than that of the main hoist ropes, thereby relieving the safety ropes of any hoist stresses other than those required to keep the ropes themselves in motion.

Operation and Safety Appliances.

The operator's cabin is fitted with one electric control and two hand-brake levers. The levers will not be used ordinarily, as the hoist is equipped with solenoid brakes operating on the motor shaft. The hand-brakes, therefore, need only be used for locking the cars at the top and bottom positions or for cases of emergency. In starting a run, the operator releases the drum post brakes by the hand-levers, puts his foot on the small foot-pedal located at the bottom of the master controller, and by moving the handle of the controller either to the right or the left, as the case may be, the cars will start and will automatically accelerate to the normal rope speed. At a predetermined point on the incline, the controller handle will be automatically turned to such a position that the speed will be cut down to one-tenth of the normal and finally be turned to the off position, thus setting the solenoid brakes and bringing the cars to rest. Should the operator become disabled during a run, he will of necessity remove his foot from the foot-pedal, thereby cutting off the current and bringing the cars to rest.

In case the cars should stop short of their landing positions, due to the automatic overwinding mechanism, there are available two or three points on the controller so that the operator can bring them to their proper positions. Should the cars fail to stop, due to the fault of the controller, an overwinding device is attached which will shut off the current and set the solenoid brakes. Should the speed of the cars exceed the normal by a predetermined amount, an overspeeding device is so arranged that it will trip a weight of 570 pounds, which will set the drum post brakes. This overspeeding device, or governor, is of the fly-ball type; and it will be caused to operate by an excessive speed, whether due to the motor or a breakage of the hoist parts. The emergency weight may also be tripped manually from the cabin.

Shafts and Drums.

The drum shaft is a steel forging in two pieces, 12 inches in diameter. Including the two sections, it is 32 feet long and weighs 13,300 pounds. The intermediate shaft has been machined from a single steel forging and is 7 inches in diameter. It is 20 feet long and weighs about 3,000 pounds.

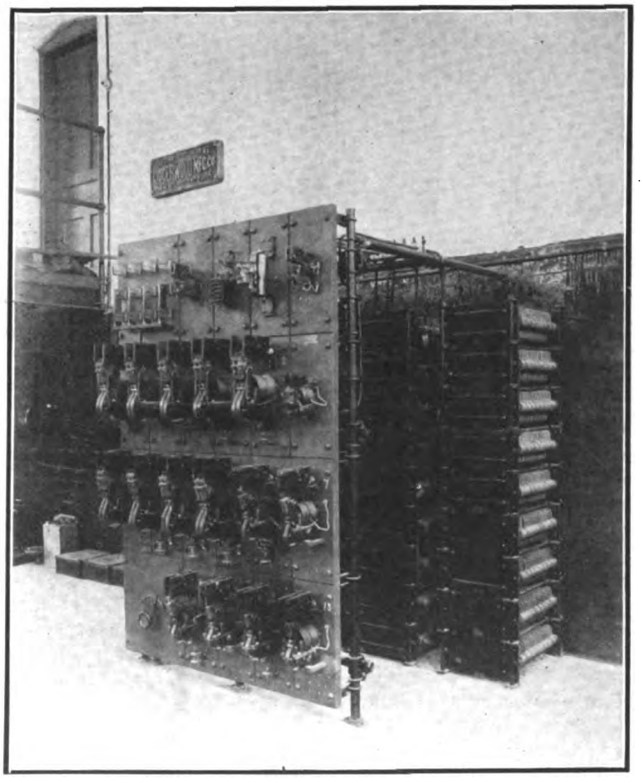
There are two cast-iron drums, 96 inches in diameter, 70-inch face, and they coil 800 feet of 1.6-inch rope, plus three holding coils at each end of one layer. These drums are made up in two sections, of barrel construction, and are bolted at one end to the post-brake ring, and at the other end to the drum gear. The two sections composing each drum weigh each 8,350 pounds, which means a total weight of drum barrel for each drum of 16,700 pounds. Each of the drum gears is made of cast steel with cut involute teeth, and is of the double-arm wheel type, having eight arms reinforced by ribs forming an "H" section. The gear has 122 teeth and a face 12 inches wide, the pitch diameter being 122 inches.

The intermediate gears are of cast steel with Herringbone teeth, cut. They have 113 teeth and a face 8 inches wide, being 56.5 inches in pitch diameter. The intermediate pinions are of forged steel and have 22 teeth, cut in Herringbone type. They have a face 8 inches wide and are 11 inches in pitch diameter.

Electrical Equipment.

Power is supplied in the form of three-phase, 25-cycle alternating current; and for changing this into direct current, a motor-generator set has been installed of sufficient capacity to supply the average demand of the hoist, plus some surplus for charging the battery described below. The direct-current end of this machine is rated at 165 amperes continuously at 550 volts, the latter being the floating voltage of the battery. This generator is driven by a 2,200-volt induction motor. The generator end is designed with a special drooping characteristic by means of a reversed series field for the purpose of throwing load fluctuations on the battery. A small percentage of the load fluctuations falling on the machine will lower its voltage to such an extent that the battery must discharge and furnish the balance of the momentary demand. The regulation is, therefore, inherent in the design of the machine.

View of Incline from Bottom.



Contactor Panel.

Digitized by Google

The hoist is driven through two gear reductions, the total ratio of which is 29.84 to 1, by a 180-horsepower, 500-volt, 475/585 revolutions per minute, direct-current motor, which is specifically designed to stand such voltage variations as come from a storage battery when it is frequently charging and discharging. The motor is controlled by a magnetic contactor panel so as to provide for remote control. This system of control admits of the various protective devices to insure against the cage operating at greater than a predetermined speed. To insure a greater degree of continuity of service, a reserve 180-horsepower motor and solenoid brake are provided. The machinery of the hoist is so constructed that in a very few moments one motor can be disconnected from the hoist and the other clutched in ready for service. The master controller is situated in the operator's cabin at the top of the incline.

Storage Battery.

The power plant has been supplemented by a storage battery built by the Electric Storage Battery Company. One of the objects of installing this was to reduce the maximum peaks due to the fluctuating load of the hoist, and thus reduce the power bills. Another object was to furnish energy for operating the hoist if the alternating-current supply should be interrupted.

The demand of the hoist motor when lifting a load of 7.5 tons was estimated at 470 amperes for 10 seconds, followed by a demand varying from 410 down to 230 amperes for a period of 80 seconds, the voltage being approximately 550 volts. Under the conditions of maximum schedule, it was estimated that the load period of 90 seconds would be followed by a 3-minute rest, this providing for a trip of the hoist every 4.5 minutes. For handling a 10-ton load, the maximum 10 seconds demand was estimated at 530 amperes, followed by 80 seconds of load varying from 470 down to 310 amperes. The hoist is designed to handle a 15-ton load occasionally, but this will not occur when the battery is handling the entire load with the power supply cut off. It is believed that hoisting a 7.5-ton load every 4.5 minutes will represent the average conditions during the hours of maximum traffic. The average load is 112 amperes on this basis.

The battery consists of 262 cells of the Tudor-box type. Each cell contains 11 plates. The plates are supported in glass jars mounted on glass and trays, the entire battery being installed on wooden racks. The capacity of this battery is 200 amperes for one hour on a continuous discharge. For intermittent service extending over several hours, the ampere-hour capacity will be somewhat greater, and it is estimated that this battery will operate the hoist under the average load conditions cited above over 1.75 hours with the power supply entirely cut off; or if the schedule is reduced, so that the trips of the hoist are made less frequently, the hoist can probably be kept in operation for several hours.

Under normal conditions, with the motor-generator supplying the average load, the battery does not become exhausted, but receives back sufficient charge during the period of rest between trips to make up for the discharge while the hoist is in operation. The battery, therefore, while relieving the motor-generator and power line of the severe load fluctations, is maintained at all times practically full and ready to supply the entire demand in case of interruption to the power supply.

Prosperity Activities In Dayton.

A belated report from Dayton, O., indicates that Electrical Prosperity Week there was an entire success. The activities started the latter part of the previous week with the decorating of the fronts of the different stores occupied by electrical dealers, etc. The Home Telephone building, which houses the Ohio State Telephone Company, the Dayton Power & Light Company and the Postal Telegraph Company, was very cleverly decorated with bunting, flags and shields outlined in electric lights.

Sunday, at the request of the Dayton Jovian League, a number of pastors throughout the city preached "prosperity" sermons and drew attention to Electrical Prosperity Week and the wonderful advancements that are being made in electrical science.

Monday evening a joint banquet was held of the members of the Dayton Jovian League and the Dayton Advertising Club at the Algonquin Hotel.

Tuesday evening one of the big events of the week took place, it being an Electrical Prosperity parade, given under the auspices of the Dayton Jovian League. The parade was headed by a platoon of police, followed by the Mayor, Director of Public Service and Director of Public Safety, all of whom are Dayton Jovians. Then followed the grand marshal of the parade, J. C. Baggott, leading between 500 and 600 men connected with the electrical industry, each of whom carried an electric baton consisting of a 25-watt Mazda lamp mounted on the end of a round stick about 36 inches long. The lamps received their energy from the batteries of electric trucks belonging to the Dayton Power & Light Company, and there were approximately 100 lamps and 100 men to each truck, 50 on a side. Throughout the march the lamps were waved and held in different positions, securing some very interesting effects. The men marched two abreast, 30 feet apart, and the lamps in the line were located every 10 feet. On the principal street of the city, Main Street, the center lamp on the five-light boulevard standards had been changed to red, which harmonized with the coloring of the lamps carried by the marchers. There were two bands in the parade which furnished suitable music. Before the parade disbanded, the marchers assembled, and being led by the band, throngs of people sang "America."

Wednesday was "Telephone Day," when the Central Union Telephone Company and the Ohio State Telephone Company opened their exchanges to visitors and many people took this opportunity of becoming more familiar with this branch of the electrical industry.

Thursday noon the Dayton Rotary Club held its Electrical Prosperity Week meeting, when President J. A. MacMillan introduced Charles S. Hall, one of Dayton's leading Jovians and a Rotarian, chairman of the day. Mr. Hall in turn introduced D. L. Gaskill, the secretary of the Ohio Electric Light Association and President of the Greenville Electric Light & Power Company, Greenville, O., who gave a very interesting talk on "Service."

Thursday evening at the Hotel Miami a Prosperity Banquet was held under the auspices of the Dayton Jovian League. First Tribune W. S. McKee was chairman and introduced Ex-Governor James M. Cox as toastmaster. Many interesting talks were made.

In addition to the activities that have been mentioned, the electrical dealers throughout the week featured "Prosperity Week Bargains" and they report very satisfactory sales.

Under the auspices of the Dayton Jovian League there was also held two essay contests,—the first being confined to the pupils of the seventh and eighth grades, entitled "The Uses of Electrical Appliances in the Home," and the second to the high schools, on "What Electricity Has Done for Mankind." Approximately 5,000 essays were written on these two subjects.

Insofar as Dayton is concerned, Electrical Prosperity Week proved to be a very interesting and beneficial week, and it is thought that it will be the means of increasing the sales of electrical appliances this season and of securing many new customers for the central station, which will in turn benefit the electrical contractors and dealers.

The Dayton Electrical Prosperity Week Committee was headed by Thomas F. Kelly, commercial manager, the Dayton Power & Light Company.

The telephone system of Seville, Spain, is being extended to 22 adjoining towns.

Digitized by Google

Bureau of Standards Reports in the Case Concerning Fire and Accident Hazard of the Economy Refillable Fuse.

The National Bureau of Standards, Washington D. C., has completed its report in the case of the Economy Fuse & Manufacturing Company versus the Underwriters' Laboratories, Inc., concerning the fire and accident hazard of the Economy refillable fuse. The Laboratories conclude that the report finds in its favor, as it recommends that these fuses be not approved at present for general use on the same basis as fuses at present listed as standard by Underwriters' Laboratories. On the other hand, the company concludes that the report is favorable to it, because of the finding that the evidence in the case does not show that the use of the fuses has on the whole resulted in any greater fire or accident hazard than is involved in the use of standard inclosed cartridge fuses.

Under a permanent arrangement which exists between the Underwriters' Laboratories, Inc., of Chicago, Ill., and the Bureau of Standards, whereby in the event of dispute between the Laboratories and the manufacturer of any device submitted to them for approval, the dispute may, with the consent of both parties, be submitted to the Bureau of Standards for decision, the Underwriters' Laboratories and the Economy Fuse & Manufacturing Company, of Chicago, Ill., jointly appealed, under date of May 17, 1915, to the Bureau of Standards for decision on the following question: "Has it been shown that the use of the fuses manufactured by the Economy Fuse & Manufacturing Company results in no greater fire or accident hazard than the use of other cartridge inclosed fuses at present listed as standard by the Underwriters' Laboratories, Inc.?"

After hearings and the submission of a great amount of testimony the report, which embraces over 500 pages, was completed and filed on December 14, 1915. The conclusion of the Bureau of Standards is as follows:

Conclusion.

"It appears from the foregoing resumé of the Bureau's investigation that the Economy fuse, when new and properly filled or refilled, operates satisfactorily under the most common working conditions of overload and moderate short-circuits when in circuits with low inductance, and possesses some marked advantages over the approved fuses with which it has been compared. This fuse is, however, distinctly inferior to most of these approved fuses under severe short-circuit conditions. It has not yet been established that it will not introduce hazards peculiar to refillable fuses, owing to deterioration from repeated blowing of the fuse elements in the same casing and possibly from long-continued subjection of the fuse to the working current. The approval of the present type of Economy fuse for unrestricted use would therefore result in a lowering of the standard of fuse performance under severe test conditions, and might introduce hazards in actual use, the importance of which it is difficult to estimate at this time. The experience with the present type has not yet been sufficient to determine whether the total hazard is greater or less than it is with approved fuses as they are actually used in practice. The investigation therefore leads to the following finding.

Finding.

"It has not been shown that the use of the fuses manufactured by the Economy Fuse & Manufacturing Company will result in no greater fire or accident hazard than the use of inclosed cartridge fuses at present listed as standard by the Underwriters' Laboratories, Inc.

"On the other hand, the evidence in the case does not show that the use of Economy fuses has on the whole resulted in any greater fire or accident hazard than is involved in the use of standard inclosed cartridge fuses.

"In comparison with fuses listed as standard by Underwriters' Laboratories, the fuses at present manufactured by the Economy Fuse & Manufacturing Company have been shown to possess certain features which tend to increase the hazards involved in the use of fuses, and other features which tend to reduce such hazards. The relative importance of these features can be determined only by extended experience under working conditions.

"It is therefore recommended that Economy fuses be not approved at present for general use on the same basis as fuses at present listed as standard by Underwriters' Laboratories, Inc., but that a continuation and extension of their use be permitted by municipal and underwriters' inspection departments under conditions where their performance can be observed by each inspection department until sufficient experience regarding their performance under service conditions can be obtained to justify an unqualified approval or refusal to approve.

"The evidence on which the foregoing decision has been reached is summarized and discussed in the succeeding sections of this report."

In connection with the report the following statement has been issued by the Underwriters' Laboratories, Chicago:

"The National Bureau of Standards has rendered decision in favor of the Laboratories in the case of the Economy Fuse and Manufacturing Company vs. Underwriters' Laboratories. The report of the Bureau sets forth in full the evidence upon which the finding is based and covers 550 pages.

"This is the first case to come before the federal authorities since arrangements were made several years ago for decisions on technical matters concerning which fixed differences of opinion exist between the Laboratories and their clients.

"Notice of appeal in this case was filed at Washington on May 17 of this year. A preliminary hearing was held in Chicago on May 27 and pursuant to notice issued June 10 a public hearing was held in Washington on July 8.

"Experts of the Bureau conducted exhaustive tests at Washington, Boston and Chicago, investigated performance of the devices in service at New York, New Haven, Philadelphia, Baltimore, Pittsburgh, Cincinnati, Cleveland and other cities, and following requests received from manufacturers twice extended the time fixed for filing evidence. Working under these conditions the Bureau handed down its exhaustive report and decision under date of December 14, less than seven months after the first notice was filed at Washington. The case presented very unusual complications which would have undoubtedly involved excessive costs and several years of litigation if adjudication had been attempted through the machinery of state or federal courts. The expert judges of the National Bureau of Standards have demonstrated their ability to render a new and very valuable service to the public.

"The Laboratories were represented by W. H. Merrill, manager, Dana Pierce, electrical engineer, and Darrell S. Boyd, attorney. The Economy Fuse and Manufacturing Company was represented by A. L. Eustice, president, R. J. Foote, counsel, H. M. Huxley, patent counsel, H. E. Clifford, electrical expert, and A. B. Mallory, chief engineer.

"Representatives of the Bureau of Standards conducting the investigation and presiding at the hearings were Dr. S. W. Stratton, director; Dr. E. B. Rosa, chief physicist; W. J. Canada, electrical engineer; Burton McCollum, electrical engineer; H. B. Brooks, associate physicist, and T. W. Glading, associate electrical engineer."

Upon being shown this communication, R. L. Foote, counsel for the Economy Fuse and Manufacturing Company, stated that the report from the Bureau of Standards had been received, that the evidence is decidedly

Digitized by Google

in favor of Economy fuses and the finding "that the evidence in the case does not show that the use of the Economy fuse has on the whole resulted in any greater fire or accident hazard than is involved in the use of standard inclosed cartridge fuses," decides the controversy in favor of the company. "The company," he said, "has always contended that the use of the Economy fuse, while susceptible of abuse, tended to eliminate the great fire dangers due to the abuse of standard inclosed fuses. The Bureau states that the evidence obtained shows quite clearly that there is a large amount of abuse of approved fuses and a large amount of refilling of approved fuses by small shops and users which is improper and that while there is also some abuse of the Economy fuse 'that the evidence indicates that up to the present time there has been relatively less of this form of abuse in the case of Economy fuses in proportion to the number used, than in the case of standard inclosed fuses;' and that although the Economy fuse may introduce certain hazards (not known to actually exist) not occurring in approved fuses, they at the same time tend to reduce one of the chief sources of the danger connected with the use of the latter which in a measure at least compensates for any hazard that may be peculiar to the Economy fuse and possibly is more than a fair equivalent for such hazard.

"The controversy submitted to the Government for answer was: 'Has it been shown that the use of the fuses manufactured by the Economy Fuse and Manufacturing Company results in no greater fire or accident hazard than the use of other cartridge inclosed fuses at present approved by Underwriters' Laboratories, Inc.?'

"It was to this question of the results of the use of the fuse alone that the company directed its evidence. And the finding above quoted seems to determine this question in favor of the Economy fuse, and this was the sole question for decision.

"The Bureau of Standards, however, as a government institution, seems to have felt it was making an investigation into the whole fuse question, and that it was called upon to treat of matters outside of the controversy between the company and the Laboratories, and although no evidence of hazards from possible deterioration, due to long continued use with much replacing of elements, is shown by the investigation to have occurred in practice, it was thought that the experience with the air-space fuse was not long enough to determine definitely whether such deterioration would occur to a greater extent in the Economy fuse than in the approved fuses from long continued use.

"Although the Bureau concludes that this hazard which may be peculiar to a renewable fuse is possibly more than offset by the tendency to reduce the chief source of danger connected with the use of approved fuses; i.e., their abuse and improper refilling, they believe that the inference that they had definitely passed upon this possible phase of the question, which would result from unqualified approval at their recommendation, should not be drawn against them, and they, therefore, recommend that the fuses be not approved generally at present, and expressly recommend that a continuation and extension of their use be permitted by municipal and underwriters' inspection departments under conditions where their performance can be observed, until sufficient experience regarding their performance under service conditions can be obtained to justify unqualified approval, or refusal to approve."

Game of Going to Market.

Playing a Trump in the Electrical Advertising Game.

The electrical industry is represented by the Western Electric Company in a new advertising game, which recently appeared on the market, in the production of which 13 large distributors of nationally advertised goods collaborated. The game, known as "Going to Market," is modeled after the famous game of "authors," the dignified old faces and names of the latter giving place in the new game to the names and products of 13 diversified manufacturers. Each manufacturer has a set of four cards, making a total of 52 for the deck. The game is played exactly like its prototype; the main difference, as explained above, is the substitution of names. It is necessary to repeatedly call for certain cards, the call in every case being the name of the manufacturer and his product, as for example, "Give me Western Electric Interphones," etc. Just as the game of "Authors" engraved on its players the names of famous writers and their works, so will the "Going to Market" game engrave the names of these 13 manufacturers and their 52 products on its players and engrave them more indelibly than any other form of advertising yet devised. A name learned in this fashion will not be soon forgotten, and its repetition seen anywhere will automatically call to mind the associated product.

The Western Electric Company's four cards are used for washing machines, vacuum cleaners, interphones and electric irons. Wherever possible all national advertisements issued by the Western Electric Company and the allied originators of the game carry an invitation to write for this "Going to Market" game, which will be sent prepaid anywhere in the United States by any one of the thirteen companies on receipt of ten cents in stamps or currency. The game has made a "hit".

Chicago Electrical Engineers to Discuss Naval Preparedness.

A joint meeting will be held on December 29 in the rooms of the Western Society of Engineers, Monadnock Block, Chicago, of the Electrical Section of the Society and the Chicago Section, American Institute of Electrical Engineers. Frank J. Sprague, of the recently established Naval Advistory Board, will make an address on "Naval Preparedness and the Civilian Engineer."

Digitized by Google

BOOK REVIEWS.

"Principles of Direct-Current Machines." By Alexander S. Langsdorf. New York: McGraw-Hill Book Company, Incorporated. Cloth, 404 pages (5½ x 8 inches), 313 diagrams and illustrations. Supplied by the Electrical Review Publishing Company, Inc. for $3.00.

This is one of a series of engineering texts outlined by a committee of nine prominent electrical engineers and teachers. The author is professor of electrical engineering and dean of the schools of engineering and architecture, Washington University, St. Louis. One would naturally expect a book conceived and executed under such auspices to be of more than usual merit. This expectation is fulfilled to a great degree.

The book is intended for junior and senior students in engineering schools, and accordingly the treatment is somewhat more advanced than that of the more common American texts. The author has not hesitated to use the calculus whenever its application would aid in showing the interdependence of the physical quantities more advantageously. The use of higher mathematics has not, however, degenerated into mere mental gymnastics, as special prominence has been given to the physical bases of the equations, and the mathematical analysis is usually preceded by a full discussion of the physical principles involved.

Much of the subject matter is of necessity the same, and is treated in somewhat the same manner, as that in other textbooks on direct currents. The classification is in many respects original and considerable attention is given to more recent developments in the art. It is the first American book on direct currents which makes use of three-dimensional diagrams for depicting the operating characteristics of generators and motors.

The chapters on commutation cover the subject in a much more extended and comprehensive manner than is usual. The subject of armature winding is likewise quite extended, more so than would seem necessary for others than designers. The chapter on Efficiency, Rating and Heating contains much valuable matter and is an excellent example of the application of mathematical analysis to physical problems.

New applications and designs of direct-current machines are discussed in the last chapter, which treats of Balancers, Train-Lighting Systems and Automobile Generators. A very elegant mathematical analysis of the Wagner automobile generators closes the text. This last will undoubtedly serve as an example of a method of attack for students.

There is practically nothing in the text that can be adversely criticised. The wording of the definitions and statements of principles shows that great care has been taken to make these exact, clear and concise. In the opinion of the reviewer it is a most excellent book for advanced classes in direct currents. It has set a high mark for other books of the series.

C. M. JANSKY.

"Conservation of Water by Storage." By George F. Swain. New Haven: Yale University Press. Cloth, 384 pages (6¾x 9¾ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $3.00.

This book represents a series of lectures given by the author at Yale University in 1914 and constiutes the third such course dealing with the subject of Water Storage Conservation, given in the Chester S. Lyman lecture series. The first chapter deals with conservation in general, while the next four are devoted to the particular relation of conservation of water to the conservation of other natural resources and also to the much debated controversy with reference to the question of federal control of water powers. The latter is especially discussed with respect to streams along which private parties hold riparian rights and with respect to the public domain in the western states. Like many other authors, the writer assumes that any use of water power means a saving of an equivalent amount of coal, not recognizing that most developments of water power, at least in the western states, represent new applications of power or the creation of new industries. He also ignores the contention made in the latest report of the United States Forester that more rapid development of water power in the West is mainly prevented by the lack of consumers rather than by the absence of suitable legislation. A chapter on the technical aspect of conservation by storage cites a number of examples of this work and is profusely illustrated with photographs of water-power projects. The last two chapters deal with the relation of forests to stream flow, and to floods, the damage wrought by them and their prevention. Appendices give the text of a number of legal documents affecting the subject. The book is well printed upon an excellent quality of paper and is exceptionally well illustrated. It constitutes a valuable addition to the available information upon the subject, although but little of the material is new. Extensive quotations are made from other sources. The legal aspect of the subject seems to be given quite as much, if not more attention, than the engineering features and possibilities.

"Electric-Light Fitting." By S. C. Batstone. London: Whittaker & Company. Cloth, 317 pages (4½x7¼ inches), 238 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $1.50.

This volume deals in a very able manner with the subject which it is intended to cover, only enough introductory matter being given to make the ensuing chapters readable by the contratcor or wireman who has not had a technical education. The construction and use of the various fittings which enter into ordinary lighting installations, and other applications of electric current to domestic uses are fully explained and illustrated. The practical side of the subject is continually emphasized. Later chapters are devoted to lamps, reflectors, transformers and meters, while the two concluding chapters consider respectively private plants and central stations. An appendix gives the wiring rules of the British Institution of Electrical Engineers and the British Government Regulations for Factories and Workshops. These, of course, will have little interest in this country except for comparative purposes, and it should be stated that the fittings which are described and discussed consist of types which are in general use in England, but are almost unknown in this country. The same statement applies to the methods of wiring, although, of course, the principles involved and the necessary connections do not have to be thus qualified.

"Official Index to State Legislation." Vol. I. New York: Law Reporting Company. Cloth, 8x11 inches. Price, $10 to subscribers.

This is a cumulative numerical and subject index and a complete record of all bills introduced in all state legislatures. It is published under the direction of a joint committee representing the National Association of State Libraries and the American Association of Law Libraries. The present volume covers the sessions of state legislatures taking place in 1915. The pages are not numbered. Under each state is a list of all bills and resolutions introduced into Senate and House, giving number, title, date, name of member introducing, subject matter and disposition. There is also an index for all by subjects. This index will be very valuable to all trying to keep in touch with current legislation. It could be improved by indicating in the subject index which bills have become laws.

During 1916 it is proposed to issue the index weekly and make it cumulative, thus showing the progress of each bill during the legislative sessions. The subscription to all weekly issues, the annual number to be issued in August, and the supplements is $100.

Ohio Association Committee Meetings.

Akron is to be the scene of meetings of three committees of the Ohio Electric Light Association in January. The Transmission and Distribution Committee will meet on January 18, the Committee on New Business Co-operations on January 19, and the Meter Committee on January 20. The Meter Conference will be devoted to "Maximum-Demand Apparatus."

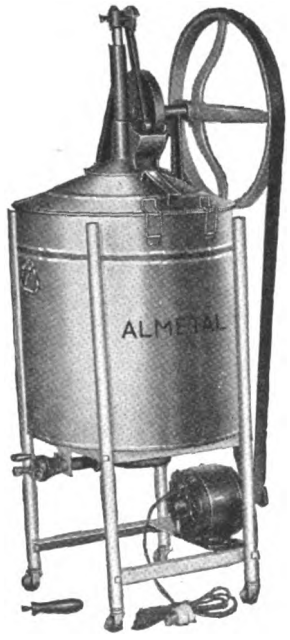
Digitized by Google

New Electrical and Mechanical Appliances

New Electric Washing Machine.

The new "Almetal" washing machine operates on the vacuum-suction principle. There is one vacuum plunger which is operated by a crank belted to the motor. A gas burner is mounted directly under the tub and a fountain of boiling suds and steam from the bottom of the boiler forces its way upwards through the clothes, while the stroke of the plunger forces it back again. All parts are made of metal, with copper or galvanized aluminum finish as desired.

The motor, which has a capacity of



New Electric Washer Operating on Plunger and Suction Principle.

one-fifth horsepower and operates at 1,750 revolutions per minute, is made by the Robbins & Myers Company, Springfield, O. It is mounted on a plate under the tub. The machine is made by the Almetal Manufacturing Company, 7227 Manchester Avenue, St. Louis, Mo.

A New Gas-Filled Arc Lamp.

A high-efficiency lamp consisting of an arc between tungsten electrodes in a nitrogen-filled glass bulb has been introduced in England by the Edison-Swan United Electric Light Company. The lamp is made for both direct and alternating circuits in sizes from 500 to 1,000 candlepower. It is expected to increase this range at both ends. The efficiency at normal current is 0.5 watt per candle.

The lamp consists of a bulb similar to that used for incandescent lamps, and like the latter, is filled with nitrogen. Two of the terminals which are lead in in from the base of the lamp are connected by a tungsten filament. The ionization produced by this hot filament permits an arc to jump to a third terminal when the cutout in the original circuit is operated. The third terminal also consists of a flat piece of tungsten and the maximum intensity of the light is in a direction at right angles to the plane of this electrode. To obtain the best results a definite relation of electrode area to volume must be maintained. The bulbs are much smaller than for incandescent lamps of corresponding candlepower. A bulb 4 inches in diameter is used for a lamp of 500 candlepower.

Lamps have been made with a life of 500 hours and it is expected to extend this to 800 hours. The average decrease in candlepower during life is about 10 per cent. The arc is said to be very stable, but when interrupted will be reestablished upon restoration of normal voltage. There are no moving parts in this lamp.

The intrinsic brilliancy of the new lamp is approximately 10,000 candlepower per square inch as compared with 1,000 candlepower per square inch for incandescent tungsten lamps, or 375 candlepower per square inch for carbon-filament lamps.

The color of the light can be made to vary from bright yellow to an intense white by running at different efficiencies. The lamp burns satisfactorily in series on high-voltage circuits.

The advantages claimed for this lamp are that no regulating mechanism is required, little light is obstructed by the electrodes and there is no flickering. It is especially suitable for projection work, motion pictures, searchlights, microscope illumination and color matching.

Electrolytic Iron Produced Commercially in France.

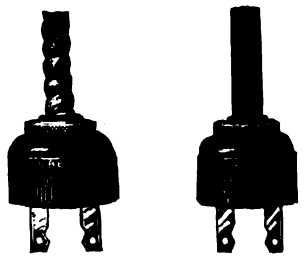
It is reported that a company in France is now producing tubes and sheets of electrolytic iron by a process in which ordinary cast iron serves as a basis. The cathode rotates in a solution of ferrous salt and a layer of iron is deposited on the surface. The iron thus produced is very hard at first and it contains some gas. It is annealed so as to expel the gas and give a soft, malleable metal.

The solution is kept neutral by placing iron turnings in the bottom of the tank and by adding oxide of iron as a depolarizer.

Iron pipe can be made by using a rod as a core. It is expected to make sheet iron without rolling which shall be very soft and pure and valuable for electrical machinery.

Improved Strain-Relief Cap.

A few weeks ago a new form of strain-relief cap for use with attachment plugs and receptacles and manufactured by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., was described in these columns. This cap has been found to meet an urgent demand. Experience with it, however, suggested that by a slight improvement it could be made of still greater service. Consequently it has been substantially strengthened in construction and improved so as to make it prac-



Attachment-Plug Caps for Armored Cable and Reinforced Cord.

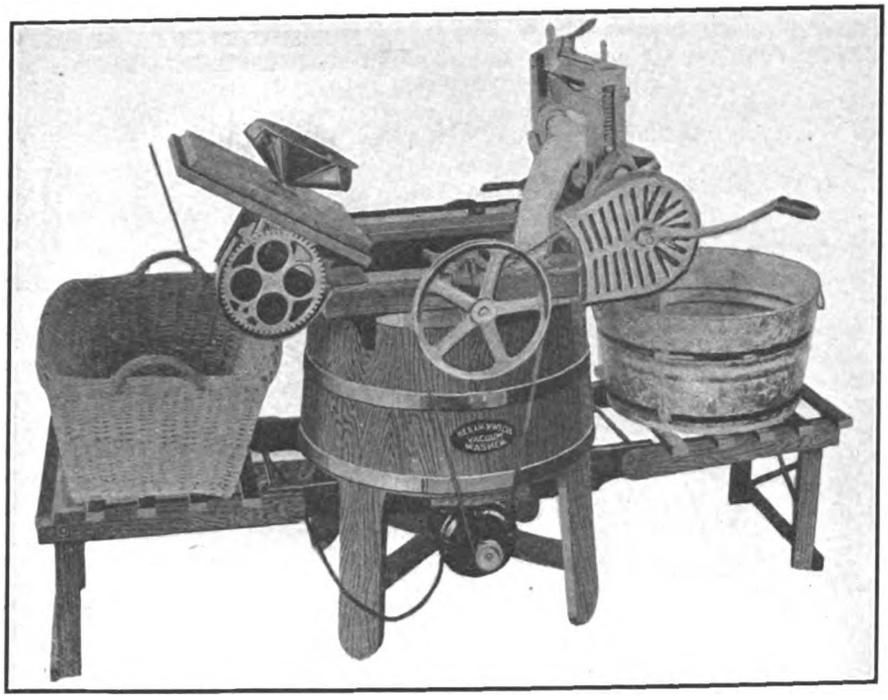
tically indestructible. In the accompanying illustrations these caps are shown adapted for both armored cable and reinforced cord.

In industrial plants where both armored cable and reinforced extension cords are being used more and more for the connection of portable tools, inspection lamps, etc., the use of these improved caps will be found a very serviceable means of making the connection to the supply circuit.

The "Klean Kwick" Electric Washing Machine.

When the Du Mond Manufacturing Company, Cedar Falls, Iowa, designed its new "Klean Kwick" washing ma-

Digitized by Google



Motor-Driven Vacuum-Cup Washer with Attached Folding Benches for Baskets and Rinsing or Bluing Tubs.

chine, it was on the principle that soap and water clean clothes by the action of the soapy water passing through them, regardless of the process. Pounding clothes with a slab on a rock at the side of a stream or rubbing them back and forth on a washboard cleans the clothes, but the work is fatiguing and the clothes are soon worn out from the severe usage in laundering. So to obtain the desired action of the water through the clothes without wear and with little effort, a stomper or vacuum cup was designed to be moved up and down in the tub of clothes. This forces the water back and forth through the garments, first by suction and then by pressure. The vacuum cup is attached to the lower end of a vertical plunger rod set in extra long bearings and is driven by a Westinghouse Electric small motor mounted out of the way under the machine.

The wringer too is driven from the motor, which is capable of operating both the washer and the wringer at the same time. While a machineful of clothes is being washed, clothes can be rinsed and run through the wringer from the washtub to the clothes basket ready to be hung up to dry.

The "Safety First" idea is not overlooked in the construction of this machine, as a release lever protects the operator from injury in the wringer, and all working parts of the machine are guarded, as will be seen in the accompanying illustration.

After the old-style washing was on the line it used to be quite a job to move away the benches and clean up. With the "Klean Kwick" machine the benches are easily folded up compactly with the machine, which is readily moved aside until needed for the next wash day.

New Esterline Recording Instruments.

The Esterline Company, 221 East South Street, Indianapolis, Ind., announces a new line of graphic voltmeters and ammeters, known as Esterline type G. H. meters. These instruments are supplied in either switchboard or portable type, weighing 9.5 pounds, and although of light weight, they are designed for heavy service, such as met with in ordinary commercial and industrial work, where laboratory accuracy is not necessary.

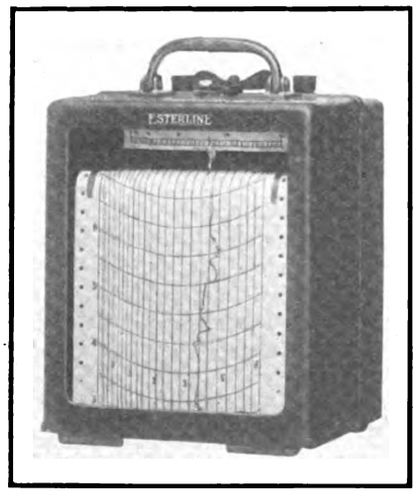
The cases are of cast aluminum, the front half being removable, as in all Esterline instruments, a brass handle being provided on the portable, and mounting studs on the switchboard types.

The charts are 26 feet in length and are driven at a speed of either 0.75 or 1.5 inches per hour by an eight-day jeweled lever clock. A reroll is also provided for the used chart. The ink is contained in a large, stationary ink well. The Esterline patented inking device enables a continuous record to be obtained with an all-metal pen, with minimum friction.

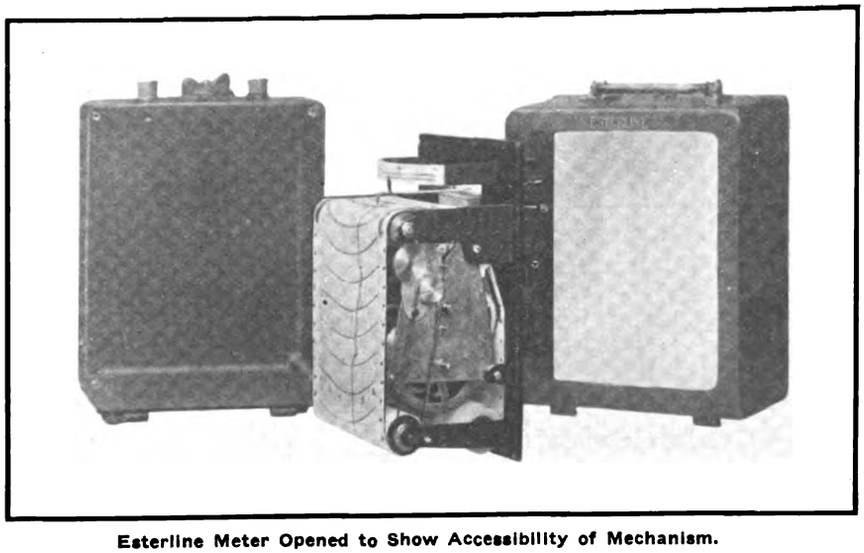
A clear, open scale is obtained, the scale being 4.5 inches in width and printed on perforated paper 6 inches wide. An indicating scale is also provided, enabling readings to be taken without opening the case.

The movements in the instruments are of the moving-iron-vane type, the armature being mounted in jewel bearings. The clock movement, scale plate and all parts are mounted on a center casting, thus insuring true alinement, and making all parts interchangeable and easily accessible for inspection or replacement.

Although the price of these type G. H. meters is remarkably low, the well known Esterline accuracy and reliability have been maintained, and it is expected that these instruments will be



New Graphic Recording Meter.



Esterline Meter Opened to Show Accessibility of Mechanism.

Digitized by Google

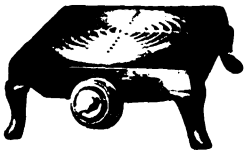
used in large quantities for checking voltage and current of street-lighting circuits, etc.

Westinghouse Hot Plates.

For hotel, restaurant and domestic use the Westinghouse Electric & Manufacturing Company has recently added an assortment of electric hot plates to its line of heating devices. It is claimed that no special utensils are needed with these hot plates, as they have radiant heaters with glowing heating coils at the top and are therefore very efficient with ordinary cooking vessels.

The hot plates are made in eight-inch and ten-inch sizes and a combination of eight-inch and ten-inch. On the eight-inch heater, the switch has four positions

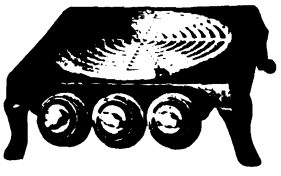
New Type of Hot Plate.



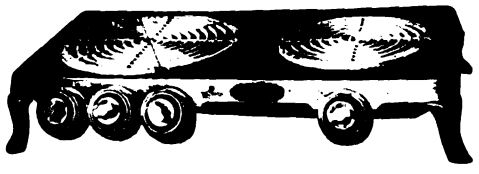
Another Form of Hot Plate.

—high heat, medium heat, low heat, off. No current is wasted at any heat, the connections being such as to utilize all the current consumed and to produce uniform heating. In the ten-inch heater, three separate switches are used by means of which an area 6 inches, 8 inches, or 10 inches in diameter may be intensely heated, thus permitting the greatest economy with various sizes of dishes.

Noncorrosive material is used for the heating elements. Water or food spilled over the heater will not damage it. The porcelain brick on which the heating element is assembled will stand rough usage. Deflector plates below the heaters prevent scorching the table, protect the connections and increase the efficiency of the heater. All these hot plates are built primarily for utility. They are therefore of simple design and easily kept clean.



Hot Plate with Three Separate Concentric Elements.



Double Hot Plate with One Triple and One Single Heater.

Hard Paper for Insulation.

In an article in the *Elektrotechnische Zeitschrift*, K. Fischer describes the uses of hard paper or "pertinax" for the construction of insulators, it being preferable in many cases to porcelain. In other cases, however, shapes that can easily be made in porcelain are not suitable for hard paper.

Pertinax is made by rolling layers of paper one upon another, the paper being impregnated with some kind of resin, while heat and pressure are applied. The electrical properties are principally those of paper, but the other properties depend upon the resin used. Formerly natural resins were used, but the introduction of synthetic resin has raised the temperature of softening to above 180 degrees centigrade, so this temperature can be used without harm and the material is then as free from chemical action as porcelain and is waterproof. The mechanical strength is about 14,000 pounds per square inch, the electrical working stress is about 2,500 volts per millimeter and the testing voltage 8,000 volts per millimeter, applied for three minutes. The dielectric constant is about 4.5.

The writer of the article in question gives a number of precautions which should be taken in the design of insulation.

Electrical Control for Traverser Car.

The control of electric motors can be considerably simplified by the use of a push-button control system, and within the last few years such systems have been applied with increasing success to motors driving many kinds of machines. At a large English wharf the Igranic electric firm of Bedford, England, has fitted a system of this type to the electric traverser shown in Fig. 2 for current is supplied by overhead trolley. The control outfit consists of a panel with automatic devices and also a small reversible master switch. On the car are a set of tappet switches which work by striking projections along the track.

All movements of the car are controlled by the master switch (Fig. 1) in the driver's cabin, and it is so constructed that any mistake the driver may make cannot result in damage to the electric equipment or to the traverser. When the handle is at the center position the current is off. Studs on either side of this position correspond to stoppage at each track. At the ends are two "inching" positions which enable the car to be "inched" or moved slight amounts in either direction. To start the car, the operator merely moves the handle to right or left according to the driving direction on the track, and when the handle is brought opposite the button corresponding to the desired road he presses the handle against the face of the switch. A projection on the switch-handle then depresses the button.

The control panel (Fig. 3) is then brought into action with its magnetic switches and the car motor is started up to full speed by a uniform acceleration. Just before the traverser reaches the road at which it is to stop, a tappet switch carried under the car engages with a tappet projecting from the side of the track. This causes the motor's speed to be reduced so that when the traverser approaches the road it is traveling very slowly. At the stopping point the tappet switch engages with a second tappet, and the motor circuit is then opened by a circuit-breaker on the panel. The brake is applied automatically and the traverser is brought to rest exactly opposite the road, the rails of the latter being in line with those of the traverser. In case of emergency it is possible, by making use of the emergency stop button in the "off" position of the switch, to stop the traverser at any point on its journey. To do this the operator has only to return the switch handle to the central position and then to press it against the emergency stop button there located. When once the master switch has been operated, the self-acting control panel performs all further

Fig. 1.—Master Switch for Igranic Control System for Traverser.

Digitized by Google

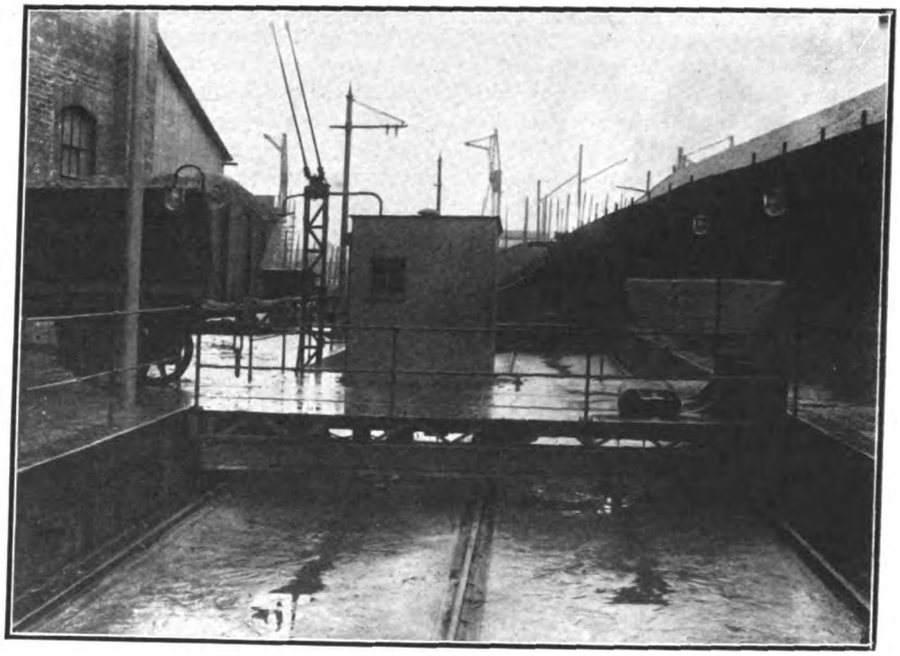


Fig. 2.—Electrically Operated Traverser Car.

operations automatically, the motor being accelerated or retarded and reversed without jerks. The main circuit is always made or broken by a circuit-breaker on the panel, which is fitted with magnetic blowout and carbon contacts, and can therefore work without damage.

The various parts of the controlling apparatus are interlocked, thus compelling all operations to take place in their proper sequence. Should current fail, the motor is brought to rest, but when current comes on again the motor will not start up until the operator manipulates the master switch. There are no conductors in the track. Moreover, the only live switchgear on the traverser outside the driver's cabin are the limit switches which are carried underneath the traverser, where no one can accidentally come in contact with them, but where they can be easily inspected by raising a trap door.

It is possible to arrange the control of a traverser of this kind by means of a series of push-buttons, but experience seems to show that the master switch shown is superior for this purpose, as it only allows one button to be pressed at a time and the position of the handle at any time indicates the number of the road to which the traverser is to travel.

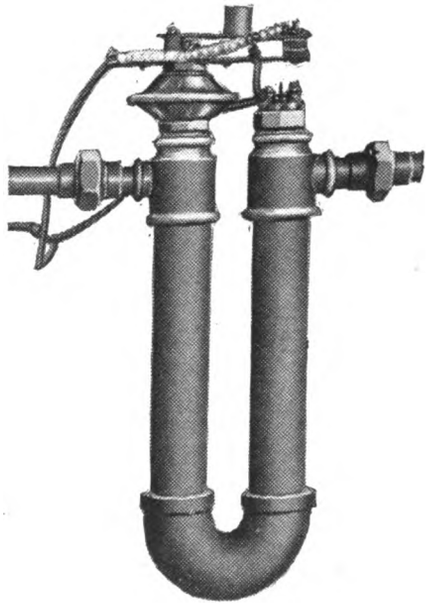
By this method, the control of the electrical apparatus and indeed the whole of the driving mechanism, is located within the operator's cabin. Right under his eye he has the motor and the controlling panel, but he does not have to operate these or even touch them, except to keep them clean and properly lubricated. He can concentrate his attention on the master switch, which is conveniently placed so that he can operate it while at the same time noting the progress of affairs through the window in the side of the cabin.

The mistake-proof interlocks that are provided on the control panel effectively prevent any improper operation. For instance, the motor cannot be accelerated too violently or the resistance cut out too quickly. All such functions are performed automatically and thereby the motor is efficiently guarded against unintentional injury.

New Automatically Regulated Electric Water-Heater.

During the past few years much interest has been created in the development of electric cooking, and particularly in the West the use of electric cooking appliances, stoves, ranges, etc., has increased at a very rapid rate. The manufacturers and central stations who have actively promoted the use of electric cooking on an extensive scale have realized that in connection with it there must be provided means for the heating of running water so that electricity can replace entirely whatever method of providing the heat for cooking that has previously been used.

To meet this evident need there has recently been placed on the market a new type of electric water-heater which includes a number of unique features. It has been developed by the Good Housekeeping Cooker Company, of Berkeley, Cal., and practically is an auxiliary to the Good Housekeeping cooker, which was described in our issue of August 7,



Good Housekeeping Automatically Regulated Electric Water Heater.

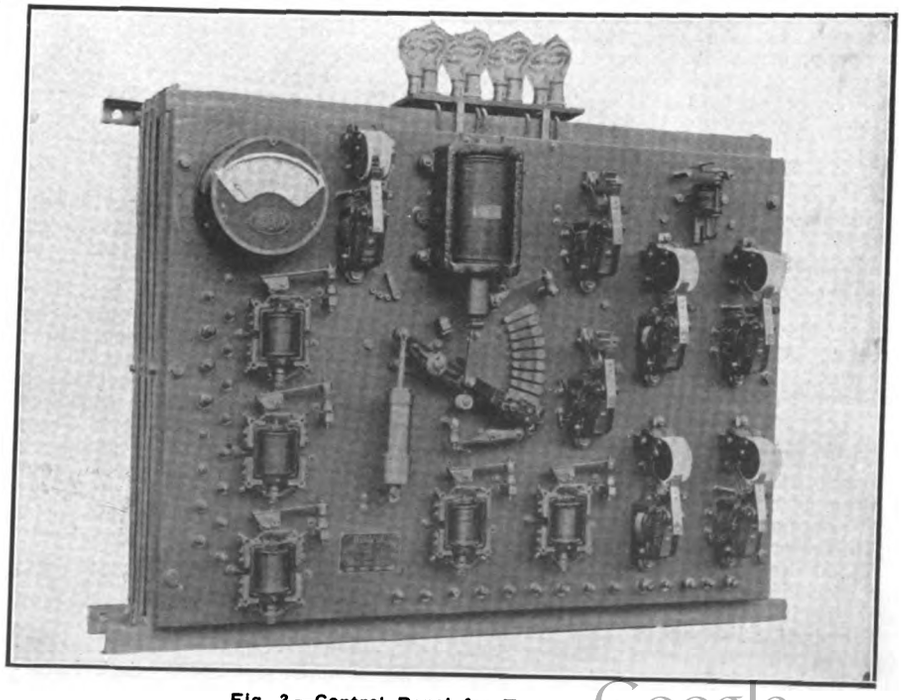


Fig. 3.—Control Panel for Traverser Car.

Digitized by Google

1915. This cooker, it will be recalled, is an inclosed automatically regulated appliance in the chamber of which the manufacturers claim that 80 to 90 per cent of the family cooking can be readily done without attention and in a very economical, hygienic and wholesome manner. This cooker has also provided on its top two hot plates or disk stoves on which frying and other cooking operations that cannot be done in an inclosed chamber can be performed. Thus this cooker, with the aid of these disk stoves, can take care of all of the cooking necessary.

The new water-heater, which is illustrated herewith, is designed to provide hot water at the faucets at any hour of the day or night in sufficient quantities to take care of the entire needs of the family. In contrast with other types of water-heaters, which include merely a three-heat switch and heating coil contained in the pipe for circulating the water and therefore require careful attention to prevent waste, the new heater takes only enough current to supply the necessary heat units to the water and maintain a supply thereof at a constant temperature of about 180 degrees Fahrenheit. As soon as this predetermined temperature has been reached the current is automatically turned off and is not again turned on until the hot water is withdrawn from the tank and cold water takes its place. At this time the current is again automatically turned on and the cold water flowing into the tank is heated to a temperature of about 180 degrees, after which the current is again automatically broken. This operation is repeated without any attention.

This heater thus provides an abundant supply of thoroughly hot water at the faucets instantly at any time during the entire 24 hours of the day. The energy taken to operate the heater is 750 watts while the current is on. A 10-gallon tank well insulated to avoid radiation of heat is all that is needed to store the hot water for the average family of three or four persons. For larger families a correspondingly larger tank is recommended. For such larger installations this heater can be secured with the heating element arranged to consume 1,000, 1,500 or 2,000 watts.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

ATTACHMENT PLUGS, Fuseless.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Separable and non-separable porcelain or composition attachment plugs. Benjamin 660 watts, 250 volts, catalog No. 903 H.

Listed November 23, 1915.

CONDUIT BOXES.—William H. Hope, 16 Palm Street, Newark, N. J.

Hope boxes with separable cast-iron cable clamps.

Hope boxes with tangential-screw cable clamps, catalog Nos. 12, 14.

Listed November 9, 1915.

CONDUIT BOXES, Service Entrance.—The Adapti Manufacturing Company, 919 West Street, Cleveland, O.

Cast-iron service entrance fittings. Catalog Nos. 2701-9 inclusive, 2700-T, 2701-T, 2770-79 inclusive, 2801-03 inclusive, 2800-T 2801-T, 2810, 2811, 2810-T, 2811-T.

Listed November 15, 1915.

ELECTRIC LIGHT BATH CABINET.—J. L. Mott Company, Trenton, N. J.

A mirror and sheet-metal-lined wood cabinet. Maximum rating 4,000 watts, 250 volts.

Listed November 24, 1915.

OUTLET BUSHINGS. — Killark Electric Manufacturing Company, 2005 Locust Street, St. Louis, Mo.

A porcelain fitting having a separate opening for each wire.

Electrolet, type O, secured in knockout of cabinet or outlet box by washers and special bushing.

Standard when wires pass through furrings without splices, joints or taps within the fittings.

Listed November 8, 1915.

OUTLET BUSHINGS, Service Entrance.—Killark Electric Manufacturing Company, 2005 Locust Street, St. Louis, Mo.

Cast-iron outlet bushing. Electrolets, type FB.

Standard for use only at exposed end of conduit (but not under fixture canopies) and only where conduit wires pass out through fittings without splices, joints or taps within fittings.

Listed November 9, 1915.

PICTURE MACHINES AND APPLIANCES.—Lumex Manufacturing Company, 50 Church Street, New York, N. Y.

Lumex Motion-Picture Projectors.

Three types each hand or motor-driven by special motors mentioned below: (1) A 30-ampere arc-lamp machine to be connected to supply circuit through a standard motion-picture-machine rheostat or transformer; (2) a 5-ampere arc-lamp machine to be connected to supply circuit through a special non-adjustable transformer or rheostat; (3) a 500-watt incandescent machine to be connected directly to supply circuit. None of above is classed as miniature.

The motors supplied by the Lumex Manufacturing Company and accepted for this purpose are as follows:

Direct-current motor Diehl Manufacturing Company, one-twentieth horsepower, 115 volts.

Alternating-current motor, Diehl Manufacturing Company, one-twenty-fifth horsepower, 110 volts, 60 cycles.

Listed November 16, 1915.

RECEPTACLES, for Attachment Plugs.—The Connecticut Electric Manufacturing Company, Connecticut and Florence Avenues, Bridgeport, Conn.

C. E. M. Co. Flush type. Chapman, 12 amperes, 250 volts, catalog No. 8000.

Listed November 23, 1915.

RECEPTACLES, for Attachment Plugs.—Union Electric Company, Trenton, N. J.

Union flush receptacles, Chapman type, 10 amperes, 250 volts, catalog No. 750.

Listed November 23, 1915.

ROSETTES, Fuseless.—Ernest Klein & Brother, 44 Fulton Street, New York, N. Y.

Klein, 3 amperes, 250 volts. Molding rosette, catalog No. 510.

Listed November 3, 1915.

SWITCHES, Automatic.—A. G. Electric & Manufacturing Company, 905 Howard Avenue North, Seattle, Wash.

No-voltage release switch consisting of National Electrical Code standard knife switches normally held closed against tension of springs by a catch operated by armature of an iron-clad magnet coil. Failure of voltage allows solenoid plunger to drop and cause switch to open.

Listed November 16, 1915.

SWITCHES, Surface Snap.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Ceiling switches (pull type).

(With metal covers.)

Single-pole, 1 ampere, 250 volts, 3 amperes, 125 volts, catalog Nos. BW-19, BW-20, BX-19, BX-20.

Listed October 25, 1915.

Digitized by Google

Current Electrical News

ATLANTIC STATES.

BUTLER, N. J.—The borough council has authorized the installation of an electric light and power system at Bloomingdale, to be operated from the local municipal lighting plant. A.

IRVINGTON, N. J. — The town commission is again considering the installation of a municipal electric lighting plant. A.

JERSEY CITY, N. J.—The City Commission is planning for extensions in the street-lighting system along Ocean Avenue. A.

JERSEY CITY, N. J.—The New Jersey Power and Light Corporation has been incorporated with a capital stock of $2,000,000, to operate electric light and power plants. A. B. Cheadle, C. N. Wilson and Raymond A. Weatherby are incorporators. John M. Enright is authorized agent. The company is located at 75 Montgomery Street. A.

ALLENTOWN, PA.—The Traylor Engineering and Manufacturing Company will in the near future expend about $350,000 in erecting new buildings, among which will be a large new machine shop and a four-story warehouse. It is said that all of the new machinery will be electrically driven to conform with their present practice. Samuel W. Traylor is president.

PHILADELPHIA, PA.—Plans are in progress for a power house and manufacturing plant to be built at American and Somerset Streets for Hafleigh and Company, W. E. S. Dyer is the mill engineer in charge of the work.

PHILADELPHIA, PA.—A power house and factory to cost $300,000 will be erected at Westmoreland Street and Frankford Avenue for Thomas Wolstenholme Sons and Company. W. E. S. Dyer is the mill engineer in charge.

WYOMISSING, PA.—The borough council has passed a loan ordinance of $30,000 recently provided for, and has arranged for another loan of $10,000 to purchase electric light equipment.

BLUEFIELD, W. VA.—Power and electrical equipment for the manufacture of armatures and other electrical machinery will be required in the plant of the West Virginia Armature Company organized here by A. L. and F. E. Smith and others, with a capital stock of $50,000. L.

NEWBERN, N. C.—The Brighton Light and Power Company has been incorporated with a capital of $25,000, by J. C. Irving, J. V. Blades and others.

NORTH CENTRAL STATES.

CINCINNATI, O.—A large amount of power and electrical equipment will be required in the construction of a proposed power building at North and Broadway, ten stories in height, of reinforced concrete, and costing $300,000. John H. Boll, architect, has plans for the building, which is being promoted by Cincinnati and eastern capitalists.

ARLINGTON HEIGHTS, ILL. — The Arlington Electric Company has been incorporated with a capital of $25,000, by Michael Koener, Frank Schuda and others.

MARSHALL, WIS.—The Marshall Electric Light and Power Company has been incorporated with a capital of $10,000. The incorporators are R. J. Buss, J. D. Meyers and others.

DEFIANCE, IOWA.—George Rosman has been given contract to construct a new electric light plant.

MASON CITY, IOWA. — The Thornton Light and Power Company has been incorporated with a capital of $10,000, by H. O. Case, J. L. James and others.

MARSHALLTOWN, IOWA. — The Iowa Railway and Light Company has purchased the electrical plant at Zearing, owned by Belden & Son, and plans next summer to connect the plant with a high-tension line to be built west of the city to Colo, and Ames.

PIERCE CITY, MO.—An election may be held here soon to decide whether to give a franchise to the Ozark Power and Water Company to supply current for the municipal system, displacing the municipal plant.

SEDALIA, MO.—The street-lighting system is to be bettered the first of the year. Address Mayor Babcock.

TRENTON, MO. — The Trenton Gas and Electric Company will remodel its gas plant, installing electric generators and fuel oil engines; will also equip an ice house, total cost $61,000.

AGENDA, KANS. — The Agenda Milling Company is installing additional electrical equipment for the purpose of supplying current for the local lighting system now being planned. M.

CIRCLEVILLE, KANS.—At the recent bond election the people of Circleville recorded their verdict in favor of electric lights by a vote of 97 to 11.

COFFEYVILLE, KANS. — The council plans to expend $20,000 for electric machinery. Address the city clerk.

KANSAS CITY, KANS.—The city of Kansas City has sold an additional $50,000 of the bond issue of $450,000 authorized for the light plant in 1914, leaving $37,000 unsold of that issue. The money will be used for extensions.

PAOLA, KANS.—The city council has awarded a contract for maintaining street lights, at $2,600 a year, to W. H. Moorehouse; the period being nine years and two months, the period of the electric company's franchise. It is said that the granting of this contract obviates the combination of a municipal lighting project with the municipal-owned water plant. M.

BISMARCK, N. D.—The Woodruff Electric Light and Power Company has been incorporated with a capital of $25,000, by W. G. Woodruff and others.

SOUTH CENTRAL STATES.

CARLISLE, KY.—The Carlisle Electric Light and Power Company has increased its capital stock from $15,000 to $30,000.

NASHVILLE, TENN.—The Board of Education will build an addition to the high school to cost $225,000. W. B. Ittner, of St. Louis, is architect.

NASHVILLE, TENN.—The Moore Development Company has been incorporated by J. C. Collins, J. S. Neely and others, with a capitalization of $10,000, to develop certain Tennessee property and to construct a hydroelectric plant.

ARDMORE, OKLA. — The North American Power and Light Company, of Chicago, has purchased the Ardmore City Gas Company, which owns a gas pipe line to the fields west of here and supplies this city with gas. O. J. McLane, of St. Louis, was president and principal stockholder of the old company. Studebaker Brothers, of South Bend, Ind., are heavily interested in the purchasing company. P. C. Ekern, of Chicago, will be the new manager.

DACOMA, OKLA.—The Dacoma Light and Power Company has been incorporated with a capital of $3,000, by Levi O. LeDou, G. E. Selfridge and others.

LAHOMA, OKLA. — The city has issued $6,000 bonds to construct electric light plant. Address the mayor.

SHAMROCK, OKLA.—Site for the big power plant which will furnish electricity for the Sapulpa and Oil Fields Railroad, has been located just south of the new town of Shamrock, Okla., where two forks of Spring Creek join, giving an abundant water supply. Power also will be furnished oil-producing companies needing it and to the town of Shamrock for electric lights and establishments needing power. P.

LORENA, TEX.—Street lights for Lorena are an assured thing, contract having been closed with the Texas Power and Light Company. It is expected that the lights will be installed before Christmas.

WESTERN STATES.

WENDELL, IDAHO.—It is reported the Great Shoshone and Twin Falls Water Power Company and the city of Wendell have entered into a contract whereby the power company will install a new lighting system in Wendell. R. B. King, superintendent of the Twin Falls Company, of Twin Falls, will have charge of the installation. The lights will be 400 candlepower, 250 candlepower and 100 candlepower. A majority will be 400 candlepower.

WHEATLAND, WYO. — Improvements to cost about $10,000 will be made to the municipal electric light plant, including purchase of new steam engine, and two boilers; bids to be called for at once. The installation

Digitized by Google

of a new generator is contemplated in the near future. Address the city clerk.

EVERETT, WASH.—A claim for a water-power site on the Sultan River for 10,000 miner's inches of water for power development, etc., has been filed with Mae Weatherbee, county auditor, Snohomish County, by F. L. Hammond, of Everett. O.

EVERETT, WASH.—A water claim for power purposes on the north fork of the Skykomish River to the extent of 1,200 cubic feet per second, has been filed by H. K. Owens, consulting engineer, Empire Building, Seattle, who represents E. C. Money, of Everett. According to the stipulations, work on the project must start within 180 days and must be completed within three years. O.

SPOKANE, WASH.—Fred B. Grinnell, et al., of Spokane, has petitioned the city council for a 25-year franchise for the purpose of furnishing the city of Spokane and its residents electricity for light, heat, power, etc., and steam or hot water for heating or other purposes. O.

VANCOUVER, WASH.—Reported plans for the construction of a transmission line from Vancouver to Kalama, which is to be constructed for the North Coast Power Company, formerly the Washington-Oregon Corporation, are practically completed, and the improvement will go forward shortly after the first of the year. Surveys for the line have been completed by J. L. Stannard, consulting engineer, of Portland, Ore. O.

CONDON, ORE.—B. A. Bower, of Condon, has purchased the Condon Electric Company's light plant here, and, according to reports, will spend considerable money increasing the capacity of the plant and giving a 24-hour service. O.

EUGENE, ORE.—At a recent meeting, the city council ratified the purchase of the holdings and franchise of the Oregon Power Company in the city limits by the city of Eugene, and the competition between the municipal plant and the plant of the Oregon Power Company has been ended. According to reports, the deal involved $150,000, of which $50,000 is to be paid at once, with deferred payments of $1,250 per month, with interest at 5 per cent. O.

BERKELEY, CAL. — The city trustees have passed a resolution of intention that 232 electroliers shall be installed within the limits of the lighting district extending south of Derby Street and east of College Avenue.

FRESNO, CAL.—According to O. G. Wishon, general manager of the San Joaquin Light and Power Corporation, the company will commence work shortly on a steam plant at San Maria, that town being at the end of a 224-mile transmission line which connects coast towns with the San Joaquin power house. The steam plant will provide extra power, proving of especial advantage to San Luis Obispo, San Maria, Paso Robles and other towns in that vicinity.

ORANGE, CAL. — The advisory committee of the Board of Trustees has passed a resolution recommending that the trustees proceed to install a lighting system under the district plan. The proposed district extends from Grand Street to Santa Fe on Chapman Street, and from Maple to Almond on Glassell Street.

SAN FRANCISCO, CAL. — Plans for the immediate expenditure of more than $4,000,000 in and near San Francisco for improvements to the Great Western Power Company's system were revealed at a hearing before the State Railroad Commission a few days ago by Mortimer Fleishhacker, president of the newly organized Great Western Power Company of California, a $60,000,000 corporation.

PROPOSALS.

PANAMA CANAL ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the General Purchasing Officer of The Panama Canal, Washington, D. C., until December 29, for furnishing at either Colon or Port of Ancon, Canal Zone, Isthmus of Panama, the following: Cable terminal, electric cable, and wire in accordance with Circular No. 996, obtainable from the above named office.

NAVY ELECTRICAL SUPPLIES.—The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., has asked for bids for electrical material as follows: 22,000 feet interior communication cable, 1,500 feet telephone cable, 2,000,000 feet plain double-conductor wire, 9,000 feet plain single-conductor wire, miscellaneous twin-conductor wire, schedule No. 9131, all for delivery at Navy Yard, Brooklyn, N. Y.; 5,300 feet single-conductor cable, etc., schedule No. 9135, for delivery at Navy Yard, Boston, Mass.; 20,000 feet cotton-covered lamp cord, 100 side current taps, 20,000 feet double-conductor telephone wire, schedule No. 9135, all for delivery at Navy Yard, Washington, D. C.; 300 high-resistance telephone receivers, schedule No. 9113, for delivery at Navy Yard, Washington, D. C.; three 15-kilowatt generating sets, schedule No. 9115, for delivery at Portsmouth or Mare Island; six-one-kilowatt radio transmitting sets, schedule No. 9118, for delivery at Navy Yard, Brooklyn, N. Y.; 250 fire control telephones, schedule No. 8139, for delivery at Brooklyn, N. Y.; 357,000 feet rubber-covered single and duplex wire, and 3,000 pounds weatherproof wire, schedule No. 9124, both for delivery at Navy Yard, Brooklyn, N. Y.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,525. TELEPHONE PLANT.—A report from an American consular officer in Ecuador states that a new telephone system is to be installed in one of the large cities of that country. Specifications and full information may be obtained from the Bureau or its branch offices. (Refer also to File No. 69,511.)

NO. 19,553. STEEL MAGNETS.—A firm in Switzerland informs an American consular officer that it urgently requests quotations from manufacturers of steel magnets for electric-current regulators.

NO. 19,555. POWER-PLANT MACHINERY.—A report from an American consular officer in Mexico states that there is a possibility of establishing a light and power plant in his district, and quotations are requested from manufacturers of pumps, engines and dynamos. Correspondence in Spanish.

NO. 19,535. MICA AND TUNGSTEN.—A letter to the Bureau from Argentina states that an owner of two mines, one of mica and the other of tungsten ore, desires to find a market for these two minerals. It is stated that from 10,000 to 33,000 pounds of tungsten and from 4,400 to 6,600 pounds of mica are taken out monthly, but it is possible to increase this output, if necessary. Specimens of the minerals are being forwarded, and when they arrive may be inspected at the Bureau or its branch offices.

NO. 19,568. MOTOR-DRIVEN MACHINES.—An American consular officer reports that a company in Chile desires to secure a machine to be operated by electric power for sewing brooms.

NEW PUBLICATIONS.

COHOES DEVELOPMENT. — Sanderson and Porter, New York, have published an illustrated pamphlet describing the hydroelectric development of the Cohoes Company, Cohoes, N. Y. The article is reprinted from the *General Electric Review* and may be had upon request.

ATOMIC STRUCTURE.—Publication 2371 of the Smithsonian Institution, Washington, D. C., is entitled "A Magneton Theory of the Structure of the Atom," by A. L. Parson. The magneton is discussed with reference to its bearing upon structure, valence, volume and magnetic properties.

CANADIAN STEEL. — The Canadian Department of Mines has issued publication No. 349 entitled "The Production of Iron and Steel in Canada During the Year 1914," by John McLeish. This pamphlet shows the production, exports and imports of iron ore, pig iron, steel and ferro-products.

MINERAL PRODUCTS OF THE UNITED STATES. — The United States Geological Survey has issued a table showing the quantity and value of the mineral productions of the United States for each year from 1905 to 1914 inclusive, the figures including both metallic and non-metallic products. Total values are given also for each year since 1880.

NEW INCORPORATIONS.

HENDERSON, KY.—The Melton Electric Company has been incorporated with $2,000 capital stock. The incorporators are M. C. Melton, R. A. Day and E. W. Melton. G.

ELDORADO, ILL. — The Saline Electric Company has been incorporated with a capital of $2,500, by J. J. Frey, Charles A. Ramsey, Guy C. Lane and Wiley F. Core.

NEW YORK, N. Y. — Flashlight Battery Company, Inc., to manufacture electric batteries, etc. Capital, $5,000. Incorporators, Joseph Berman, Hyman Davidson and Samuel Lekachman.

OMAHA, NEB.—The Alam Farm Light Plant Company has incorporated with $100,000 capital, to manufacture and sell electric lighting plants for farms. Bert LeBron and F. L. Tubbs, of Omaha, and George E. Tubbs, of Hillsdale, Mich., are incorporators.

WILMINGTON, DEL.—The Allied Equipment Corporation has been incorporated for the manufacture of mechanical and electric devices. The capital is $250,000 and the incorporators are George Rucker, Clair V. Rucker and William H. Peck, all of New York City.

Digitized by Google

FINANCIAL NOTES.

Francis T. Homer, of Bertron, Griscom & Company, and T. H. Tutwiler, of Memphis, Tenn., have been elected directors of the American Cities Company, controlled by United Gas & Electric Corporation.

The $3,000,000 seven-per-cent preferred stock of Utah Power & Light Company recently purchased from Utah Securities Corporation by Electric Bond & Share Company is being offered at par and accrued dividend or on a seven-per-cent basis. For the twelve months ended October 31, 1915, Utah Power & Light reported gross of $3,244,266, with a balance applicable to payment of dividends on the preferred stock of $656,973.

Great Western Power Company of California, controlled by Great Western Power Corporation of New York, has sold to William P. Bonbright & Company, Inc., and E. H. Rollins & Sons $4,500,000 six-per-cent, 10-year convertible debentures. The debentures will be offered at 96.5 and interest, and are convertible between November 1, 1917, and November 1, 1920, into the seven-per-cent preferred stock of the issuing company at 95.

Dividends.

	Term	Rate	Payable
Am. Pw. & Lt., pf.	Q	1.5 %	Jan. 3
Asheville Pw. & Lt., pf.	Q	1.75%	Jan. 3
Bangor Ry. & Elec., pf.	Q	1.75%	Jan. 1
Buffalo Gen. Elec., com.	Q	1.5 %	Dec. 31
Cal. Ry. & Pw., pf.	Q	1.75%	Jan. 3
Cal. Pw. & Lt., pf.	Q	1.75%	Jan. 3
Columbus Elec., pf.	S	$3.00	Jan. 1
Columbus Ry., Pr. & Lt., Series A	Q	1.5 %	Jan. 3
Con. Gas, Elec. Lt. & Pw., com.	Q	1.75%	Jan. 3
Con. Trac. of N. J.	S	2 %	Jan. 15
Detroit Edison	Q	2 %	Jan. 15
Duquesne Light, pf.	Q	1.75%	Feb. 1
Eastern Texas Elec., pf.	S	$3.00	Jan. 1
Elec. Storage Battery, com.	Q	1 %	Jan. 3
Elec. Storage Battery, pf.	Q	1 %	Jan. 3
Kansas Gas & Elec., pf.	Q	1.75%	Dec. 31
Nat'l Gas, Elec. Lt. & Pw., pf.	Q	1.5 %	Jan. 1
Nat'l Gas, Elec. Lt. & Pw., com.	Q	1 %	Jan. 1
Northwestern Elec., pf.	S	3 %	Jan. 1
No. Ontario Lt. & Pw., pf.	S	3 %	Jan. 15
Omaha Elec. Lt. & Pw., pf.	S	$2.50	Feb. 1
Pacific Tel. & Tel., pf.	Q	1.5 %	Jan. 15
Phila. Co., com.	Q	1.5 %	Feb. 1
Reading Trac.	S	1.5 %	Jan. 1
United Lt. & Rys., pf.	Q	1.5 %	Jan. 1
Va. Ry. & Pw., pf.	S	3 %	Jan. 20
Wash., Balti. & Annap. Elec. R. R., pf.	Q	1.5 %	Dec. 31
Western Elec., com.	—	$4.00	Dec. 31
Western Elec., pf.	—	0.73%	Dec. 31

Reports of Earnings.

VIRGINIA RAILWAY & POWER.

	1915	1914
November gross	$ 465,884	$ 427,352
Net earnings	251,624	224,526
Total income	259,877	231,103
Surplus after charges, taxes, sinking fund and depreciation	109,016	88,524
Five months' gross	2,282,518	2,189,055
Net earnings	1,197,871	1,139,339
Total income	1,240,795	1,173,795
Surplus after charges, taxes, sinking fund and depreciation	483,621	454,203

GEORGIA RAILWAY & POWER.

	1915	1914
November gross	$ 608,324	$ 546,656
Net after taxes	291,668	212,877
Eleven months' gross	5,868,466	5,762,392
Net after taxes	2,497,638	2,321,974

CITIES SERVICE COMPANY.

	1915	1914
November gross	$ 490,623	$ 371,124
Net after expenses	475,086	359,197
Surplus after charges	434,253	318,363
Balance after preferred dividends	303,420	181,530
Twelve months' gross	4,352,413	3,943,507
Net after expenses	4,185,301	3,834,746
Surplus after charges	3,695,301	3,426,413
Balance after preferred dividends	*2,125,305	1,784,429

*Equivalent to 14.44 per cent on common stock as compared with 11.35 per cent for twelve months ended November 30, 1914.

Consolidated gross earnings of subsidiary companies for the twelve months ended October 31, 1915, were $21,622,939, as compared with $19,093,654 for the twelve months ended December 31, 1914.

DETROIT UNITED LINES.

	1915	1914
October gross	$ 1,188,900	$ 1,042,679
Net	349,440	253,691
Surplus after charges	189,440	92,527
Ten months' gross	10,896,005	10,310,871
Net	3,214,558	3,011,240
Surplus after charges	1,586,397	1,434,491

(Year ended October 31.)

STANDARD GAS & ELECTRIC.

	1915	1914
Gross income	$1,513,114	$1,456,231
Expenses and taxes	38,855	36,863
Net income	1,474,259	1,419,368
Bond interest	587,580	.....
Balance applicable to note and scrip, interest and preferred dividends	886,679	.....

UTAH SECURITIES.

	1915	1914
November gross	$ 434,379	$ 379,192
Net	239,236	181,059
Six months' gross	2,491,684	2,333,586
Net	1,333,873	1,113,286
Twelve months' gross	4,758,983	4,605,581
Net	2,485,622	2,254,673

EAST ST. LOUIS & SUBURBAN.

	1915	1914
October gross	$ 222,456	$ 216,801
Net after taxes	97,184	86,406
Surplus after charges	34,133	24,231
Twelve months' gross	2,430,418	2,686,595
Net after taxes	994,029	1,012,911
Surplus after charges	233,225	344,508

NEW ORLEANS RAILWAY & LIGHT.

New Orleans Railway & Light Company reported earnings for the nine months ended September 30, 1915, as follows:

Gross	$5,147,362
Net after taxes	1,959,582
Miscellaneous deductions	29,574
Underlying bond interest	440,545
General mortgage interest	592,110
Refunding lien interest	134,287
Debenture note interest	142,814
Renewal and replacement reserve	103,315
Surplus	516,937

LAKE SHORE ELECTRIC RAILWAY.

	1915	1914
October gross	$ 118,314	$ 113,777
Net after taxes	42,839	40,800
Surplus after charges	6,557	4,999
Ten months' gross	1,150,649	1,212,704
Net after taxes	404,031	465,845
Surplus after charges	42,914	130,807

PHILADELPHIA COMPANY.

The Philadelphia Company reports to the New York Stock Exchange for the six months ended September 30, 1915, as follows:

Gross earnings	$ 461,360
Expenses and taxes	262,576
Net	198,784
Other income	2,174,737
Total income	2,373,521
Charges, etc.	1,111,356
Net income	1,262,165
Improvements, betterments, etc.	20,228
Surplus	1,241,936
Previous surplus	5,324,535
Miscellaneous addition to surplus	230
Total surplus	6,566,701
Preferred dividend	235,983
Balance	6,330,718
Common dividend	1,756,826
Balance	4,573,892
Miscellaneous deductions	71,464
Profit and loss surplus	4,502,428

COLUMBIA GAS & ELECTRIC.

Columbia Gas & Electric Company reports earnings for the twelve months ended October 31, 1915, as follows:

	1915	1914
Gross earnings	$8,006,543	$7,770,524
Net after taxes	3,924,227	3,940,517
Total income	4,444,602	4,392,151
Rentals and prior fixed charges	3,360,603	3,371,133
Interest Columbia Gulf & Eastern first 5's	517,795	515,762
Miscellaneous interest	167,595	161,050
Sinking fund	95,005	95,005
Surplus	303,604	249,201

PERSONAL MENTION.

MR. LOUIS A. FERGUSON, vice-president of the Commonwealth Edison Company, Chicago, delivered an address before the Executives' Club, Friday noon, December 17, at the Hotel Sherman. Mr. Ferguson's subject was "Electrical Achievement in Chicago." He gave his hearers a resume of the early history of the Commonwealth Edison Company, recalling conditions in electrical affairs, generally, in the old days of the 80's and 90's. Coming down to the present, he sketched the development of the company's physical system and mentioned its financial growth, giving a number of instructive statistical references. Mr. Ferguson's points were illustrated by stereopticon slides, giving charts, tables and photographic views.

MR. E. M. HERR, president of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., in a recent address before the Railway Club of Pittsburgh, said: "Due largely to the wonderful development in the steam turbine and its direct-connected electric generator, and the remarkably flexible, efficient and easy distribution of electricity, we are on the eve of a notable development in the utilization of electric power. First, the modern steam turbo-generator makes it possible to concentrate enormous amounts of power generation in one place. Second, this makes possible and advantageous very large individual generating units. The growth in the capacity of generators has really been enormous, made possible by the steam turbine. Third, electricity can be transmitted long distances in large or small quantities and its characteristics changed at will, all with small losses and at comparatively low cost." The speaker then proceeded to trace the development of large generating units as exemplified by certain notable installations of central stations, industrial and railway plants, and then discussed the effect of the concentration of such a large amount of power in one station.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 20	Dec. 13
American Tel. & Tel. (New York)	128⅜	128½
Commonwealth Edison (Chicago)	141	144
Edison Electric Illuminating (Boston)	242½	242
Electric Storage Battery, common (Philadelphia)	66	67
Electric Storage Battery, preferred (Philadelphia)	66	67
General Electric (New York)	172¾	174¾
Kings County Electric (New York)	126	125
Massachusetts Electric, common (Boston)	6	6¾
Massachusetts Electric, preferred stamped (Boston)	36	35
National Carbon, common (Chicago)	165	150
National Carbon, preferred (Chicago)	121	120
New England Telephone (Boston)	131	131½
Philadelphia Electric (Philadelphia)	28¾	27¾
Postal Telegraph and Cables, common (New York)	78	79
Postal Telegraph and Cables, preferred (New York)	65	66
Western Union (New York)	89	88½
Westinghouse, common (New York)	68½	67¾
Westinghouse, preferred (New York)	79	76

Digitized by Google

OBITUARY.

MR. IRA MILLER, who for several years was active in electric vehicle promotion and was largely instrumental in introducing the electric fire apparatus, which has proved so successful, at Springfield, Mass., died at Little Rock, Ark., December 16, at the age of 67 years. Mr. Miller's career was notable. He was a native of Kentucky, served in the Confederate army, engaged in the saddlery business during which time he traveled through Europe and South America in the interests of his firm, and about 30 years ago settled in Westfield, Mass., where he was successively president of the Americain Whip Company and of the United States Whip Company. He became interested in the manufacture of electric trucks and was agent in western Massachusetts for the Couple-Gear Freight Wheel Company of Grand Rapids, Mich. Mr. Miller was widely known among electric vehicle men, and was an active member of the Electric Vehicle Association of America.

MR. WILLIAM ANDREW CONNER, whose sudden death on December 6, at Perth Amboy, N. J., was announced in last week's issue, was buried on Thursday afternoon, December 9, from his late residence at Plainfield, N. J. The Rev. Dr. Phillip B. Strong, pastor of the First Baptist Church of Plainfield, and the former pastor of Mr. Conner's Pittsburgh church, the Rev. Lemuel C. Barnes, of New York, now secretary of the Board of Home Missions of the Baptist Church, officiated. The services was attended by the officers and many of

William A. Conner.

leading employees of the Standard Underground Cable Company, and by numerous business acqauintances, testifying to the love and esteem in which he was held by all who knew him, for his sterling qualities as a man and a friend.

DATES AHEAD.

American Association for the Advancement of Science. Annual meeting, Columbus, O., December 27-31. Secretary, L. O. Howard, Washington, D. C.

Pan-American Scientific Congress, Washington, D. C., December 27-January 8. Secretary General, John Barrett, Pan-American Union, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, January 17-19, 1916. Secretary Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, January 25-27, 1916. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9, 1916. Secretary, F. L. Hutchison, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11, 1916. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York City.

With the Electrical Manufacturers

Hyatt Holler Bearing Company, Newark, N. J., has sent out, dedicated to the manufacturing industries of the world, a very attractive Christmas folder in appropriate holiday colors and decorations.

The Wallace Novelty Company, Incorporated, New York, N. Y., states that in a suit brought against H. C. F. Koch & Company, Incorporated, of New York City, for infringement of patents covering the portable electric lamps, known as the Wallace lamps, the United States Court for the Southern District of New York has held that these patents are valid and were infringed by the defendant.

Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill., has prepared for distribution a "Handy Lighting Manual." It gives in compact form illustrations and data of a large number of Benjamin reflectors, fixtures, specialties and fittings of particular use for industrial plants. Nine pages are devoted entirely to useful general illuminating information and data. The book also has an index and eight pages of ruled blank stock for making memoranda.

The National Metal Molding Company, Pittsburgh, Pa., has adopted a new system of announcing trade discounts which eliminates entirely any complication of serial percentages. In cost bulletins now being published the company establishes a straight discount of say 69 per cent, or 66 per cent, in place of, for instance, sixty, two tens and five. This is in line with favorable suggestions and recommendations recently proposed at the Hot Springs convention of the Electrical Supply Jobbers' Association.

The Way-Cleanse Company, Sandusky, O., has ready for distribution its bulletin No. 10, which describes and illustrates its gas and electric suction street sweepers. The hygienic importance of cleaning streets in a sanitary manner that removes the dust without swirling it into the air, like the ordinary broom methods do, is clearly pointed out. The construction and operation of the Waycleanse machine is explained. A brief description of it was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 13, 1915.

The Bristol Company, Waterbury, Conn., is sending out to its patrons copies of Bulletin 200, which is a souvenir marking the twenty-fifth anniversary of the company's manufacture of recording instruments. The booklet is attractively illustrated and gives a brief outline of the company's history and shows several views of the splendid exhibit it made at the recent Panama-Pacific International Exposition, which won for it a gold medal, the highest award. These exhibits gave a good idea of typical instruments of the extensive line made by the firm, which include devices for automatically indicating and recording practically every measurable varying physical property.

The Valentine-Clark Company, Minneapolis, Minn., well known dealers in cedar poles, announces that it has opened up an office in Kansas City, Mo., in charge of Frank L. McGillan. Mr. McGillan was in the employ of the Valentine-Clark Company from 1899 to 1907, severing his connection to go with Pearson, Roedering Company, electrical supply dealers, San Francisco. The Valentine-Clark Company has found it necessary to open the Kansas City office to handle its southwestern business, and Mr. McGillan's experience and wide acquaintance fit him admirably for the position.

The H. J. Jaeger Company, Hoboken, N. J., has moved into its new modern and up-to-date plant in order to meet the increasing demand for Jaeger Nitros gas-filled tungsten lamps. The output will be about ten itmes that of the old plant, and the new type of filament will meet the only objection raised against the nitrogen lamp which is its focusing ability. With this new type of filament a perfect focus can be obtained. These lamps will be made for headlights only, and in candlepowers ranging from 15 to 50 and with a voltage range of from 6 to 21 volts. These lamps consume one-half watt per candlepower.

Digitized by Google

The General Electric Company, Schenectady, N. Y., announces that on January 1, 1916, the name Holophane Works of the General Electric Company, will be changed to Ivanhoe-Regent Works of the General Electric Company. This change was made necessary by the expiration, on that date, of the contract through which the General Electric Company possesses exclusive right to manufacture and sell Holophane prismatic glass. The General Electric Company will continue to manufacture and sell Regent glass and Ivanhoe metal reflectors; and although its right to handle Holophane prismatic is no longer an exclusive one, it will continue to furnish this line also. In its organization the Ivanhoe-Regent Works of the General Electric Company is in every respect the same as that hitherto known by the name of Holophane Works of the General Electric Company. No radical changes in policy are involved in this change of name of this well known Cleveland works.

Record of Electrical Patents

Issued by the United States Patent Office, December 14, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,163,631. Railway Switch or the Like. C. O. Anderson, assignor to A. T. Austin and W. A. Austin, Omaha, Nebr. Control of electric operating motor.

1,163,647. Apparatus for Drawing on Stencils. A. B. Dick, assignor to A. B. Dick Co., Chicago, Ill. Stand has transparent top with electric light beneath.

1,163,656. Neutralizer. W. S. Hadaway, Jr., New Rochelle, N. Y. Electrically generated vapor neutralizes electrostatic charges on belts, etc.

1,163,657. Vapor-Heater. W. S. Hadaaway, Jr. Electrically heated tank or boiler.

1,163,658. Socket. W. S. Hadaway, Jr. Has front edge adapted for securing in hole in supporting plate with socket inside of wall.

1,163,659. Method of Producing Electric Heaters. W. S. Hadaway, Jr. Manner of forming cylindrical heater.

1,163,664. Directional-Current Arrester. P. C. Hewwit, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Mercury-vapor rectifier has metal container supporting cathode and insulating portion supporting anodes.

1,163,665. Protecting Device for Vapor Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. Mercury-vapor rectifier tube avoids straight paths between electrodes.

1,163,666. Vapor Electric Apparatus. P. C. Hewitt, assignor to Cooper Hewitt Electric Co. Rectifier has two receiving circuits for opposed half waves.

1,163,678. Duplex Weigher. E. H. Messiter, assignor to Electric Weighing Co., New York, N. Y. Endless conveyor with two independent weighers and electric recording instruments.

1,163,685. Snap Switch. T. L. R. Parker, Chicago, Ill. Particular ratchet device.

1,163,688. Controlling Device. C. M. Rice, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Control of gearing between controller and driving motor.

1,163,692. Controlling Device for the Electric Ignition Systems of Internal-Combustion Engines. F. H. Royce, Derby, England. Interrelated magneto and battery ignition and forced lubrication systems.

1,163,703. Connection for Electrical Terminals. A. C. Taylor, assignor to Winfield Mfg. Co., Warren, O. Fastening working terminals to transformers secondary in welding machine.

1,163,705. Vapor Converter. P. H. Thomas, assignor to Cooper Hewitt Electric Co. Particular chambers for anodes.

1,163,706. Method of Operating Vapor Electric Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co. Rectifier with special arrangement of supplemental anode, resistance and inductance.

1,163,707. Single-Phase Gas or Vapor Electric Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co. Supply voltages to anodes changed and total current flow steadied.

1,163,708. Mercury-Vapor Apparatus. P. H. Thomas, assignor to Cooper Hewitt Electric Co. Lamp operated from constant-current alternating supply.

1,163,720. Railway Signaling. H. A. Wallace, assignor to Union Switch & Signal Co., Swissvale, Pa. For double-track roads.

1,163,762. Composite Electric System. A. D. T. Libby, assignor to Garford Mfg. Co., Elyria, O. Combined police and telephone lines.

1,163,765. Electric Counter Attachment for Rotary Meters. E. H. Messiter, assignor to Electric Weighing Co. Particular form of mercury contact for interrupter.

1,163,768. Tubular Ozone-Generator. M. P. Otto, Paris, France. Special arrangement of electrodes and cooling and air-suction chambers.

1,163,783. Automatic Alarm Lock. M. Sheinman, assignor to Gibraltar Alarm Lock Co., New York, N. Y. Alarm circuit controlled by bolt.

1,163,823. Electric Fly-Killer. R. B. Irvine, Bay City, Mich. Includes induction coil for electrocution.

1,163,834. Primary Battery. H. E. R. Little, New York, N. Y. Active element introduced into electrolyte in form of gas.

1,163,839. Ground Receiving Outfit. C. E. Mellon, assignor to said Mellon, J. H. Smythe, C. E. Gillespie, and M. A. Park, Parkesburg, Pa. For wireless; includes an audion.

1,163,852. Telephone System. R. L. Quass, assignor to Western Electric Co., New York, N. Y. Special arrangement for ringing through trunks.

1,163,883. Selective Signaling Device. J. P. C. Boswau, assignor to Western Electric Co. Step-by-step mechanism.

1,163,887. Electric Hand Lantern. C. F. Burgess, assignor to C. F. Burgess Laboratories, Madison, Wis. Includes resistance element.

1,163,896. Signaling System. H. L. Darrah, assignor to Western Electric Co. Relay arrangement for controlling signal circuit.

1,163,899 and 1,163,900. Telephone System. A. H. Dyson, assignor to Western Electric Co. First patent: automatic system; particular arrangement for operating central switch by interrupter at subscriber's station. Second patent: modification.

1,163,903. Electromagnetic Device. O. F. Forsberg, assignor to Western Electric Co. Combined telephone jack and signal.

1,163,904. Terminal Mounting for Metallic Spools. O. F. Forsberg, assignor to Western Electric Co. Manner of securing and insulating terminals on ends of metal spools for coils, etc.

1,163,911. Electrolysis. C. A. Hall, Mount Airy, Pa. Process of maintaining free anion concentration of a zinc electrolyte constant.

1,163,918. Vehicle Signal. C. Heidemann, St. Louis, Mo. Lever mechanism controlling position and circuit of lamp in automobile direction signal.

1,163,953. Automatic Call-Distributing System. J. G. Roberts, assignor to Western Electric Co. Comprises automatic switches for distributing calls from instruction circuits to idle receiving apparatus.

1,163,957. Plunger Switch-Key. O. A. Shann, assignor to Western Electric Co. Details of telephone-key structure.

1,163,959. Stereoscopic X-Ray System. H. C. Snook, Cynwyd, and E. W. Kelly, Philadelphia, Pa. Combination of several X-ray producers.

1,163,960. Electrical System of Distribution. W. A. Turbayne, Lancaster, N. Y., assignor to Gould Coupler Co. Voltage regulation in generator and battery lighting system.

1,163,972. Lighting-Fixture Shade-Holder. A. W. Clarke, assignor to American Car & Foundry Co., St. Louis, Mo. Special releasable shade-gripping means on lamp-holder housing.

1,163,973. Railway Signaling System. C. J. Coleman, assignor to Hall Switch & Signal Co., New York, N. Y. Alternating system with cross bonds between rails.

1,163,985. Type-Setting Machine. H. Drewell, Charlottenburg, Germany. Automatically operating composing machine; main circuit opens if lines, letters, etc., are not properly set up.

1,163,989. Gauge for Indicating Vacuum. S. W. Farnsworth, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Transparent tube opens into container and has condenser-type electrode at other end with high potential on electrode and container.

1,163,991 and 1,163,993. Secondary or Storage Battery. B. Ford, Philadelphia, Pa. First patent: gases drawn off and prevented from escaping to atmosphere; also level of electrolyte limited. Second patent: closure device for filling opens battery-jar covers.

1,163,992. Automatic Filler and Vent for Storage Batteries. B. Ford. In battery-jar cover.

1,163,996. Automatic Switch. H. Grob, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Details of switch having selectively adjustable rotating brushes and stationary contact segments.

1,163,997. System of Electrical Distribution. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Arrangement of circuit-breakers to isolate section of distributing circuit on excess current or low voltage.

1,164,001. Electric-Circuit Controller. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Drum type having drum and stationary contacts suspended from cover with spring connection for moving drum to give snap.

1,164,006. Starting Device for Automobiles. C. B. Mills, assignor to Westinghouse Electric & Mfg. Co. Gearing between starting motor and engine shaft.

1,164,009. Electric Welder. J. A. Osborn, St. Louis, Mo. Resistance type; electrode can be replaced by cool one when it becomes heated.

1,164,015. System of Electrical Distribution. K. C. Randall, assignor to Westinghouse Electric & Mfg. Co. Provision for shifting phase of voltage supplied by motor-generator set to feeder system.

1,164,018. Vibratory Apparatus. P. Rice, Bekeley, Cal. For pneumatic treatment of rear

1,164,020. Means for Insulating Rail-Joints. E. F. Schermerhorn, assignor to Rail Joint Co., New York, N. Y. Particular manner of insulating joint bar from rails.

1,164,032. Electrical Measuring Instruments. P. Thomas, assignor to Westinghouse Electric & Mfg. Co. Method of measuring electromotive force with potentiometer.

1,164,035. Electrical Controlling System. E. Tobiessen, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Separately excited field of alternating-current machine reduced when armature circuit is broken.

1,164,038. Electric-Motor Controller. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Pilot motor operating resistance control governed by main motor current.

1,164,045. Automobile Signaling Device. V. Willing, Philadelphia, Pa. Electromagnetically operated; displays signals in daytime by positioning them and at night by selective illumination.

1,164,069. Call Box. A. A. Clokey, assignor to Western Union Telegraph Co., New York, N. Y. Details of make-and-break impulse transmitter.

1,164,082. Electric Ignition Device. J. E. Gallant, assignor of three-fifths to E. R. Batchelder, Boston, Mass. Spark plug has auxiliary gap filled with mixture of conducting and nonconducting particles.

1,164,101. Apparatus for Curling Hair. G. Kremer, assignor of one-half to E. Unger, New York, N. Y. Details of electrically heated device.

1,164,113. Sparking Plug. I. C. Orswell, assignor to Orswell Igniter Co., Boston, Mass. Combined with spark coil.

1,164,134. Electropneumatic Apparatus. J. M. Stansell and C. D. Oland, Centralia, Ill. Air cylinder has electromagnetically controlled valves.

1,164,148. Lock Device for Fuse Blocks or Cutouts. C. S. Walton, Los Angeles, Cal. Locking bar for fuse plug mounted on adjacent dummy plugs.

1,164,159. Fluid-Controlled Electric Regulator. E. V. Anderson, Monessen, Pa., assignor of one-half to C. E. Golden. Switch operated by impact of ball in cylinder tilted by fluid pressure.

1,164,191. Knife Switch. H. F. Johaningmyer, assignor to Frank Adam Electric Co., St. Louis, Mo. Structure and mounting of blade and fuse clips.

1,164.205. Electric Chair. J. J. Odenwald, Washington, D. C. Seat of chair contains means for administering electric discharges.

1,164,211. Combined Vase and Lamp Stand. W. N. Reed, Hackensack, N. J.

Digitized by Google

Lamp and shade support pass up through vase.

1,164,213. Sequence Switch. J. N. Reynolds, assignor to Western Electric Co. Mechanical details.

1,164,223. Stabilized Commutator Machine. A. Scherbius, assignor to General Electric Co., Schenectady, N. Y. Variation of field flux with terminal voltage prevented in self-excited machine.

1,164,236. Electrical Outlet Box. H. E. Svenson, New York, N. Y. Manner of securing bushings in cable openings.

1,164,246. Electrical Measuring Instrument. A. P. Young, assignor to General Electric Co. Mercury motor type meter.

1,164,249. Swivel Attachment Plug. C. J. Alpaugh, assignor to Trenton Electric & Conduit Co., Trenton, N. J. Details of construction.

1,164,254. Method of Shaping Wire Ends. F. G. Breul, Bridgeport, Conn., Method of shaping and welding overlapping end portions of wire links.

1,164,257. Circuit-Interrupting Device. E. R. Carichoff, assignor to General Electric Co. Magnetic blowout device.

1,164,259. Cutout and Release for Air-Brake Apparatus. S. P. Cota, Portland, Ore. Contact operated from brake cylinder.

1,164,260 to 1,164,263. Reversible Brush-Holder for Dynamo-Electric Machines. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. First patent: brush carrying means bear frictionally on commutator. Second patent: carrying devices in frictional engagement with armature shaft. Third patent: movement of brush carrier determines connections to terminals. Fourth patent: modification of last.

1,164,265. Combined Piano-Player and Phonograph. W. M. Davis, Paris, France. Phonograph closes circuit for starting player.

1,164,271. Progressively Movable Electric Switch and Controlling Mechanism Therefor. B. G. Dunham, assignor to Western Electric Co. Manner of controlling the motor magnet.

1,164,273. Relay and Repeater. W. Finn, assignor to Western Union Telegraph Co. Has main and local circuit coils, and polarized armature moved to reverse position on decrease of strength of main coils in anticipation of next magnetization.

1,164,274. Telegraph-Repeater. W. Finn, assignor to Western Union Telegraph Co. Arrangement of relays and circuits with repeater comprising a repeating transmitter and line relay for each of a number of main-line circuits.

1,164,278. Metal Working. H. Geisenhöner and E. F. Collins, assignors to General Electric Co. Water is flowed on joint during formation of electrical resistance weld.

1,164,280. Storage-Battery System. E. A. Haibleib and F. F. Dorsey, assignors to North East Electric Co., Rochester, N. Y. Generator controlled to prevent return flow or excess voltage.

1,164,282. Protective Device for Searchlights. G. Hennings, assignor to General Electric Co. Screen between the arc and picture film to be protected is automatically adjusted according to position of light.

1,164,283. Lamp-Bracket. R. E. Hess, Milwaukee, Wis. Rotary, articulated structure formed of parallel plates between which circuit wires are protected.

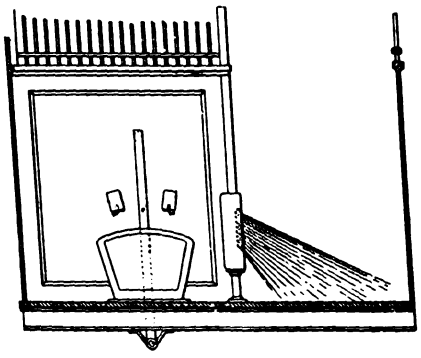
1,164,284. Automatic Device for Controlling the Speed of Trains. L. W. Horne and W. N. Crane, New York, N. Y. Rails have magnetic and nonmagnetic sections with electromagnets adjacent the latter.

1,164,291. Electric Motor-Starting Rheostat. C. Kosnick, New York, N. Y. First point closes relay, which closes main circuit through separate contacts to avoid arcing at rheostat.

1,164,297. System of Control. R. H. McLain, assignor to General Electric Co. Field resistance of generator is shunted when speed of motor driving it decreases.

1,164,298. Automatic Train-Line Coupling. G. Macloskie, assignor to General Electric Co. Structure of connecting sockets.

1,164,301. Threshold-Illuminator. C. E. Moore, New York, N. Y., assignor to Elevator Supply & Repair Co. For elevator cars; controlled by operating lever. (See cut.)



No. 1,164,301.—Threshold Light.

1,164,302. Split-Pole Induction Motor. J. S. Mueller, Chicago, Ill. Reversing arrangement.

1,164,313. Contact Device for Interrupters. A. Pollak, Paris, France. Spring contact structure.

1,164,317. Ignition System for Ford Automobiles. H. B. Snell, assignor of one-half to A. W. Fisher, South Bend, Ind. Current interrupted synchronously with fundamental periodicity in all adjustments of spark.

1,164,320. Circuit-Breaker. A. M. Taylor, Birmingham, England. For automatic instantaneous operation under excessive momentary currents.

1,164,323. Weight-Motor. G. C. Andrews and L. V. Barnes, Minneapolis, Minn.; said Barnes assignor to said Andrews. Has electromagnetic escapements including thermostat; for controlling temperature.

1,164,330. Block-Signal System. T. Bodde, assignor to Hall Switch & Signal Co. For railways having electrically continuous rails.

1,164,348. Pull-Switch Lighting Fixture. P. M. Hotchkin, Chicago, Ill. Switch operated by lever pivoted on canopy and actuated by pull cord.

1,164,349. Switch Box. P. M. Hotchkin. For flush wall mounting with lateral extension for conduit connection. (See cut.)

1,164,356. Electromagnet. C. A. Kaiser, Philadelphia, Pa. Has laminated spool structure built up around supporting bolt.

1,164,358. Lamp and Lamp-Support. C. Kaufmann, Santa Ana, Cal. Adjustable headlight.

1,164,366. Travel-Indicating Signal for Automobiles. A. J. Lamb, Brooklyn, N. Y. Arrangement of lamp house, color disks and arrow.

1,164,407. Telephone Relay. J. Schiessler, Baden, Austria-Hungary. For weak alternating and undulating currents.

1,164,432. Ignition System. R. Varley, Englewood, N. J. Special means for adjusting spark.

1,164,438. Refrigerating Apparatus. J. F. Winkler, Philadelphia, Pa. Electrically operated; thermostatically controlled.

1,164,440. Electric Binding-Post. R. K. Witz, Chicago, Ill. Details for securely holding wire.

1,164,446. Electric Switch. C. E. Anderson, assignor to Perkins Electric Switch Mfg. Co., Bridgeport, Conn. Oscillating, double push-button, wall switch.

1,164,464. Treatment of Storage-Battery Plates. C. C. Carpenter, assignor to Guaranty Trust Co., New York, N. Y. Process of permanizing lead battery plates.

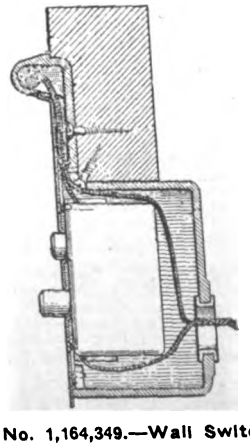
1,164,471. Air-Cooling Device. J. E. Cockran, San Diego, Cal. Attachment for fan motor comprising water bath and gauze vanes over and through which air is blown.

1,164,475. Automatic Mallet or Plugger. G. Croston, Hoquiam, Wash. Reciprocated by solenoid coils.

1,164,479. Automatic Telephone-Exchange System. G. Deakin, Berkeley, Cal. Arrangement of trunk lines and subscribers' lines having restricted and unrestricted service, respectively.

1,164,482. Machine for Renapping and Refinishing Cloth. E. J. Dunklee, Hackensack, N. J. Comprises electrical heating means for roller support to convert it into flatiron.

1,164,507. Signal Control. J. B. Guyer, New York, N. Y. Push-button bell circuit requires gravity device to be reset before ring is repeated.



No. 1,164,349.—Wall Switch.

1,164,511. Electric Clock. F. Hardisty, assignor of one-half to C. B. Williams, Frankfort, Ind. Striking arrangement.

1,164,514. Automobile Indicator and Signal. J. B. Healey and H. E. McKinley, Brooklyn, N. Y. Signal lamps are flashed.

1,164,521. Protective Covering or Armor. O. P. Houben, Akron, O. Special winding of wire.

1,164,524. Disconnective Switch. B. G. Jamieson, assignor of 49 per cent to H. J. Richardson, Chicago, Ill. Knife switch elements on conductor ends are operated by gearing.

1,164,547. Automobile Signal. F. Rauscher, Port Richmond, N. Y. Lamp on telescopic tube may be retracted within vehicle or projected out at one side.

1,164,557. Master Clock. W. F. Straub and A. A. Radtke; said Straub assignor to Electric Time Recorder Co., Chicago, Ill. Electric winding means.

1,164,558. Wire-Supporting Device. R. H. Uhrbrock, Towson, Ind. Wire held in slot by reverse wedges.

1,164,563. Guard for Cords or Wires of Telephone Sets. O. Yates, Portland, Ore. Vertical tube secured to telephone standard supports wires.

1,164,572. Electric Signaling Device. C. Brandon, Indianapolis, Ind. Thermometer-controlled.

1,164,588. Self-Propelled Vehicle. J. B. Entz, Hartford, Conn. Electromechanical transmission.

1,164,602. Time-Controlled Mechanism. W. Greenleaf, assignor to Hartford Clock Co., Hartford, Conn. Electric clock apparatus.

1,164,603. Electric Vapor Lamp and the Like. J. Jonas, assignor to Aktiengesellschaft, Brown Boveri et Cie, Baden, Switzerland. Mercury-vapor apparatus has metal container and arc-deflecting magnet.

1,164,611. Inductor. A. B. Herrick, assignor to M. C. Messler, Pawtucket, R. I. Special structure for mounting on spark plug.

1,164,613. Cable-Hanger. E. Jewell, assignor of one-half to R. Carson, Bellaire, O. Sheet-metal clamp for suspending from messenger.

1,164,614. Filament for Incandescent Lamps. F. G. Keyes, East Orange, N. J. Straight wire of tungsten intimately surrounded by helix of same material.

Reissue 14,031. Commutator Motor. H. K. Schrage, assignor to General Electric Co. Original No. 1,079,994, dated Dec. 2, 1913. Induction motor type.

Patents Expired.

The following United States electrical patents expired on December 20, 1915:

616,079. Electrical Burglar-Alarm. C. Coleman, Chicago, Ill.

616,082. Thermostatic Auxiliary Fire-Alarm System. A. H. Cross, New York, N. Y.

616,110. Electric Switch. W. J. Kelly, Boston, Mass.

616,111. Arc-Light Regulator. W. J. Kelly. Boston, Mass.

616,120. Railway Switch. E. S. Leaycraft, Jersey City, N. J.

616,136. Auxiliary Fire-Alarm Telegraph Apparatus. B. Oehmen, New York, N. Y.

616,139. Method of Electrolytically Treating Straw or Other Fibrous Material. G. H. Pond, Ashburnham, Mass.

616,148. Magnetic Switch. C. E. Scribner, Chicago, Ill.

616,165. Carbon for Electric Welding. G. W. de Tunzelmann, London, England.

616,174. Electric Voting Machine. F. S. Wood, Boston, Mass.

616,186. Microphone Containing Granular Carbon for Retaining Material in Position. L. M. Ericsson, Stockholm, Sweden.

616,190. Electric Operation of Elevators by Three-Button Push Systems. J. D. Ihlder, Yonkers, N. Y.

616,222. Telegraph Repeater. F. W. Cole, Newton, Mass.

616,265. Field Magnet for Electric Machines. S. H. Short, Cleveland, O.

516,339. Ammeter for Alternating Electric Currents. W. A. Layman, St. Louis, Mo.

616,343. Electric Generator for Cycles or Other Vehicles. J. Moores and H. O. Farrell, Manchester, England.

616,358. Electrically-Operated Regulator for Dampers, etc. G. F. Richardson, Hartford, Conn.

616,396. Combined Bearing and Power-Transmitting Device. C. O. C. Billberg, Lewisburg, and P. A. N. Winand, Philadelphia, Pa.

616,403. System of Electric Traction. M. Cattori, Rome, Italy.

616,417. Indicator. F. Hackman, Milwaukee, Wis.

616,435. Electrically Welded Joint. R. Eyre and W. Dishong, Johnstown, Pa.

616,436 and 616,437. Electric Welding. Henry F. A. Kleinschmidt, Johnstown, Pa.

Digitized by Google

Index to Advertisers, Page 56 Classified Index, Page 52

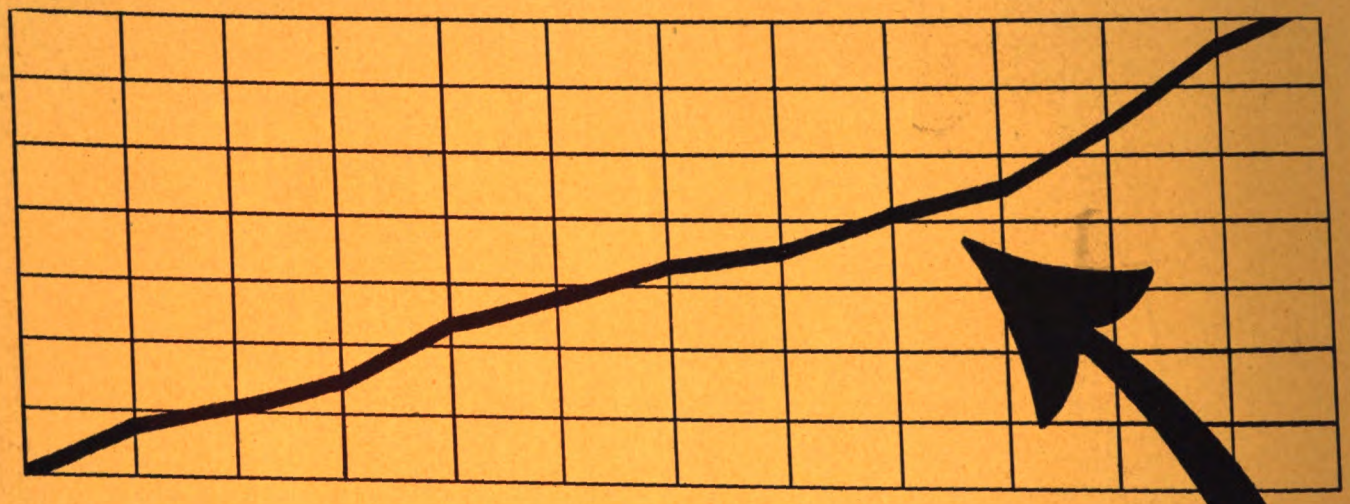
ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVII, No. 26 CHICAGO, DECEMBER 25, 1915 Three Dollars a Year

PERIODICAL ROOM RECEIVED DEC 27 1915 UNIV. OF MICH. LIBRARY

Digitized by Google



Central Station Managers

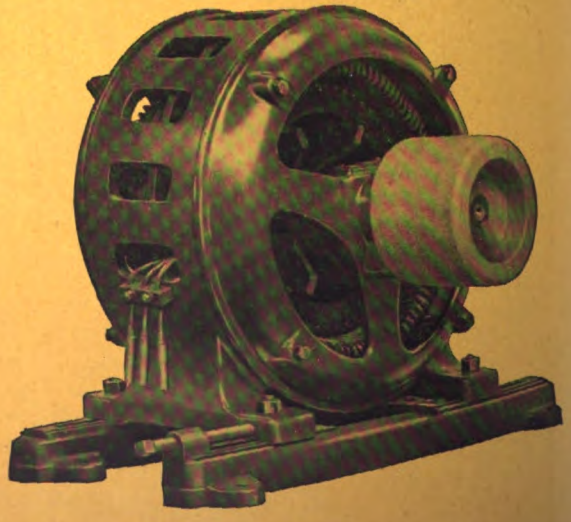
Increase your commercial day load by selling motors that meet every requirement of your customers. The use of

ALLIS-CHALMERS Induction Motors

means freedom from break-down troubles.

Reliability at all times is assured by their rugged construction and effective forced ventilation, by the use of moisture proof windings and dust proof bearings.

These features also give the reserve force necessary to meet emergency conditions and assure long life and low maintenance charges.



Bulletin 1087
Gives All Details of Construction

Allis-Chalmers Manufacturing Company

General Offices, Milwaukee, Wis.
Sales Offices in All Principal Cities

Digitized by Google

TRANSFORMERS

Manufactured for all electrical purposes in any size, frequency or voltage.

Lighting and Power Transformers
High Transmission Transformers
Single and 3-Phase Transformers

To secure prices, give us K. W. capacity voltage, cycles, transformers required

MOLONEY ELECTRIC CO.
St. Louis, Mo. Windsor, Canada
District Offices:
CHICAGO SAN FRANCISCO NEW YORK

Insurance at Cost

25% to 40% Saving

Don't wait until your insurance expires or until you suffer a loss, but

Waste no time, and communicate now with the Utilities Indemnity Exchange, so that a proposition may be presented you whereby

Your Money spent for insurance will go farthest and the amount be reduced to a minimum.

SHOLTO D. ROGERS AND COMPANY,
MILWAUKEE

Utilities Indemnity Exchange,
St. Louis, Missouri. December 20, 1912.

Gentlemen:

I am just in receipt of a letter from our Hoopeston office to the effect that you had disposed of the $3,500 claim on account of the death of our head lineman, and I desire to say that it is very gratifying to the management to know that our desire, as well as that of the widow, for a prompt lump settlement was carried out to the letter with the approval of the court. As the death loss occurred in September, and our company had but a short time previous become a member of your exchange, I naturally felt somewhat interested as to the manner in which you would handle the loss. You certainly met the demands made upon you in a business-like way, and your insurance as I figure it out costs our company at least 40 per cent less than the premium payable to an old line company. This being a fact I can cheerfully recommend this form of insurance as most commendable and economical.

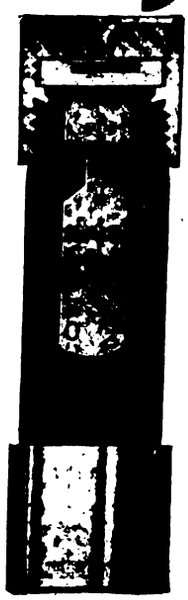
Very truly yours,
(Signed) Sholto D. Rogers,
Sec. and Treasurer,
Hoopeston Gas & Elec. Co.

Utilities Indemnity Exchange
LYNTON T. BLOCK, Attorney and Manager
Railway Exchange Bldg., St. Louis, Mo.

Test these Statements for Yourself

Figure up what last year's fuse renewal expense was in actual dollars and cents, and add the cost of the time consumed in replacing. What does 80% of that amount to? You can **save** this 80% by installing

ECONOMY renewable cartridge FUSES



An entire Economy Fuse is not thrown away after it blows. A new, inexpensive link and a few seconds of time are all that your fuse maintenance expense includes. That's why Economy Fuses mean a permanent fuse investment.

But prove for yourself that you can make the saving we claim. Write for Catalog No. 8—describe the fuse to fit your requirements and get free samples. Test them under your severest conditions and see how they serve. This puts you under no costs or obligations. **Send now.**

ECONOMY FUSE & MFG. CO.
Kinzie and Orleans Sts. Chicago

Digitized by Google

The "Ironclad-Exide" Battery
is not what you know as the ordinary "lead battery"

It gives two to three times the life; seldom, if ever, requires cleaning and gives greatly increased total mileage.

The "Ironclad-Exide" Battery maintains its voltage—that is—the speed of the electric vehicle, tractor or industrial truck in which it is installed. An electric vehicle equipped with this battery don't "balk" on a steep grade nor is it "all in" after climbing one.

The "Ironclad-Exide" Battery is full of life—always on the job. It is the battery that stands up when it comes to emergencies.

THE ELECTRIC STORAGE BATTERY CO.

Boston Atlanta Rochester Cleveland PHILADELPHIA, PA. Detroit Chicago Denver St. Louis
New York Washington Pittsburgh 1888-1915 San Francisco Los Angeles Toronto

Write for it today
The "SUNDH"
Catalog of Electrical Controlling Devices
For Direct and Alternating Currents

You need it—and you'll find it mighty helpful

SUNDH ELECTRIC CO., New York

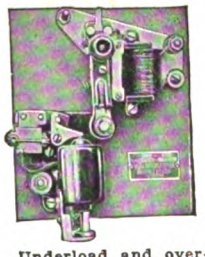
Chicago Office: H. J. Kaufman, Peoples Gas Building

MICA FROM THE PRODUCERS
Plate Mica of All Sizes—Mica Discs—Mica Washers —1 and 2 Inch Clean Scrap Mica in 100 lb. Sacks—Feldspar

Send for Samples and Prices

STAR MICA MINING CO., Inc.
CANAAN, N. H.
New York Office 61 Broadway

WARD LEONARD
25 Years of Experience



Underload and overload. 20 ampere size. $7.00 list.

Thousands of
WARD-LEONARD CIRCUIT BREAKERS

are in use today, giving 100 per cent satisfaction in battery protection. Types for every service demand, always efficient and dependable to operate at their ratings.

Satisfaction guaranteed. Write for Catalog.

WARD LEONARD ELECTRIC CO.
BRONXVILLE, N. Y.

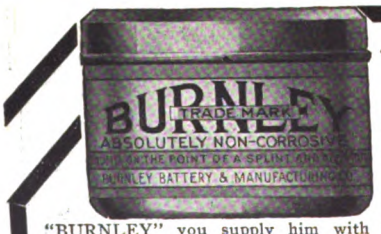
Note Protection at Corners

Blake Insulated Staple
Unequaled for telephone and bell wiring. The fibre insulation prevents troublesome short circuits and grounds.

5 Sizes Pat. Nov. 1900

Write for Samples

Blake Signal & Mfg. Co.
BOSTON, MASS.



Worth a Word
to the customer who wants a soldering flux. If you recommend "BURNLEY" you supply him with the means of CONVENIENT SOLDERING. You also stand back of a company that stands back of you.

BURNLEY SOLDERING PASTE

IS THE BRAND WORTH HANDLING BECAUSE both the goods and the makers help you to sell it.

BURNLEY BATTERY & MFG. CO.
NORTH EAST, PA.

Western Electric COMPANY DISTRIBUTORS

"Design of Excellence"

ELECTRICAL ENGINEERS EQUIPMENT CO.
711-715 Meridian Street, CHICAGO

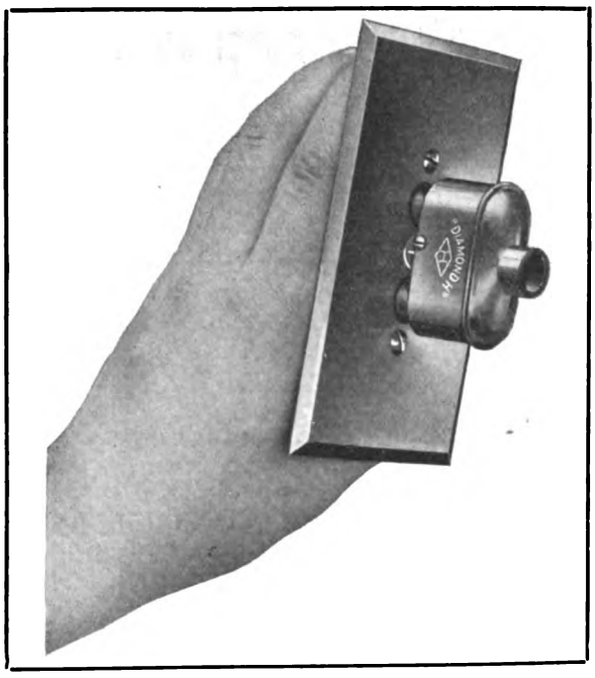
POWER PLANT APPLIANCES

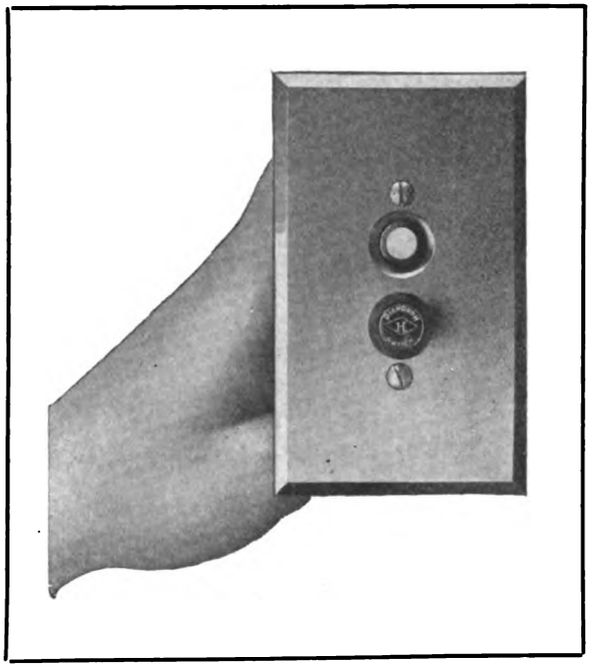
DISTRICT REPRESENTATIVES:

AKRON, O., Fiatiron Bldg., V. W. Shear & Co.
BOSTON, MASS., 84 State St., James C. Barr
DENVER, COLO., Gas & Electric Building, Mers Electric Co.
INDIANAPOLIS, IND., 318 Amer. Cent. Life Bldg., R. M. Cass
PHILADELPHIA, PA., 312 Deaskin Bldg., Lewis & Roth Co.
LOS ANGELES, CAL., 217 W. 4th St., R. B. Clapp
RICHMOND, VA., 301-302 American Nat'l Bank Bldg., The Hawkins-Hamilton Co., Inc.
CANADA, Northern Electric Company

Digitized by Google

Will you accept a cut in the prices of





"Diamond "H" Switches and Receptacles?

Sometimes a buyer will say "Your 'Diamond H' price is a little high."

Invariably we ask "Higher than what?" And on the basis of a *comparison* the viewpoint is changed to assurance that "Diamond H" prices are *extremely* low.

"Diamond H" prices can be cut by substituting copper for spring tempered phosphor bronze contacts.

Would you accept such a cut?

"Diamond H" prices could be cut by upsetting wire for binding screws instead of turning them from solid metal.

Would you accept such a cut?

"Diamond H" prices could be cut by substituting fibre for sheet mica for insulation.

Would you accept such a cut?

By letting stamping machines do the work on the mechanism — machinists' time could be saved.

Would you accept such a cut?

On the basis of comparative *value* "Diamond H" prices should be doubled.

THE HART MANUFACTURING COMPANY

HARTFORD, CONN.

Digitized by Google

P & B Insulating Varnishes

For all classes of work, also the old **P & B** COMPOUND and **P & B** TAPE such as you have always used.

WRITE FOR BOOKLET No. 3

The Standard Paint Company
Woolworth Bldg., New York

Chicago Boston Denver

Splicing Compound

makes a covering di-electrically as strong as the original covering of the cable. Why invite trouble by using inferior compounds?

Walpole Tire & Rubber Co.
Massachusetts Chemical Co.'s Products
Walpole, Mass.
Pioneers in Insulation Engineering

Mesco Products MESCO

Snap Switches, Push Button Switches, Separable Attachment Plug, and some other things. Mesco Products' Catalog mailed to the trade. Mention Electrical Review.

MANHATTAN ELECTRICAL SUPPLY CO.
New York Chicago St. Louis San Francisco

FUSES
Arresters
Voltage Detectors

S C

High Voltage Specialties

SCHWEITZER & CONRAD, Inc.
1770 Berteau Avenue
CHICAGO

HEMMING INSULATION
GUMMON
EG
HEMIT

STANDARD
HEAT RESISTING MOLDED INSULATION

Made By Specialists Exclusively Devoted To Solving Your Molding Problems.

WHY NOT PROFIT BY OUR EXPERIENCE?

HEMMING MANUFACTURING CO.
GARFIELD, NEW JERSEY

Digitized by Google

"UNION" SWITCH AND OUTLET BOXES

The "Union" Universal Box No. 180

Is more flexible in its uses than is generally realized. It is adapted to all kinds of open work, either rigid conduit, armoured cable or knob and tube work. It is also well suited to changes from one to another of these forms of wiring.

It takes all makes of shallow Switches and Rectangular Base Flush Receptacles, and has a complete line of covers for various purposes. It may also be used as a pull or junction box.

Our No. 27 Catalog gives detailed information—also describes the very complete line of "Union" Switch Boxes and Outlet Boxes.

Write for a free copy.

CHICAGO FUSE MFG. CO.
CHICAGO NEW YORK

"XDUCT"

Galvanized Conduit

Made for users who want the best.

"XDUCT" is a high-grade conduit, designed and made with a view to meeting all the requirements essential to precise work in electrical wiring.

Made from easy bending, Spellerized Mild Steel Tube. Protected from rust by a heavy deposit of pure non-corrosive zinc. Enameled inside with especially prepared black enamel which forms a smooth glossy interior through which the wires are easily fished.

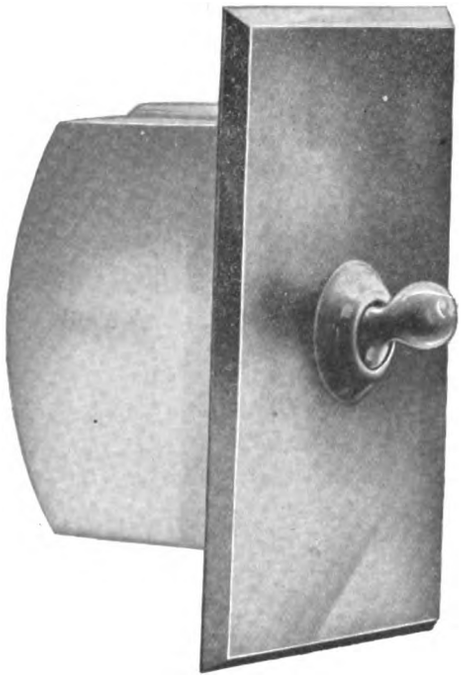
Furnished in 10-foot lengths, reamed and threaded on both ends with coupling on one end.

Write for samples

AMERICAN CIRCULAR LOOM CO.
90 West St., New York
Boston Chicago Los Angeles San Francisco Seattle Toronto

AMERICAN CIRCULAR LOOM CO. TRADE MARK BOSTON, MASS.

Announcing



The New Toggle Switch

This form of switch is new in this country, but old in England and Continental Europe.

It is made for the first time in the United States in improved mechanical form and is approved.

A switch of high quality and artistic appearance, having a small plate and no fastening screws.

Prices and discounts on application

Newton Manufacturing Co.
Lynbrook, New York

Digitized by Google

Armored Conductors and Fittings

Flexsteel

Flexible Metallic Conduit

NATIONAL Products

Metal Molding
Sherarduct
Economy
Flextube
Flexsteel
Outlet Boxes
Locknuts
Bushings
Fixture Studs
Autoflex

is more flexible, and with its flat surface, fishes more easily. The flat surface is an exclusive feature.

Flexsteel is of such construction and strength as to permit of its being bent to the shortest radius without danger of "spreading."

No 2163 BOX CONNECTOR WRITE FOR SAMPLE

Write for Catalog of Flexsteel and Fittings and ask for samples.

BOSTON LOS ANGELES
NEW YORK PORTLAND
CHICAGO SEATTLE
ATLANTA BUFFALO
DENVER DETROIT
SAN FRANCISCO

National Metal Molding Co
Manufacturers of
Electrical Conduits & Fittings
1106 Fulton Building. PITTSBURGH, PA.

FS-2

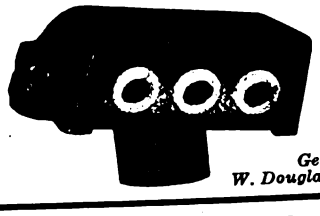
Flexsteel is always tied with Red, White & Blue ribbon.

G. M. Gest

Conduit Engineer & Contractor

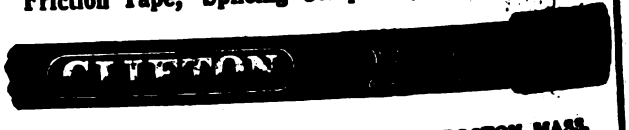
Executive Offices
Woolworth Building
NEW YORK
Cincinnati *San Francisco*

G. M. GEST, Limited
Montreal *Winnipeg* *Vancouver*



There's *Real* Economy in Using
Electrolet Conduit Fittings
Not only *inexpensive* in first cost, but also make a *quicker, better, neater-looking job.*
Ask for Prices and Samples
Killark Electric Mfg. Co.
St. Louis
General Sales Representative,
W. Douglas Woolley, 30 N. Michigan, Chicago

Friction Tape, Splicing Compound, Armature Tape



CLIFTON MANUFACTURING CO., BOSTON, MASS.
Warehouses: Boston, New York City, Buffalo, Chicago

Have you read the report of the Electrical Testing Laboratories on
ORANGEBURG
FIBRE CONDUIT—BOOK W
THE FIBRE CONDUIT CO.
ORANGEBURG, N. Y.
New York Boston Chicago San Francisco

DURADUCT
FLEXIBLE WOVEN CONDUIT

The better jobbers sell it—they don't do it for fun.
—that conduit is DURA

TUBULAR WOVEN FABRIC
MANUFACTURERS
GENERAL SALES AGENT
97 WARREN ST. NEW YORK

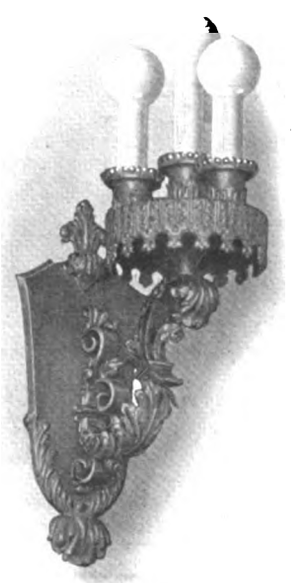
Digitized by Google

JOHNS-MANVILLE SERVICE

TRUE economy can be determined only by the test of time. The cost price is only the first factor. Length and quality of service are far more important—and when all three obtain, then and then only does true economy exist.

And that's why true economy and J-M Products are identical. Because first of all J-M Products are standards of quality and because J-M Service and Responsibility assure their continuous service to your continuous satisfaction.

"Do it Electrically"—J-M Lighting Service is a nation-wide organization that tells how.



And it is the part of the Central Station to tell its public to *do* it electrically, as well as to tell them *how*.

No Central Station can take fullest advantage of the electrical sales promotion work done all over the country unless able to promptly and adequately advise its prospects on lighting problems.

To help the Central Stations in handling this situation effectively the Johns-Manville Company has organized JOHNS-MANVILLE LIGHTING SERVICE. This service will co-operate with *your* Central Stations in obtaining for your customers satisfactory and efficient electric illumination.

Johns-Manville Lighting Service will plan any lighting installation, supply the fixtures and, if desired, promptly and efficiently install them, guaranteeing satisfaction to the customer and entirely relieving the Central Station of responsibility.

Johns-Manville LIGHTING SERVICE represents the combined resources of the

MITCHELL-VANCE CO.
I. P. FRINK CO. and
GILL BROS. CO.

The superior lighting equipment and engineering skill developed by these notable companies are collectively offered for service to the Central Stations.

Every Lighting Company, large and small, is invited to utilize this service in selling more prospects more and better equipment.

H. W. JOHNS-MANVILLE COMPANY

Akron	Boston	Columbus	Duluth	Kansas City	Minneapolis	Philadelphia	St. Paul	Toledo
Albany	Buffalo	Dallas	Galveston	Los Angeles	Newark	Pittsburgh	Salt Lake City	Washington
Atlanta	Chicago	Dayton	Houghton	Louisville	New Orleans	Portland	San Francisco	Wilkes-Barre
Baltimore	Cincinnati	Denver	Houston	Memphis	New York	Rochester	Seattle	Youngstown
Birmingham	Cleveland	Detroit	Indianapolis	Milwaukee	Omaha	St. Louis	Syracuse	

THE CANADIAN H. W. JOHNS-MANVILLE CO., LTD., Toronto, Winnipeg, Montreal, Vancouver.
For Great Britain and Continental Europe, Turners & Manville, Ltd., Hopetoun House, 5 Lloyds Ave., London, E. C.

552

Digitized by Google

The Highest Attainment of Insulation Permanence

AWARDED PANAMA PACIFIC GRAND PRIZE

Made by

American Steel & Wire Company

Chicago New York Cleveland Pittsburgh Worcester Denver

Export Representative: U. S. Steel Products Co., New York

Pacific Coast Representative: U. S. Steel Products Co.

San Francisco Los Angeles Portland Seattle

...The...

National Conduit and Cable Co.

EXECUTIVE OFFICES

41 Park Row - - - New York, N. Y.

Manufacturers of

Bare Copper Wire and Cable
Weatherproof Wires and Cables
Paper Insulated Cables
For Power, Telephone and Telegraph

Boston Philadelphia Chicago San Francisco

WE HAVE IT

If it is Insulated Electric Wire or Cables of the

BEST QUALITY

We can give you what you want and when you want it.

ALFRED F. MOORE

PHILADELPHIA

NEW YORK CLEVELAND CHICAGO BOSTON
CHATTANOOGA NEW ORLEANS

Show Window Cord Lamp Cord
LOWELL INSULATED WIRE CO.
Lowell, Mass.
N. E. C. S. Wire Telephone Wire

JOHN G. ALDRICH, Pres. J. F. BLAUVELT, Agt. RUSSELL W. KNIGHT, Treas.

New England Butt Company

MANUFACTURERS OF

Machinery for Insulating Electrical Wires

Braiding, Taping, Winding, Twining, Cabling, Stranding, Polishing and Measuring Machines.

CABLE COVERING BRAIDERS FINE CASTINGS A SPECIALTY

304 Pearl Street, Providence, R. I., U. S. A.

DOLPHIN
INSULATED WIRE

Notable for its uniformly high quality and dependability.

DOLPHIN ATLANTIC

Atlantic Insulated Wire and Cable Company

Sales Office: 120 Liberty Street, New York
Factory—Stamford, Conn.

Commercial Code

ROEBLING

Insulated Wires and Cables

AERIAL CABLES
ANNUNCIATOR WIRE & CABLES
ARMATURE COILS
ARMATURE LEADS
ASBESTOS BRAIDED WIRE
AUTOMOBILE CHARGING CABLES
AUTOMOBILE HORN CORD
AUTOMOBILE IGNITION CABLES
AUTOMOBILE LIGHTING CABLES
AUTOMOBILE STARTER CABLES
BARE BRAIDED COPPER
BARE COPPER STRANDS
BARE COPPER WIRE
BATTERY WIRE
BORDER LIGHT CABLES
BREWERY CORD
BRIDLE WIRE
BRUSH CABLES
CAMBRIC CABLES
CANVASITE CORD
CAR WIRE AND CABLES
CHARGING CABLE FOR ELEC. VEHICLES
CONTROL CABLE FOR ELEVATORS
COPPER SLEEVES
COPPER STRANDS, BARE
COPPER WIRE, BARE
COTTON TUBING OR SLEEVING
DECK CABLES
DROP WIRE
ELECTRIC HORN CORD
ELECTRIC LOCOMOTIVE CABLES
ELECTRIC VEHICLE, CHARGING CABLES
ELEVATOR ANNUNCIATOR CABLES
ELEVATOR CONTROL CABLES
ELEVATOR LIGHTING CABLES
ENAMELED WIRE
FLAMEPROOF WIRES
FIELD COILS
FIRE AND WEATHERPROOF WIRE
FIREPROOF WIRES
FIXTURE WIRE
GAS ENGINE CABLES
GAS FIXTURE WIRE
HEATER CORD
IGNITION CABLES
INTERIOR TELEPHONE WIRE
INSULATING PAPER
JUMPER WIRE
LAMP CORD
LOCOMOTIVE CABLES, MINE
MAGNET WIRE
MESSENGER STRAND
MINING MACHINE CABLES
MOTOR BOAT WIRES AND CABLES
MOTOR LEAD CABLE
MOVING PICTURE CORD
OFFICE WIRE AND CABLES
OILPROOF FINISHING BRAIDS
POWER CABLE, CAMBRIC INSULATED
POWER CABLE, PAPER INSULATED
POWER CABLE, RUBBER INSULATED
PACKING HOUSE CORD
RUBBER COVERED WIRE, N. E. C. S.
RUBBER TAPE
SIGNAL WIRE AND CABLES
SOLENOIDS
SLOW BURNING WIRE
SWITCHBOARD CABLE
SWITCHBOARD WIRE
TELEGRAPH CABLE, PAPER INSULATION
TELEGRAPH CABLE, RUBBER INSULATION
TELEGRAPH WIRE
TELEPHONE CABLE, PAPER INSULATION
TELEPHONE CABLE, RUBBER INSULATION
TELEPHONE WIRE
WEATHERPROOF WIRE

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J.

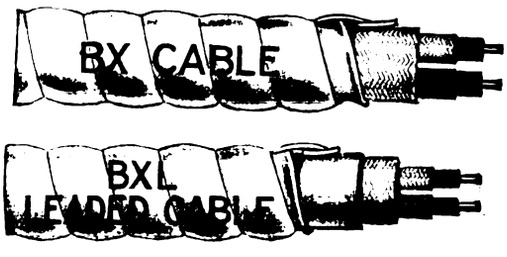
Digitized by Google

FIELD COILS SOLENOIDS ELECTRO MAGNETS MAGNET WIRE

THE ACME WIRE COMPANY

NEW HAVEN
CONNECTICUT

Original Steel Armored Cable



BX is designed for wiring old and new buildings.

BXL (lead covered) is adapted for use in wet places or when imbedded in concrete.

BX Cables
Are the Standard of Quality

Write for Pamphlet No. 4406.

SPRAGUE ELECTRIC WORKS
OF GENERAL ELECTRIC COMPANY
Main Offices: 527-531 West 34th Street
New York, N. Y.
Branch Offices in Principal Cities

Central Station Profits

Metropolitan Type "S" Service, Meter Protective and Testing Device

Are you sure that every kilowatt of energy used by your consumers is recorded on your watthour meters?

You will be if you use

Metropolitan Protective Devices

on your service and watthour meter installations. They are made by a company that has specialized in this particular line for many years.

Let us tell you about them.

Metropolitan Engineering Co.

42d Street Bldg.
New York

Canadian Representative—
Metropolitan Engineering Co., Ltd.,
90 Sherbourne St., Toronto, Can.

Protection First

Digitized by Google

SPEED UP YOUR HANDLING—TRUCKING

NATIONAL ELEVATING ROLLER BEARING CHAPMAN TRUCKS

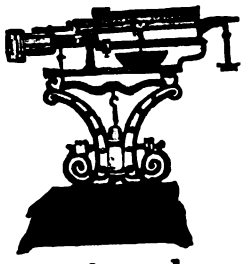
ONE man with a National-Chapman Elevating Truck can handle more material in one day than four or five men who have to stop to load and unload old fashioned trucks.

Why not cut this labor cost—install a National-Chapman and put those extra men on more productive labor elsewhere in the shop.

There are many facts concerning the practical structural details of this truck, its handy, exclusive labor-saving features, etc., that will interest you—if you propose to cut production costs to rock bottom in 1916.

National Scale Co.
36 Montgomery Street
CHICOPEE FALLS, MASS.

Send for Illustrated Catalog R—
Ask Us Questions

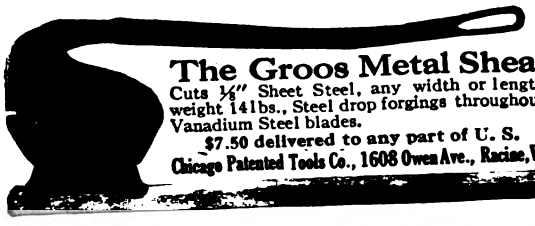


National Counting Machine

Two simple manual operations on this machine will count thousands of pieces of material in a moment.

There is nothing to compute—nothing to remember—nothing to forget. Simple instructions on the beam of the machine enable anyone to operate it and obtain an immediate, correct count.

It will pay you to investigate.



The Groos Metal Shear
Cuts ⅛" Sheet Steel, any width or length, weight 141bs., Steel drop forgings throughout. Vanadium Steel blades.
$7.50 delivered to any part of U. S.
Chicago Patented Tools Co., 1608 Owen Ave., Racine, Wis.

FIRE ALARM SYSTEMS
FOR USE ON
Alternating Current
The Palmer Electric & Mfg. Co., Boston, Mass.

SEAMLESS RUBBER SAFETY INSULATIONS

SAFETY INSULATED WIRE & CABLE CO.
114 LIBERTY ST., NEW YORK
CHICAGO BOSTON
SAN FRANCISCO

Electrical Slate
IMPERIAL BLACK MONSON BLACK
PENRHYN PURPLE
LARGE STOCKS ACCURATE WORK
Send for Electrical Price List No. 2
DAVIS SLATE & MANUFACTURING CO.
CHICAGO, ILL. BANGOR, PA.

BELDEN

MAGNET WIRE
Cotton, Silk, Beldenamel, Cotenamel, Silkenamel, Rectangular, and Square.
WINDINGS
Coils, Solenoids, Electro-Magnets.
CABLES
Moving Picture Machine, Annunciator and Elevator.
BAKELITE
Moulded Parts, Sheets, Rods and Tubing.
FLEXIBLE CORDS
Lamp, Portable, Brewery and Packinghouse.
WIRES
Power, Lighting, Fixture.

WIRE
Spring-brass, Office Annunciator, Bare and Tinned Copper. Armature, Banding, Norway Iron Core, Gas Fixture, Telephone, Switchboard. Jumper and Motor Lead.
CORDS AND CORDAGE
Stranded Tinsel Conductor, Stranded Copper Conductor, Telephone Receiver Transmitter, Switchboard and Push Button.
RUBBER INSULATED PRODUCTS
CABLES
Automobile Lighting and Starting, Elevator Lighting and Control, Theatre, Annunciator, and Telephone.
OTHER PRODUCTS
Braided Cotton Sleeving, Electrical Tapes and Webbings, Rubber Friction Tape, Self-Fluxing Solder, Wire Tension Devices, Sterling Varnishes, Wire Test Clamps.

Winding Machines, Revolution Counters, Tips and Terminals, Battery Connectors, Flexible Copper Connectors, Pigtails, Flexible Metal Conduit.
C-1 For Complete List of Belden Products See General Catalog.
BELDEN MANUFACTURING COMPANY
2304 South Western Ave. Chicago, U. S. A.

HAZARD
INSULATED WIRES & CABLES
HAZARD MANUFACTURING COMPANY
WILKES-BARRE, PENNA.
NEW YORK 533 CANAL STREET
PITTSBURGH 1ST NATIONAL BANK BUILDING
CHICAGO 552 W. ADAMS ST.

Digitized by Google

Over 100,000 Sold
SIMPLEX
Electric Heating Pads

Imitated but not Equaled

There is a big field for its sale to Hospitals, Homes, Physicians' Offices, Sanitariums, Hotels, etc.

Exclusive features described in our Sales Helps and Catalog

SIMPLEX QUALITY TRADE MARK

Simplex Electric Heating Co.

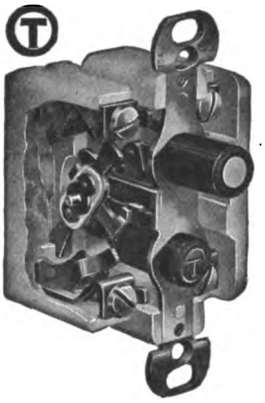
Mnfrs. of Everything for Electric Heating and Cooking

15 S. Desplaines St. Chicago, Ill. CAMBRIDGE, MASS. 612 Howard St. San Francisco

Operated at a touch, but full of a tremendous capacity for hard work, describes

"CIRCLE T" Push Button Switches

Write for bulletin.



The Trumbull Electric Mfg. Company

Plainville, :: Connecticut

"MANROSS" HAIR SPRINGS

For Electric Indicating and Recording Gauges, Steam Gauges, etc. Largest Manufacturers of

HAIR SPRINGS

in the United States. Electrical Instrument Hair Springs are made from our Special Bronze-Alloy.

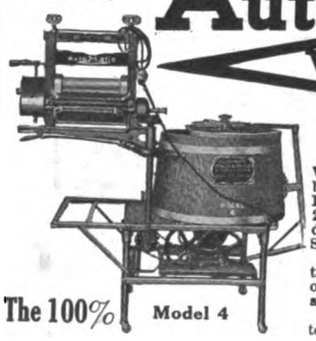
F. N. MANROSS & SONS, Forestville, Conn.

TOOLS

for all classes of electrical construction and repair work. Write for catalog.

Mathias Klein & Sons Canal Station 28 Chicago

The 100% **AutoMatic** Washer



Is the QUALITY Washer
IT HAS NO EQUAL

This splendid AUTOMATIC Electric Washer, Model 4, has a compact short bench that FOLDS UP when not in use. Has full washing capacity and takes but 2 ft. sq. floor space. Has ALL up-to-date features, including the Reversible-Swinging Wringer.

Simple in design; faultless in construction; elegant in finish and perfect in operation, is easy to sell and its users are always satisfied. Six Models.

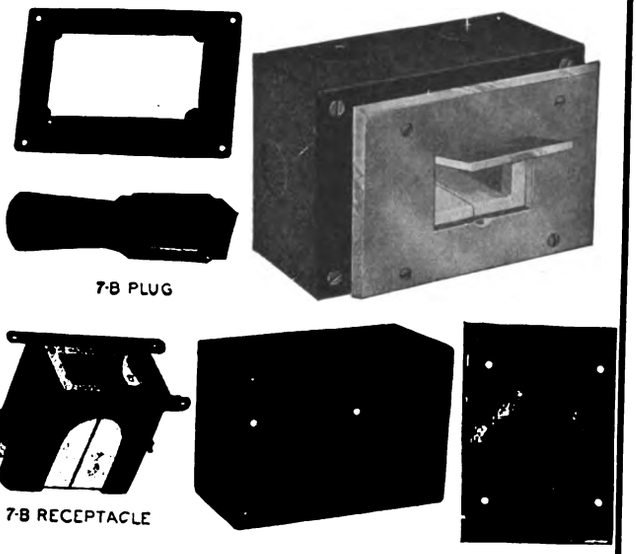
Send for Bulletin 101. It's FREE and tells the AUTOMATIC STORY.

The 100% Model 4

Automatic Electric Washer Co., Inc., Newton, Ia., U.S.A.

A Ralco Flush Receptacle

should be found in every lodge-hall, banquet-hall, school auditorium, association assembly room, churches, and other meeting places where stereopticon and moving picture lectures and entertainments are held.



7-B PLUG

7-B RECEPTACLE

7-B PLATE

Ralco Heavy Duty Plugs and Receptacles

are made in many types, fused and fuseless, each type designed for a special class of service. Type 7-B, with Non-Reversible Plug, illustrated herewith, is recommended where a neat, flush installation giving an outlet up to 30 amps. is required. Furnished with flush Yale lock and key or with hinged hasp and padlock when specified.

Write for Ralco Bulletin and Price List

Central Electric Company.

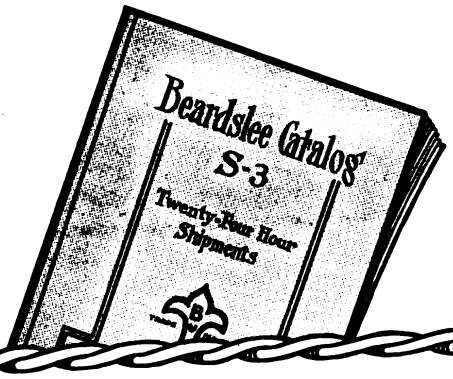
The House of Service

CHICAGO

DKONITE TRADE MARK REG. U.S. PAT. OFFICE

DKONITE TRADE MARK REG. U.S. PAT. OFFICE

Digitized by Google



A Valuable New Catalog

For Electrical Dealers

Judged by results obtained—Catalog S-3 represents the most popular catalog ever issued by this Company.

Forty-eight hours after the first copy of this catalog was put in the mail, a Beardslee dealer had wired in his order for chandeliers sold from the new line.

The vital business-getting value of this new catalog lies far back of the designing and illustrating of its attractive line of chandeliers.

Beardslee 24-Hour Shipment Service

represents, first of all, factory efficiency. Behind it are years of study, covering selling conditions as our customers found them, and the overcoming of manufacturing obstacles without sacrifice of correct design and workmanship.

Catalog S-3 brings to the chandelier field a line of moderate price designs that meets the requirements of the average buyer. And it gives—in addition to this—a delivery service that is superior because of the unusual factory organization behind it.

Write For Your Copy Today

Beardslee Chandelier Mfg. Co.
220 So. Jefferson St.
Chicago

To meet the keenest competition known to the electrical trade, we are making a lamp equal in quality to any other and selling it at a lower price.

"KENTUCKY" Drawn Wire Tungstens

Made in U. S. A.

Made in an independent factory; not connected with any other lamp concern, and sold at prices that will astonish you. No contracts or agreements required. Our guarantee goes with every lamp, and personal service with every order. Give us a small trial order.

No lamp manufacturer can beat us on service and deliveries. Write us today.

Kentucky Electrical Co., Inc.
(Not connected with any other lamp concern)
Owensboro, Ky.

Electric Light Up to the Minute

40 and 60 Watt Nitrogen Lamps just brought on the market by the

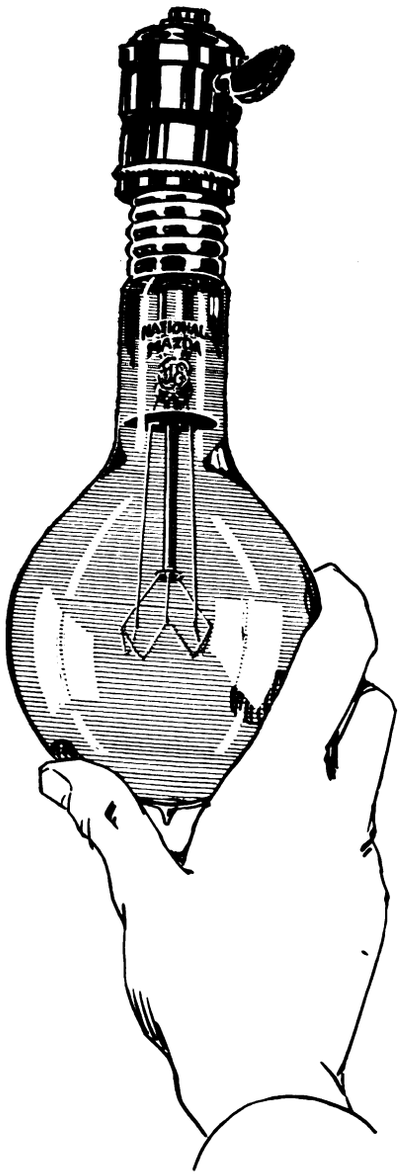
Lux Manufacturing Co.
Hoboken, N. J.

Cleveland Office,
343 Superior Arcade.
Chicago Office,
327 S. La Salle St.

San Francisco Agents,
Associated Mfgrs. Importing Co.,
883 Market St.

St. Louis Office,
Pontiac Bldg.

Digitized by Google



Put It There!

Whenever you see an empty socket—whenever you see a socket filled with an inferior lamp—put in a National MAZDA.

Fill industrial, store interior and window lighting sockets with the new 100 Watt MAZDA C lamp. They accelerate business.

Fill residence lighting sockets with the smaller National MAZDAS. They cut the cost of enjoying life.

Write to any of the Sales Divisions represented by the labels below or to Lamp Headquarters for assistance in putting a National MAZDA lamp in every socket.

National Mazda—The Way to Better Light

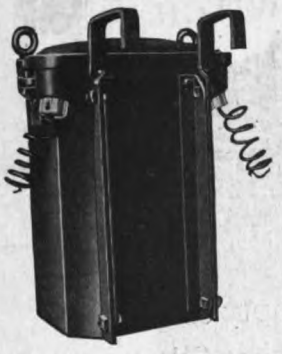
NATIONAL LAMP WORKS
OF GENERAL ELECTRIC CO.

Nela Park, Cleveland

Member Society for Electrical Development. "DO IT ELECTRICALLY"

Digitized by Google

Pittsburgh Pressed Steel Cases



Improved Heat Radiation

Pittsburgh Transformer Company

Largest Manufacturers of Transformers Exclusively in the United States

Pittsburgh, Pa.

Rumsey Electric Company, Philadelphia
Wetmore-Savage Company, Boston
Iron City Electric Company, Pittsburgh
Interstate Electric Company, New Orleans
Northwestern Supply Co., Seattle, Tacoma
Jaspersen Supply Company, St. Marys, O.
Federal Sign System (Electric), Chicago, New York, San Francisco

Western District Office
724 Harris Trust Bldg., Chicago, Ill.

Bulletin No. 1280

Verne W. Shear & Company, Akron
The Korsmeyer Company, Lincoln, Neb.
R. B. Clapp, 217 W. Fourth St., Los Angeles, Cal.
Barber-Dwinnell Elec. & Mfg. Co., Kansas City, Mo.
M. D. Summer, 805 Electric Bldg., Buffalo, N. Y.

HYLO TURN DOWN LAMPS

MAZDA and CARBON

MAZDA (Both Filament Mazda) 25 watt high x 5 watt low and 40 watt high x 5 watt low.
Carbon 8 CP x ½ CP and out, 16 CP x 1 CP and out, 32 CP x 1 CP and out.
HYLO Mazda and Carbon is made in all voltages from 100 to 250.
HYLO Mazda is also made in 32 V. 25 W x 5 W for Battery Current for Country Homes.

Sold by all jobbers.

Economical Electric Lamp Division
Nat'l Lamp Works of General Electric Co.
25 W. Broadway New York

BUILT LIKE A WATCH

SANGAMO METERS

for Every Electrical Need

Ask for Bulletins

Sangamo Electric Company
Springfield, Illinois

NEW YORK 50 Church St. | MINNEAPOLIS Metropolitan Life Bldg. | ROCHESTER Mercantile Bldg. | LOS ANGELES San Fernando Bldg.

We Finance Extensions and Improvements

to Electric Light, Power and Street Railway properties which have established earnings. If prevented from improving or extending your plant because no more bonds can be issued or sold, or for any other reason, correspond with us.

Electric Bond and Share Company
(Paid-up Capital and Surplus $15,000,000)
71 Broadway New York
Dealers in Proven Electric Light, Power and Street Railway Bonds and Stocks

TRADE MARKS THAT GUARANTEE QUALITY
Electric Railway Line Material, Charging Plugs and Receptacles, Ajax Lightning Arresters, Switches and Switchboard Appliances, Automatic Time Switches.

Albert & J. M. Anderson Mfg. Co.
Established 1877
289-293 A St. Boston, Mass.

Best Grade Renewed Lamps

Both Carbon and Tungsten Types
We guarantee you most for the money

BOSTON-ECONOMY LAMP DIVISION
National Lamp Works of General Electric Co.
128 MAPLE STREET DANVERS, MASS.

NOW LET US PROVE IT TO YOU

We have proved the month in and month out serviceability of

NUNGESSER CARBON And METALLIC BRUSHES

Will you match a little of your time against our time and expense to either correct any brush trouble you may have, or to improve present conditions?

If "Better Service" interests you, Write us for "Symptom Blanks."

THE NUNGESSER CARBON & BATTERY CO.
Cleveland, Ohio

Electrical Exchange

Anything to sell?
Do you want help?
Do you require a position?

Make your wants (Electrical) known in the classified columns of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN. See page 44 of this issue.

Digitized by Google

KUHLMAN Improved Type Distributing Transformer

In Kuhlman Distributing Transformers in sizes of from one to fifty K.V.A. capacity, losses have been reduced to the lowest practical limit—and all mechanical complications have been eliminated, thereby increasing the factors of durability and safety.
We will gladly quote on special transformer equipment and assure prompt shipment.

Write for catalog and bulletins.

KUHLMAN ELECTRIC CO., BAY CITY, MICH.

HARTFORD TIME SWITCH

Show Windows

Electric Signs

"Just wind it once a week"—that's all

Show Windows—get after your neighboring merchants who are losing money by not having their show windows illuminated. Most of them don't know that there is a Hartford or what it does. Wake them up. Get the profit on the installation as well as on the sale.
Your Jobber carries them in stock.

Hartford Time Switch Co.
A. Hall Berry, General Sales Agent, New York, N. Y.
Northern Electric Company LIMITED — Canadian Sales Agents

DUNCAN METERS

At no time in the history of the electric lighting business has such progress been made in developing electric meters as there is right now. With the Duncan Electric Manufacturing Company, this has become a fine art, and no instruments going upon the market today have the same guarantees for accuracy and stability as have the Duncan Model E for D. C. service, and the Model M2 for A. C. service. This same refinement of design and excellence of operation is carried into the Duncan Portable Test instruments, with the result that any plant equipped with Duncan Meters is in the best position possible from both commercial and electrical standpoints.

Duncan A. C. and D. C. House Type Meters; Switchboard Meters; and Portable Test Meters

DUNCAN TRANSFORMERS

No one will appreciate the sterling qualities and excellent worth of Duncan Transformers as well as those who have been using other makes, and who have been troubled with breakdowns either from lightning or poor construction. Duncan Transformers are now made to withstand every service that may be imposed upon them by the most rigid practice. An entirely new and novel means of impregnating has been developed, which surpasses any other method. It insures an absolute means of having the insulating compound reach every possible pore and and interstice within the windings. It cannot be beaten.

"Everybody knows the Duncan products"

DUNCAN ELECTRIC MFG. COMPANY

Lafayette, Indiana

Digitized by Google

CUTLER-HAMMER

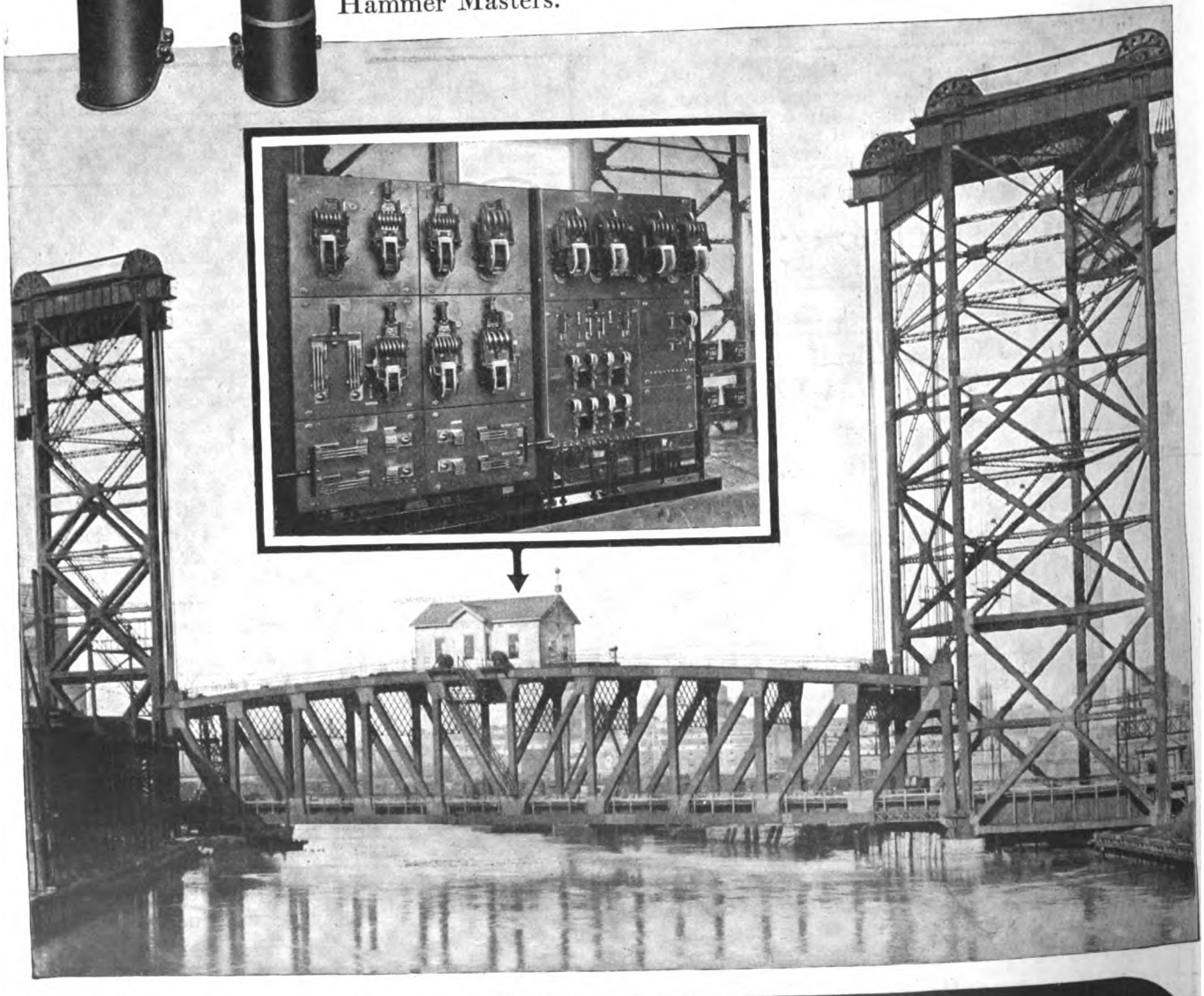
Three Big Chicago Railroad Bridges Have Cutler-Hammer Controllers

Types of Master Controllers Used

One of three big double-track railroad bridges over the Calumet River, Chicago, is shown below. This was built during the early part of 1914. Cutler-Hammer Controllers were installed.

Recently two more bridges of similar construction have been completed, and you will find Cutler-Hammer Control Panels and Master Controllers in the operators' cabins of each bridge.

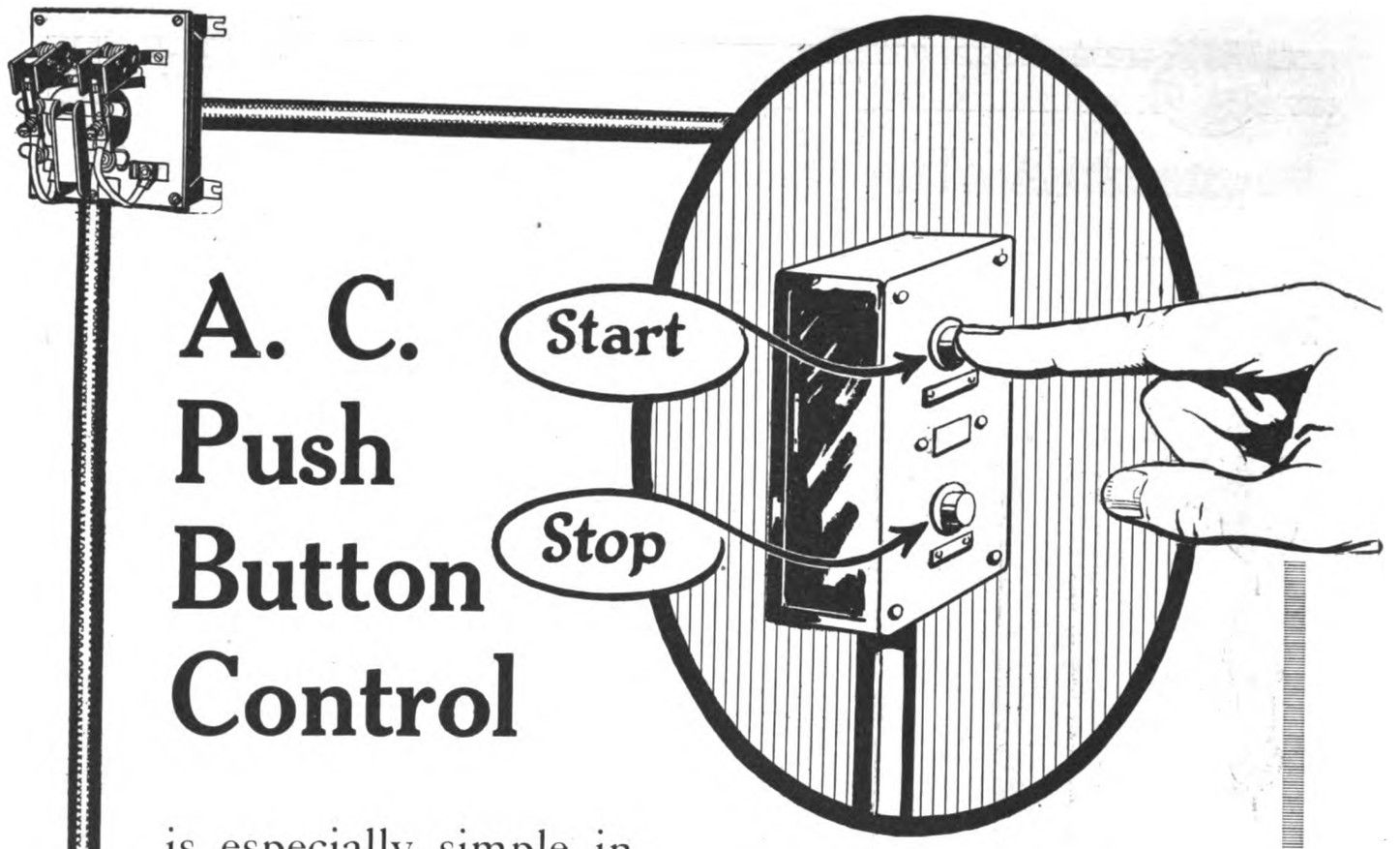
Railroad bridge service requires the most reliable operation and control. The 1550 H.P. of motors used for these Chicago bridges are readily and reliably controlled by the manipulation of the Cutler-Hammer Masters.



THE CUTLER-HAMMER MFG. CO. MILWAUKEE

NEW YORK: Hudson Term. 50 Church St. CHICAGO: Peoples Gas Bldg. PITTSBURG: Farmers' Bank Bldg. BOSTON: Columbian Life Bldg.
PHILADELPHIA: Commonwealth Bldg. CLEVELAND: Schofield Building CINCINNATI: Gwynne Building
PACIFIC COAST AGENT: H. B. Squires Co., 579 Howard St. SAN FRANCISCO, San Fernando Bldg., LOS ANGELES and Morgan Building, PORTLAND, ORE.

Digitized by Google

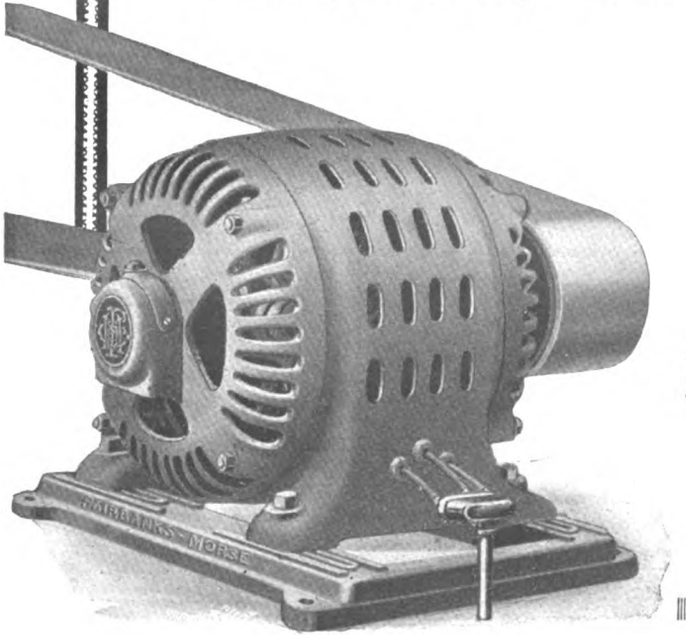


A. C. Push Button Control

is especially simple in the case of the Fairbanks-Morse

Internal Starter Induction Motor

because the starter is built solidly as part of the rotor, practically without moving parts—no sliding contacts. It perfectly regulates the starting current to every load.



May we send details?

Fairbanks, Morse & Co.

CHICAGO

New York—San Francisco

(781-7W)

Digitized by Google

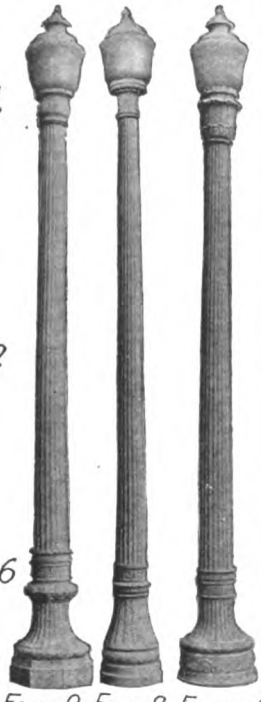
This Trade Mark The Guarantee of Excellence on Goods Electrical.

G-E MAZDA Series Street Lighting

Novalux Units

Pendent

Ornamental



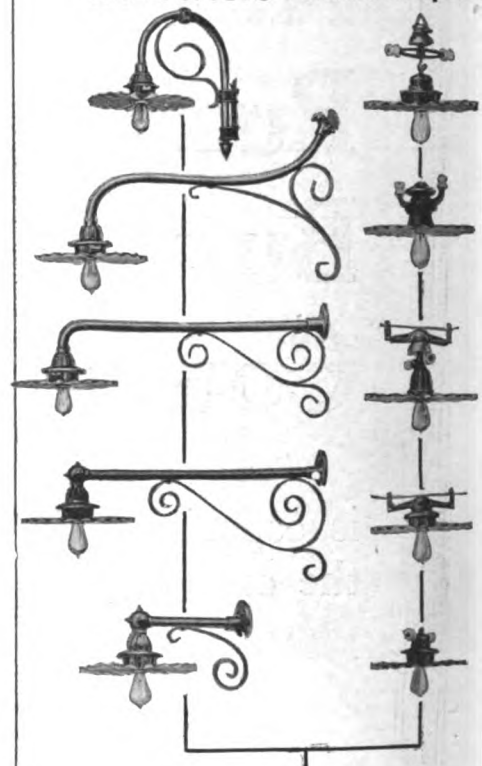
YOU CAN SELECT from the comprehensive G-E MAZDA Series system the correct lighting unit for your Business streets, Residential streets and outlying districts; also the current regulator that will meet your particular conditions.

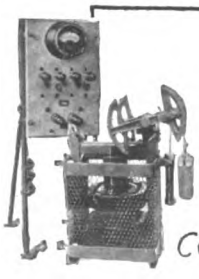
The G-E MAZDA Series System is founded on broad experience with modern street illumination requirements and is backed by the reputation of a Company that makes everything from generator to lamp.

Only one unit of each line is shown here; write for complete information.

Fixtures

Brackets Center Span





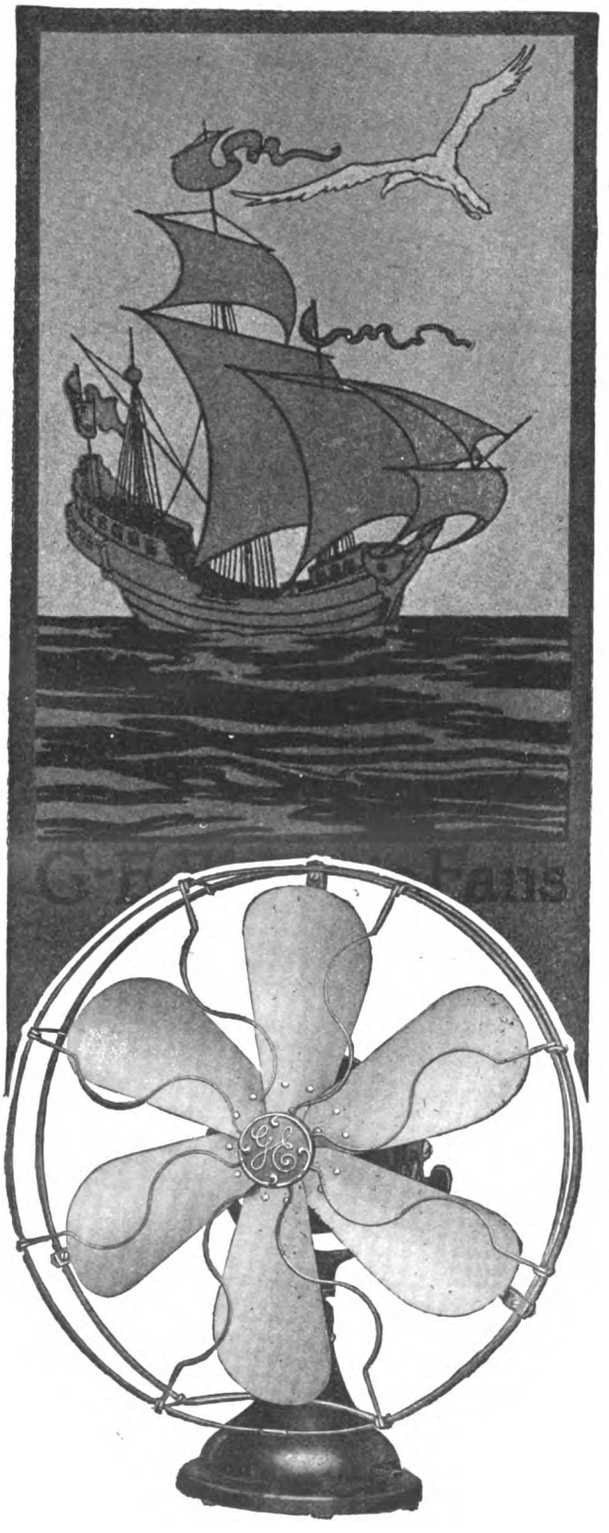
General Electric Company

General Office: **Sales Offices in All Large Cities** **Schenectady, N. Y.** 5095

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Digitized by Google

This Trade Mark The Guarantee of Excellence on Goods Electrical.



G-E Fans for 1916

The effect of the nation-wide, "bigger business" will be a greater demand for comforts and necessities in home, office and shop.

1916 will be a big G-E Fan year—let us help you make it the biggest in history.

Our advertising plans for 1916 embody a broader scope, a better service, a greater analysis of your particular needs than ever before.

When making your 1916 G-E Fan Contract—you tie up with over twenty years leadership in quality, service and reputation. You also know that the line is complete whatever fan you call for. And, further, you have the immeasurable advantage of all the broad-gauged G-E national advertising sales helps and assistance in putting G-E Fans over the counter.

Write for new Booklet.

General Electric Company

General Office: **Schenectady, N. Y.**

Sales Offices in All Large Cities

5919

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Digitized by Google

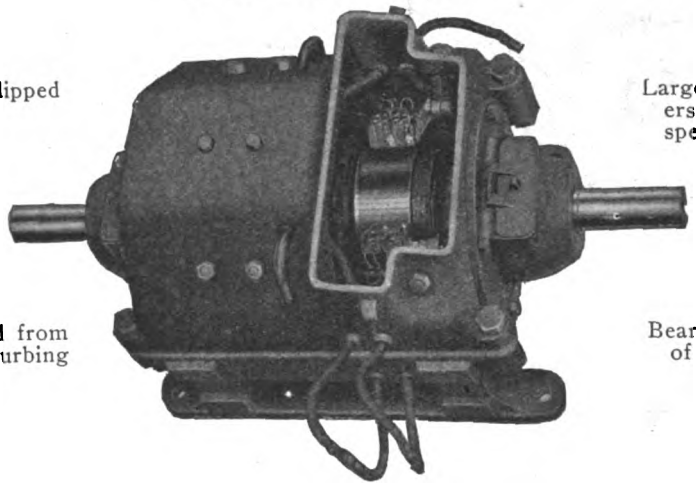
This Trade Mark The Guarantee of Excellence on Goods Electrical.

CO 1800 Crane and Hoist Motor For Intermittent Service

Hoist service is severe on a motor. Large overloads are sudden and frequent. The relative inaccessibility of the motor minimizes the attention it will receive.

Top half of frame can be lifted off without disturbing back gearing.

Commutator can be readily slipped off armature quill.



Large handhole and bearing covers permit quick and certain inspection.

Shaft can be easily removed from armature without disturbing windings or commutator.

Bearings can be slipped off ends of shafts.

Suitable for floor, wall or ceiling mounting. End shields, feet and shaft extensions same on both ends. Long feet permit wide variation in anchor bolt spacing.

These simple, durable, get-at-able motors have been designed for crane, hoist and other intermittent service requiring a maximum torque motor of ample overload capacity. Electric brakes of half or full torque capacity can be supplied to assure a quick, sure stop.

Send for bulletin 48100 which describes these motors.

General Electric Company

General Office: Schenectady, N. Y.

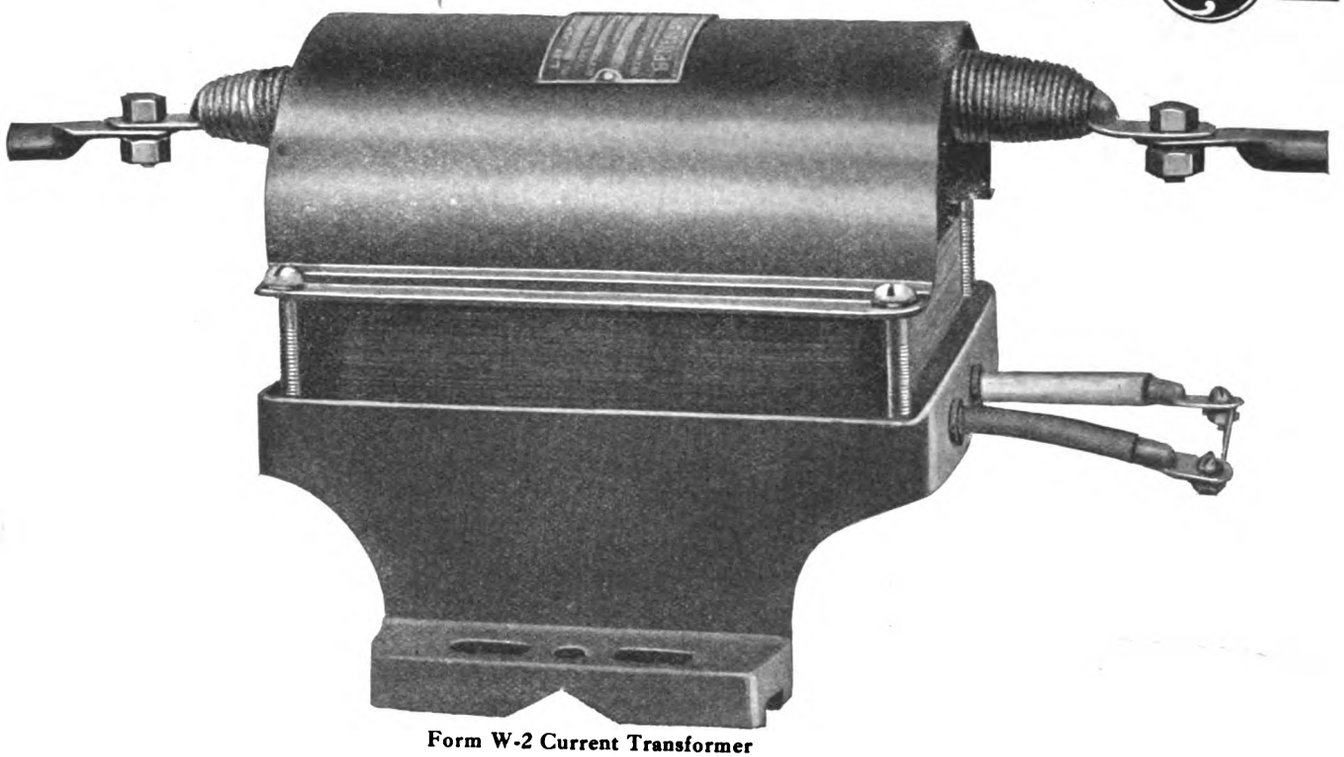
Sales Offices in All Large Cities

5399

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Digitized by Google

This Trade Mark The Guarantee of Excellence on Goods Electrical.



Form W-2 Current Transformer

G-E Instrument Transformers

Current and potential transformers when used with watthour meters or instruments are an important part of the electrical measuring device. Accuracy of transformers (which means good ratio and phase angle characteristics) is as essential as high accuracy of the meters or instruments.

In addition to being accurate, instrument transformers must also be well-insulated, as failure of the insulation between primary and secondary would endanger the life of the operator, and would also be likely to interrupt service.

G-E Instrument Transformers are unexcelled in accuracy, and their insulation has a very high safety factor.

One of the latest designs of G-E instrument transformers is the current transformer illustrated above, known as the Form W-2. This transformer can be used for accurate metering purposes with a secondary connected load up to 30 volt-amperes, which means that several meters or other devices may be operated from the same set of transformers. Where meters are not used and high accuracy is not important, the transformer will take care of much higher secondary volt-amperes.

The W-2 transformer is low in price, but is designed for use on circuits up to 4500 volts. Its high factor of safety is indicated by the fact that every W-2 transformer is given a test of 15,000 volts.

Our catalogue of instruments and instrument transformers gives details of construction and complete sets of accuracy curves for all conditions of service.

General Electric Company

General Office **Schenectady, N. Y.**

Sales Offices in All Large Cities

5570

This Trade Mark The Guarantee of Excellence on Goods Electrical.

Digitized by Google

The New

Weston

Portable Testing Instruments

Model 329 Portable Polyphase Electrodynamometer Wattmeter

An Instrument of Precision guaranteed to an accuracy of ½ of 1 per cent of full scale value, on A. C. Circuits of any frequency up to and including 133 cycles and on circuits of any wave form.

Double ranges are provided for both current and voltage circuits. The current coils will withstand 100 per cent overload indefinitely and the voltage ranges 60 per cent, without readable error.

Other important features are the uniformity of the scales throughout the *entire* length, the effective shielding from external magnetic fields, and the perfect damping.

For complete information regarding Model 329 Wattmeters write for Bulletin 2002. Other models in this group are Model 310 Single-Phase and Direct Current Portable Wattmeter, described in Bulletin 2002; Model 370 A. C. and D. C. Ammeter, described in Bulletin 2003; and Model 341 A. C. and D. C. Voltmeter, described in Bulletin 2004.

Weston Portable Instrument Transformers are described in Bulletin 2001.

Weston Electrical Instrument Co.
19 Weston Ave., Newark, N. J.

New York	Chicago	Detroit
Boston	St. Louis	San Francisco
Philadelphia	Richmond	Toronto
Buffalo	Denver	Montreal
Cleveland		Winnipeg
Cincinnati		Vancouver

SIMPLEX
STEEL TAPED CABLES

BEST
because
TWO STEEL TAPES
are wound on spirally in
OPPOSITE DIRECTIONS

SIMPLEX WIRE & CABLE Co
MANUFACTURERS
201 DEVONSHIRE ST. BOSTON
CHICAGO SAN FRANCISCO

OKONITE

TRADE MARK Registered U. S. Pat. Office

INSULATED
WIRES & CABLES
The STANDARD for
RUBBER INSULATION

THE EASE with which Okonite Insulated Wire and Cables meet your test requirements indicates the continued high service you may expect after their installation. They never disappoint.

Have you used Okonite Lead Covered or Steel Taped Underground Cables?

THE OKONITE COMPANY
253 Broadway
NEW YORK

INDIANA RUBBER AND INSULATED WIRE CO.

Paranite Rubber Covered Wires and Cables

IF IT'S PARANITE IT'S RIGHT

More Than Code Requires

PARANITE TRADE MARK

Underground, Aerial, Submarine and Inside use

Telephone, Telegraph and Fire Alarm Cables, Lamp Cords, Portable Cords and Ignition Cables

Factory and General Offices:
JONESBORO, IND.

Chicago Branch: 210 Desplaines St.
Chicago, Illinois

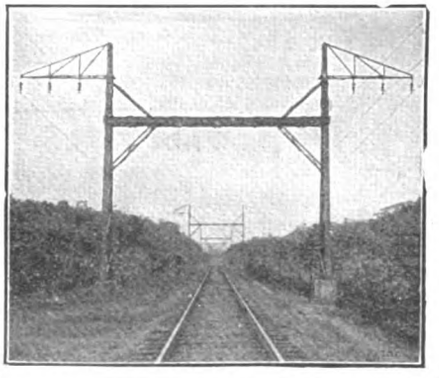
Digitized by Google

PORCELAIN AND METAL ELECTRICAL FITTINGS
MADE TO YOUR SPECIFICATIONS Send Drawings or Model for Estimate
PERU ELECTRIC CO., PERU, IND.

DISFICO TRADE MARK
The only manufacturer of
VULCANIZED FIBRE SPECIALTIES
with a factory in the
CHICAGO DISTRICT
Sheets, Rods, Tubes, Insulating Papers
Diamond Vulcanized Fibre Receptacles for Factory and Office
SAVE TIME AND TRANSPORTATION CHARGES
DIAMOND STATE FIBRE COMPANY
619-31 West Washington St., Chicago Bridgeport, Pennsylvania
Cleveland Office, 906 Hippodrome Bldg.

HIGH TENSION
STEEL TOWER OUTDOOR SUB-STATIONS
DELTA STAR ELECTRIC CO CHICAGO
ICE PROOF POLE TOP P.M. SWITCHES
ASK FOR TECHNICAL BULLETINS

AMERICAN BRIDGE COMPANY
HUDSON TERMINAL-30 CHURCH STREET, NEW YORK
Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS


Track Spans, Panama.

SALES OFFICES
NEW YORK, N. Y., 30 Church Street
Philadelphia, Pa., . Widener Building
Boston, Mass. . . John Hancock Bldg.
Baltimore, Md., Continental Trust Bldg.
PITTSBURGH, PA. . . Frick Building
Rochester, N. Y. . . . Powers Block
Buffalo, N. Y. . Marine National Bank
Cincinnati, Ohio. Union Trust Building
Atlanta, Ga. . . . Candler Building
Cleveland, Ohio . Rockefeller Building
Detroit, Mich., Beecher Ave. & M. C. R. R.
CHICAGO, ILL., 208 South La Salle St.
St. Louis, Mo., Third Nat'l Bank Bldg.
Denver, Colo., First Nat'l Bank Building
Salt Lake City, Utah, Walker Bank Bldg.
Duluth, Minn. . . . . Wolvin Building
Minneapolis, Minn., 7th Ave. & 2nd St. S. E.

Pacific Coast Representative:
U. S. Steel Products Co. Pacific Coast Dept.
SAN FRANCISCO, CAL., Rialto Building
Portland, Ore. . . . . Selling Building
Seattle, Wash., 4th Ave. So. Cor. Conn. St.

Export Representative:
United States Steel Products Co., 30 Church St., N. Y.

Buyers' Guide of Electrical Material

A complete list—32 pages—of the manufacturers of electrical material, under proper classification, is published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN in the first issue of each month, beginning on this page.

Digitized by Google

ELECTRICAL EXCHANGE

POSITIONS WANTED

The rate for "Positions Wanted" advertisements is two cents per word, minimum charge 50 cents an insertion, payable in advance. Remittances and copy should reach this office not later than Monday 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

ELECTRICIAN— Eight years' electrical construction and operating experience. Have also had 2 years' experience with selective ringing central energy telephone system. Can furnish A1 references as to character and workmanship. Open for engagement Jan. 15. Will go anywhere. Address No. 1993, Electrical Review & Western Electrician, Chicago.

A REAL POWER SALES ENGINEER— There's only about a dozen of us in the entire industry; if you are big and progressive and want such a man, get busy between now and January 1. Would consider efficiency or production work with industrial enterprise, if broad field. Address No. 2005, Electrical Review and Western Electrician, Chicago.

POSITION WANTED— A winder and repairman on A. C. and D. C. motors and generators, also transformers, rectifiers, meters, etc., desires steady position. Will go anywhere. Address, No. 2000, Electrical Review and Western Electrician, Chicago.

SALESMAN— Eastern headquarters, with established trade wishes a line either exclusively, or in conjunction with other goods, for the east, south and southwest. Address No. 2006, Electrical Review and Western Electrician, Chicago.

HELP WANTED

The rate for "Help Wanted" advertisements is three cents a word, minimum charge $1.50 an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

WANTED — Technical educated young men for work in our testing departments. Good opportunities for experience are to be had. Apply by letter, Employment, Box 911, Pittsburgh, Pa.

WANTED— Manager for water power electric light plant, also telephone plant, in tropical Spanish country. Location healthful. Only those who can speak Spanish considered; must be well qualified in construction and maintenance. Give your experience fully, age, salary expected, with photo and reference. Address No. 2004, Electrical Review and Western Electrician, Chicago.

MISCELLANEOUS

The rate for "Miscellaneous" advertisements is three cents a word, minimum charge of $1.50 an insertion, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

Replies may be sent in care of Electrical Review and Western Electrician, 608 So. Dearborn Street, Chicago, or 13-21 Park Row, New York.

WANTED— Two Second Hand, three phase, 60 cycle, 2,300 volt, 200 R. P. M., 300 to 400 K. V. A., direct connected waterwheel type alternators, complete with base, bearings and shaft, with or without exciter and switchboard. Good condition. Give description, price and delivery. Wausau Street Railroad Company, Wausau, Wis.

WANTED

Used 3-phase, 60 cycle, induction, 220-volt or 440-volt, 10, 15, 25 and 35 H. P., in operating conditions. C. J. & F. E. Briner, St. Louis, Mo.

America's Headquarters for

Second Hand Electrical Machinery

Overhauled in our shops and sent out "as good as new" with a satisfactory guarantee. We buy—sell—repair—rent and exchange—and are always ready for a trade. No quantity too large. Send for our "Monthly Bargain Sheet," showing net prices.

GREGORY ELECTRIC CO. CHICAGO, ILLINOIS

FOR SALE CHEAP

One 20x36 Nordberg Heavy Duty Engine, direct connected to a Westinghouse Generator 350 KVA, 3 Phase, 60-Cycle, 2,300 Volts.
One 25 K. W. direct connected Generator, 220 Volt, D. C.
One 15 K. W. direct connected Generator, 110 Volt, D. C.
One 65 K. W. Belted Generator, 110 Volt, D. C.
One 75 K. W. Belted Generator, 220 Volt, D. C.
One 13x12 Armington & Sims High Speed Engine.
One 14x14 Ball High Speed Engine.
One 16x36 Allis Heavy Duty Corliss Engine.
Address, MERTES MACHINERY CO., Milwaukee, Wis.

BOILER FOR SALE— Ideal, sectional, 48-in., steam; No. S. 48-7; good as new; capacity 6,300 ft.; suitable for large steam job; cost $600; will sell for $300 cash f.o.b. Moberly, Mo. If you want a bargain, write J. Oscar Smith, Moberly, Mo.

WANTED — Second Hand A.C. Generators: Two 3-phase 60 cycle, 2300 volts, 150-250 K.V.A., belted A.C. Generator, with or without exciters and switchboards. Good condition. Give description, price and delivery. Wausau Street Railroad Company, Wausau, Wis.

FOR SALE— 7½ horsepower Century motor; 60-cycle, one-phase, 110 or 220 volts. Used three months. Best offer takes it. Address, Electrical Service Co., Crystal Lake, Ill.

FOR SALE— Electric light plant in growing Montana town. Address No. 2003, Electrical Review and Western Electrician, Chicago.

FOR SALE— 5,000 ft. Roebling's No. 18 new black silk lamp cord N. C. $16.00 M. Electric Purifying Water Co., East Liverpool, Ohio.

PROPOSALS

The rate for "Proposal" advertisements is fifteen cents per line, nonpareil measurement, payable in advance. Remittances and copy should reach this office not later than Monday, 12 o'clock noon, for the next succeeding issue.

TREASURY DEPARTMENT, Supervising Architect's Office, Washington, D. C., November 30, 1915.—Sealed proposals will be opened in this office at 3 p. m., December 29, 1915, for a conduit and wiring system, lighting fixtures, etc., in the United States courthouse and post office, Winona, Minn., in accordance with drawings and specifications, copies of which may be had at this office or at the office of the custodian, Winona, Minn., in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

ELECTRIC POWER CONDUCTORS
By Wm. A. Del Mar, Asso. Mem. A. I. E. E.
69 Illustrations 8 vo. Cloth. Price $2.00

This book is a technical treatise directed towards the solution of the economic problem of the choice of size, of style, of purchase, erection and maintenance of wires and cables for electric power transmission. CONTENTS: Materials and Gauges; Electrical Properties; Insulation and Insulated Conductors; Determination of Size for Given Voltage, Drop and Power Loss; Determination of Size for Given Stress in Spans; Specifications; Testing Wire and Cable; Installation; Depreciation and Deterioration; Third Rail Circuits; Rail Bonds; Tables of Inductances, Reactance and Capacity.

For Sale by ELECTRICAL REVIEW and WESTERN ELECTRICIAN
Western Headquarters for Electrical Books **608 So. Dearborn Street, Chicago, Illinois**

C. O. BAKER, Pres. C. W. BAKER, Vice-Pres.
PLATINUM
Wire, Sheet, Rivets and Contacts
All of Baker Standard Quality
Scrap purchased or exchanged
BAKER & CO., INC.
NEW YORK OFFICE, 30 Church St. Murray and Austin Sts., NEWARK, N. J.

GALES COMMUTATOR COMPOUND
50 Cents per Stick $5.00 per Dozen
FREE Sample Stick
You who are Troubled with Sparking and Cutting of Commutators by Use — The only article that will prevent sparking will keep the commutator in good condition and Prevent Cutting. Absolutely Will Not Gum the Brushes. It will pay you high gloss on the commutator you have so long sought after.
For Sale by All Supply Houses, or
K. McLennan & Co., Sole Mfrs., R. 306, Times Bldg., 182 N. 5th Av., Chicago.

Digitized by Google

ROTH MOTORS

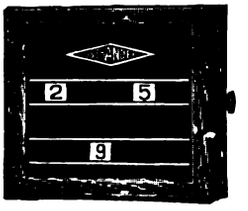
SATISFY THE CUSTOMER

is our slogan, as well as yours, Mr. Central Station Manager. If you recommend and sell ROTHMOTORS to your customers you will have satisfied current users.

Ask for Bulletins

ROTH BROS. & CO., 1404 W. Adams St., CHICAGO

OSTRANDER **ANNUNCIATORS**



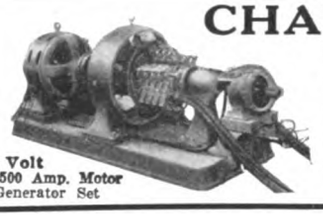
Are known for their quality.

They are built for those who want the best—with economy.

Write for Circular 29R

W. R. OSTRANDER & CO.
22 Dey Street New York

CHANDEYSSON

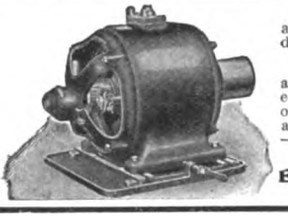


6 Volt 2500 Amp. Motor Generator Set

Dynamos and Motors

are guaranteed for two years against electrical and mechanical defects.
Write for illustrated catalog.

Pan Electric Mfg. Co.
St. Louis, Mo.

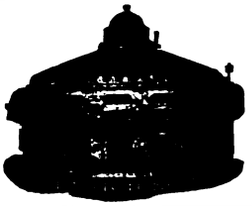


Glad to Take Up With You
any questions involving the use of the right dynamos in the right places.

Eck Dynamos
are conservatively rated, honestly constructed, fully guaranteed, have a 12 years' record of successful performance behind them, and may be had in 30 different frame types —.035 to 15 k. w.

Send for Bulletin No. 39.

Eck Dynamo and Motor Co.
Belleville, N. J.



ALTERNATORS
Vertical Type

67% Larger Income—Same Cost. For direct coupling to water-wheel shafts for Power and Lighting Service. 20 K.W. to 1,000 K.W.

Electric Machinery Company
Minneapolis - - Minn.

Crocker-Wheeler Company
MOTORS, GENERATORS, ETC.
Factory: AMPERE, N. J.

THE BABCOCK & WILCOX COMPANY, 85 Liberty St., NEW YORK
BABCOCK & WILCOX, STIRLING, RUST

WATER TUBE STEAM BOILERS

Steam Superheaters — WORKS: BAYONNE, N. J., BARBERTON, OHIO. — Mechanical Stokers

BRANCH OFFICES

BOSTON, 35 Federal Street
PHILADELPHIA, North American Building
PITTSBURGH, Farmers' Deposit Bank Bldg.
SAN FRANCISCO, Sheldon Building
NEW ORLEANS, Shubert Arcade
DENVER, 435 Seventeenth Street
SALT LAKE CITY, 313 Atlas Block
CHICAGO, Marquette Building
ATLANTA, GA., Candler Building
CLEVELAND, New England Building
CINCINNATI, O., Traction Building
SEATTLE, Mutual Life Building
HAVANA, CUBA, 116½ Calle de la Habana
LOS ANGELES, American Bank Building

AGENTS

Lewis & Roth Co
312 Denckla Bldg.
Philadelphia, Pa.

Electrical Engineering & Manufacturing Co.
Pittsburgh, Pa.

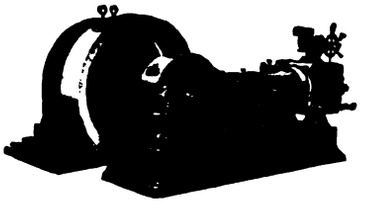
TRADE **MORGANITE BRUSHES** MARK

The Morgan Crucible Co. Ltd.
118 Liberty St., New York City
Factory-Brooklyn

FAMOUS FOR
UNIFORMITY
HOMOGENEITY
RELIABILITY
LONGEVITY
EFFICIENCY

Card Index of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Vol. 67, No. 25.

Steam-Electric Power Plant of Alaska Mine.....1097
Lower Rates at Fall River.....1101
New Rate Schedule Adopted by New Orleans Company..1102
New York Edison Company Adopts New School Course in Electric Appliances.....1102
Indianapolis Bank Adopts Flood Lighting.....1104
Notes on Interior Wiring.—By Terrell Croft.....1105
The Installation and Working of Storage Batteries.—By R. Rankin 1107
Reasons for Electrical Progress.....1110
Additional Prosperity Week Returns.....1111
Electric-Motor Control.....1111
Electrical Accidents; British Government Inspector's Report 1112
School Lighting Discussed by Chicago Illuminating Engineers 1114
National Independent Telephone Association and Independent Telephone Association of America Merge....1120
Electrical Credit Men Hold Annual Convention in Chicago 1121
A System of Keeping Records of Current Work in Electrical Inspection Department.—By Washington Devereux 1122



Ridgway Engines and Generators

are above all things RELIABLE.
Is there a much better quality to be asked of man, beast or machine?
You want your power when you want it and you will find RIDGWAY apparatus is always ready to serve.
Just drop us a card asking for our Bulletin collection X and then tell us what kind of an outfit you want.

Ridgway Dynamo & Engine Company
Ridgway, Pa.

Digitized by Google

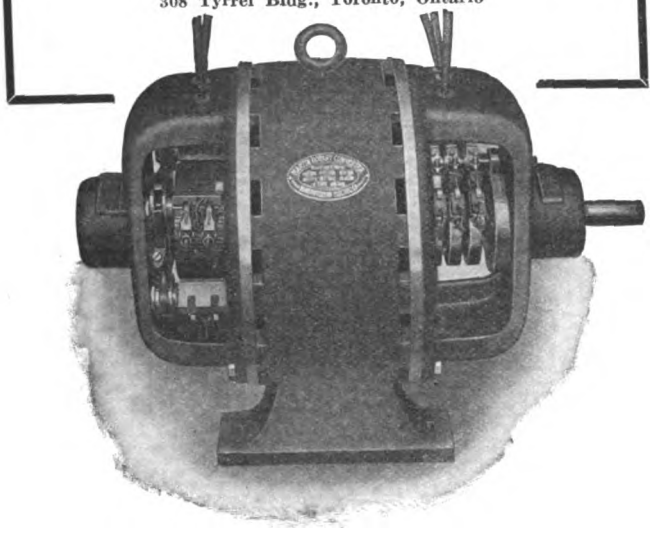
A Tireless Current Salesman

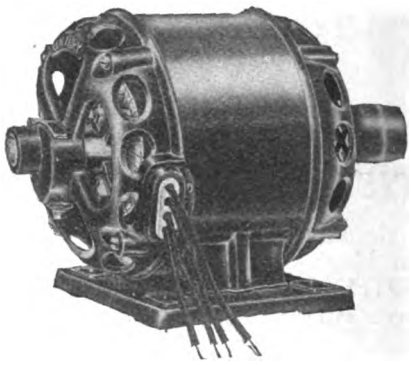
"MARTIN"
ROTARY CONVERTER

Charges storage batteries under the constant potential method. Gives the clear, steady, white light required for moving picture projection. Used in industrial plants for electric hoist operation, lifting magnets and for electro-magnetic tools.

Write for full details.

NORTHWESTERN ELECTRIC CO.
613-617 W. Adams St. CHICAGO
401 Broome St. NEW YORK
216 Bishop St., Montreal, Quebec
308 Tyrrel Bldg., Toronto, Ontario





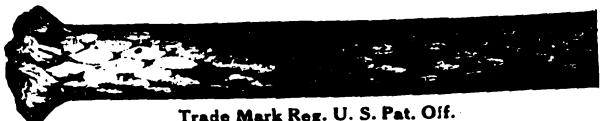
The High Starting Torque
—more than 3 times full load torque—
The Low Starting Current
—less than 3 times full load current—
The Quick Acceleration
—three to ten seconds under load—

of Century
Fractional Horse Power
SINGLE PHASE MOTORS
makes them particularly desirable for installation on lighting circuits especially where the equipment is required to start frequently.

THEY KEEP-A-RUNNING

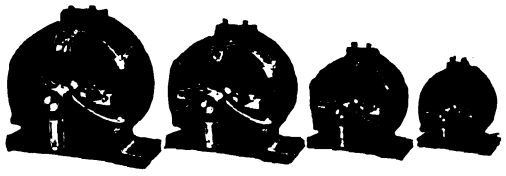
Century Electric Company
19th, Pine to Olive Streets
St. Louis, Mo., U. S. A.
New York Office: **30 Church St.**
194

PATENTS! PATENTS!
Save money and time by sending your matters to me.
TRADEMARKS DESIGNS COPYRIGHTS
E. S. DUVALL
LOAN AND TRUST BUILDING
WASHINGTON, D. C.



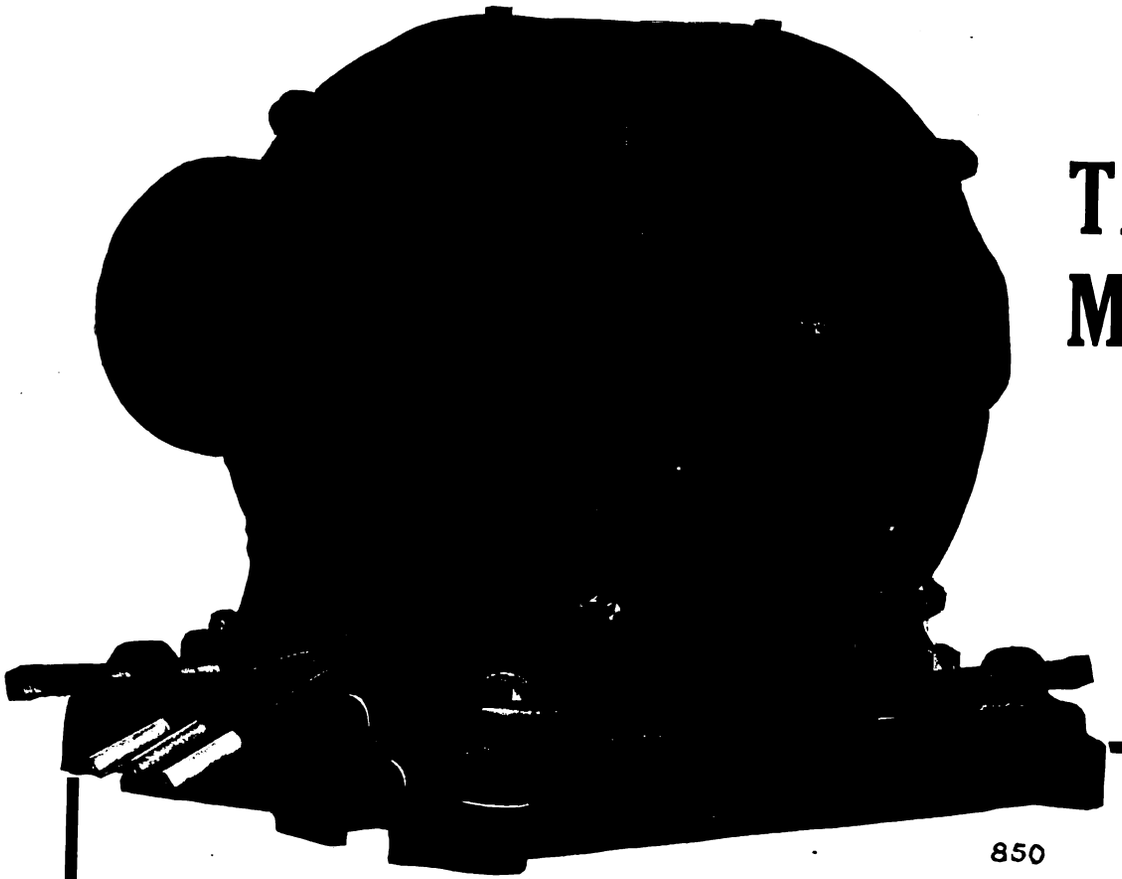
Trade Mark Reg. U. S. Pat. Off.
SAMSON SPOT WATERPROOFED CORD FOR TROLLEYS AND ARC LAMPS
Send for Samples **SAMSON CORDAGE WORKS, Boston, Mass.**

THE PEERLESS LINE
MOTORS—¼ to 35 H. P.
Peerless Motors and generators for all classes of electrical work. Write for bulletins.
THE PEERLESS ELECTRIC CO., WARREN, OHIO
Chicago Sales Agents: The Electrical Machinery Sales Co., 1536 Monadnock Block



READY NOW!
Electrical Review and Western Electrician's
Street Lighting Schedules for 1916
All-Night and Moonlight Systems
Ten Cents Per Copy
ELECTRICAL REVIEW AND WESTERN ELECTRICIAN
Western Headquarters for Electrical Books 608 South Dearborn St., Chicago, Ill.

Digitized by Google



"NO TROUBLE MOTORS"

A. C.
D. C.

C-W MOTORS ARE:

ECONOMICAL IN MAINTENANCE

RELIABLE UNDER THE MOST TRYING CONDITIONS

DURABLE WITHOUT A TIME LIMIT

Such Motors Are in Stock Ready for Immediate Shipments. Write, Wire or Phone

Crocker-Wheeler Company

Ampere, N. J.

Boston, Mass.	New Haven, Conn.	Baltimore, Md.	Newark, N. J.	Cleveland, Ohio
Syracuse, N. Y.	New York, N. Y.	Denver, Colo.	Philadelphia, Pa.	Chicago, Ill.
Birmingham, Ala.	San Francisco, Cal.		Pittsburgh, Pa.	Detroit, Mich.

Electric Motors, Generators and Transformers

Digitized by Google

WHERE shall we get the Proper Motor?

¶ The users of our device won't blame the motor if it balks—they will condemn the whole machine. It is absolutely essential to have a motor as good as our device and in every way fitted to it."

Don't take Chances—Solve your Power Problems by using

Fort Wayne Fractional Horse Power Motors

¶ We probably make the most complete line of standard motors in the country, and one of these standard motors can, without doubt, be adapted to your device.

¶ However, if you require something special, be it in weight, size, shape, torque, overload capacity, or what not, our Engineering Department is at your service. They are constantly working out power problems that others have said were impossible.

¶ Don't get discouraged until you have given us a chance to help you.

¶ Send for our Bulletin No. 1146 and learn what we are doing for the majority of the leading manufacturers of domestic and industrial power driven devices.

FORT WAYNE ELECTRIC WORKS

OF GENERAL ELECTRIC COMPANY

"Wood" Systems

1610 BROADWAY FORT WAYNE, IND.

Digitized by Google

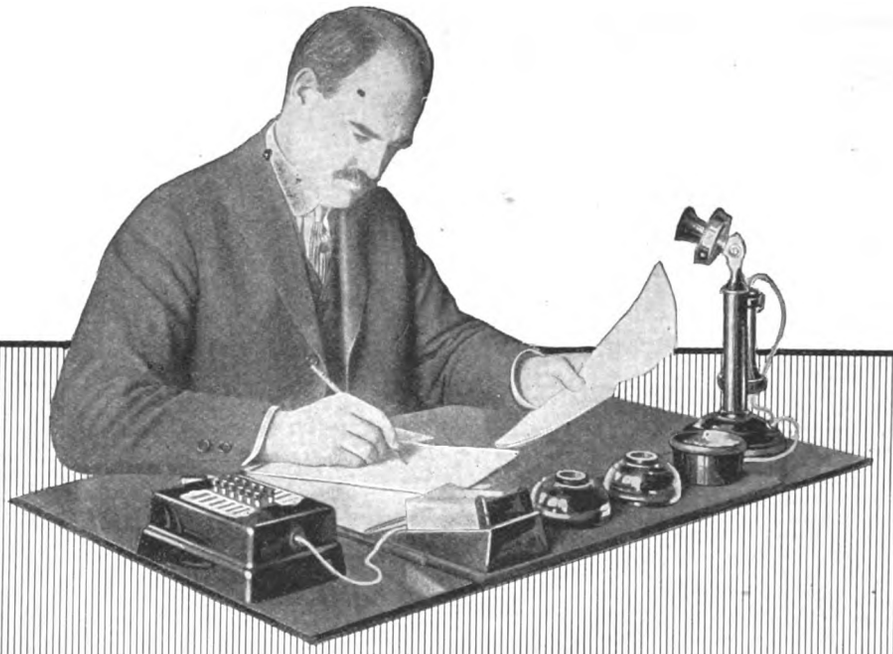


Figure out for yourself how much time, and incidentally how much money, a system of

Western Electric Inter-phones

will save by making it unnecessary for your subordinates to go back and forth from their desks whenever you or they require information.

These practical time and step saving intercommunicating telephones require no operator except the user—and there is a system to meet every requirement of service.

Write for our descriptive booklet—"When Minutes Mean Money."

SAVE TIME AND FREIGHT — DYNAMOS-MOTORS — WESTERN ELECTRIC COMPANY — CABLE-TELEPHONES-SUPPLIES — TELEPHONE OUR NEAREST HOUSE

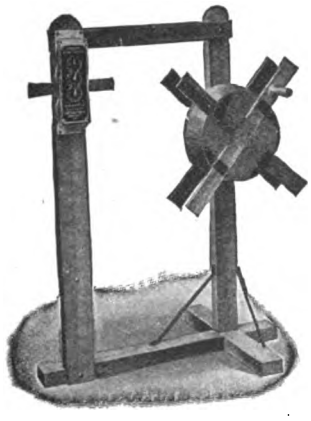
Western Electric Company

New York	Atlanta	Chicago	Kansas City	San Francisco
Buffalo	Richmond	Milwaukee	Omaha	Oakland
Newark	Savannah	Indianapolis	Oklahoma City	Los Angeles
Philadelphia	New Orleans	Detroit	Minneapolis	Seattle
Boston	Houston	Cleveland	St. Paul	Portland
Pittsburgh	St. Louis	Cincinnati	Dallas Denver	Salt Lake City

EQUIPMENT FOR EVERY ELECTRICAL NEED

SAVE TIME AND FREIGHT — DYNAMOS-MOTORS — WESTERN ELECTRIC COMPANY — CABLE-TELEPHONES-SUPPLIES — TELEPHONE OUR NEAREST HOUSE

Digitized by Google



Wire Measuring Machine

A Great Convenience and Time Saver.

Reels Wire Into a Neat Coil and Shows Number of Feet.

Made by

Minneapolis Electric and Construction Co.

Minneapolis, Minn.

DULUTH LOG COMPANY **POLE SERVICE** DULUTH MINNESOTA

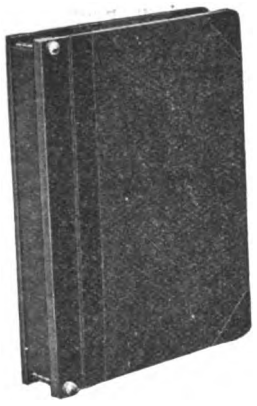
The Brady Mast Arms

THE BRADY ELECTRIC MFG. CO., NEW BRITAIN, CONN., U. S. A.

Manufacturer of

MAST ARMS, POLE and SWITCHING HOODS, HOUSE BRACKETS and other specialties for construction work

Catalogue and Prices Furnished on Application



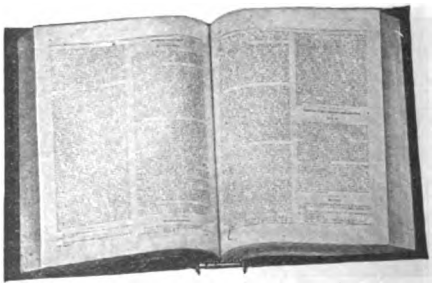
A few pages of Available Information are worth more than volumes of data you can't locate

Keep your copies of the

Electrical Review & Western Electrician

in a Dowst Magazine Binder and you will have a library of electrical information where you can refer to it at all times.

This binder has no springs, catches, strings, clamps, laces or locks, and does not mutilate the periodicals. It is simple, practical and durable, and will bind one issue, a dozen issues, or more, always making a neat book.



Price, complete with twenty-six binding rods, ten sectional posts and name of publication stamped in gold on front cover **$1.50**

Send for Illustrated Descriptive Pamphlet

Electrical Review & Western Electrician

608 South Dearborn Street, Chicago, Illinois

Digitized by Google

"GOOD POLES QUICK"

Western Red Cedar Poles out of our new

MINNEAPOLIS YARD

Supplied by 40 outside yards—two large up-to-date treating plants. We operate at Nakusp, B. C., the only treating plant in Canada.

THE LINDSLEY BROTHERS CO.

General Sales Office, McKnight Bldg., Minneapolis

General Office, Spokane, Wash. Southwestern Sales Office, St. Louis, Mo.

Hendrie & Bolthoff Mfg. & Supply Co., Denver
Electrical Engineering & Mfg. Co., Pittsburgh, Pa.
Construction Supply Co., Toronto
Lewis & Roth Co., Philadelphia
Wendell & Mac Duffie Co., New York City
Verne W. Shear & Co., Akron
Frank E. Filer, Winnipeg
John K. Bovard, Indianapolis, Ind.

CRAWFORD CEDAR CO.

MENOMINEE, MICH.

Northern Michigan White Cedar, Western Red Cedar
Woods Run POLES Butt Treated
Butts—Plain or Treated Quick Shipments

W. C. STERLING & SON CO.

POLES OF STERLING QUALITY

Oldest Cedar Pole Firm in Business Producers for 35 Years

MICHIGAN and WESTERN CEDAR

W. C. STERLING & SON COMPANY

1880 MONROE, MICHIGAN 1915

THE VALENTINE-CLARK CO.

CEDAR POLES Butt Treating Open Tank Process

MINNEAPOLIS, MINN.

Toledo Chicago St. Maries, Idaho

CEDAR POLES

Write for Prices. Prompt Shipments from Wisconsin or Chicago Switching District Yard on I. H. Belt R. R.

TORREY CEDAR CO., Clintonville, Wis.

CEDAR POLES

Wire or write for delivered prices

National Pole Co. Escanaba Mich.

NAUGLE POLE & TIE CO.

2307 S. MORGAN ST. CHICAGO ILL.

The Trinity in Poles "Service" "Price" "Quality"

POLES

POLES

NORTHERN WHITE CEDAR WESTERN RED CEDAR

BUTT TREATING

PAGE & HILL CO.

MINNEAPOLIS, MINN.

NORTHERN-WESTERN CEDAR POLES

A FULL ASSORTMENT OF SIZES
PROMPT SHIPMENTS ASSURED

T. M. PARTRIDGE LUMBER COMPANY

Lumber Exchange MINNEAPOLIS

We Ship Promptly

IDAHO CEDAR POLES

Sound in Quality, Right in Price

Let Us Quote

Sandpoint Lumber & Pole Co., Ltd.

Sandpoint, Idaho

JOHN H. FOWLER CO.

Estab. 1900.

FISHER BLDG. CHICAGO **CEDAR POLES** MAIN YARD CHICAGO

Digitized by Google

CLASSIFIED INDEX OF ADVERTISERS

ADAPTERS, Lamp.
Benjamin Electric Mfg. Co.
Faries Mfg. Co.
General Electric Co.
Harvey Hubbell, Inc.
ADJUSTERS, Cord and Lamp.
McGill Mfg. Co.
Trumbull Electric Mfg. Co.
AIR COMPRESSORS, Meter Driven.
Allis - Chalmers Manufacturing Co.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
ALTERNATORS.
Allis - Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
Fort Wayne Electric Works.
General Electric Co.
Ridgway Dynamo & Engine Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
AMMETERS AND VOLTMETERS.
Bristol Company.
General Electric Co.
Metropolitan Engineering Co.
Roller-Smith Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
Weston Electrical Instrument Co.
ANCHORS, Guy.
Central Electric Co.
Johns-Manville Co., H. W.
Klein & Sons, Mathias.
Ohio Brass Co.
Oshkosh Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
ANNUNCIATORS.
Central Electric Co.
Manhattan Electrical Supply Co.
Ostrander & Co., W. R.
Stanley & Patterson.
Western Electric Co.
ASBESTOS.
General Bakelite Co.
Johns-Manville Co., H. W.
ATTACHMENT PLUGS.
Benjamin Electric Mfg. Co.
Central Electric Co.
Cutler-Hammer Mfg. Co.
Faries Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
Hart Mfg. Co.
Harvey Hubbell, Inc.
Manhattan Electrical Supply Co.
Pass & Seymour, Inc.
Simplex Electric Heating Co.
Trumbull Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.
Wirt Co.
ATTACHMENTS, OUTLET BOX.
Frorup & Co., L. E.
AUTO STARTERS (For Starting A. C. Motors).
Allis - Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
Western Electric Co.
AUTOMOBILES, Electric.
General Motors Truck Co.
General Vehicle Co.
AUTOMOBILE LIGHTING SYSTEMS.
General Electric Co.
Wagner Elec. Mfg. Co.
Ward-Leonard Electric Co.
Westinghouse Electric & Mfg. Co.
BANDS, PIPE.
American Bridge Co.
BASES AND SUB-BASES, Snap Switch.
Pass & Seymour, Inc.
BATTERIES, Dry.
Central Electric Co.
Fairbanks, Morse & Co.
Manhattan Electrical Supply Co.
Nungesser Carbon & Battery Co.
Stackpole Carbon Co.
Stanley & Patterson.
Usona Mfg. Co., Inc.
Western Electric Co.
BATTERIES, Medical.
Manhattan Electrical Supply Co.
Ostrander & Co., W. R.
Stanley & Patterson.
BATTERIES, Storage.
Edison Storage Battery Co.
Electric Storage Battery Co.
Fairbanks, Morse & Co.
Gould Storage Battery Co.
Mentzer & Co., J. P.
BATTERIES, Wet.
Central Electric Co.
Manhattan Electrical Supply Co.
BATTERY CONNECTORS.
Belden Mfg. Co.
BATTERY HOLDERS.
Stanley & Patterson.
BEARINGS.
Hyatt Roller Bearing Co.
BELL RINGING MOTORS.
Manhattan Electrical Supply Co.
Ostrander & Co., W. R.
BELLS, Electric.
Central Electric Co.
Manhattan Electrical Supply Co.
Schwarze Electric Co.
Stanley & Patterson.
Western Electric Co.
BELT DRESSINGS.
Dixon Crucible Co., Joseph.
BELT FASTENERS.
Bristol Co.
Flexible Steel Lacing Co.
BENDERS, Conduit and Pipe.
Thomas & Betts Co.
Western Electric Co.
BINDING POSTS.
Bridgeport Brass Co.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Western Electric Co.
BLOCKS, Meter Testing.
Hart Mfg. Co.
Metropolitan Engineering Co.
BLOWERS AND EXHAUSTERS.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Sprague Electric Co.
BLOWERS, Organ.
Crocker-Wheeler Co.
Emerson Electric Mfg. Co.
BOILERS, Steam.
Babcock & Wilcox Co.
Fairbanks, Morse & Co.
BOLTS, EXPANSION.
Hubbard & Co.
BONDS, SHARES AND SECURITIES.
British American Co.
Electric Bond & Share Co.
BOOKS, Technical.
Electrical Review Pub. Co.
Van Nostrand Co., D.
BOOSTERS.
Allis - Chalmers Manufacturing Co.
Crocker-Wheeler Co.
General Electric Co.
Ridgway Dynamo & Engine Co.
Westinghouse Electric & Mfg. Co.
BOXES, Conduit.
Adapti Mfg. Co.
Benjamin Electric Mfg. Co.
Bissell Co., F.
Central Electric Co.
Chelten Electric Co.
Chicago Fuse Mfg. Co.
Columbia Metal Box Co.
Cutter Co.
Cutter Co., George.
Federal Sign System (Electric).
Hart Mfg. Co.
Metropolitan Engineering Co.
Ostrander & Co., W. R.
Pass & Seymour, Inc.
Sprague Electric Works.
Thomas & Betts Co.
BOXES, Floor.
Central Electric Co.
Electrical Engineers Equipment Co.
General Devices & Fittings Co.
General Electric Co.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Thomas & Betts Co.
BOXES, Manhole.
Columbia Metal Box Co.
D & W Fuse Co.
General Electric Co.
Johns-Manville Co., H. W.
Metropolitan Engineering Co.
Standard Underground Cable Co.
BOXES, Service, Sheet Steel and Cast Iron Entrance Boxes and Panelboard Cabinets.
Adapti Mfg. Co.
Bissell Co., F.
Brady, T. H.
C. & P. Electric Works.
Columbia Metal Box Co.
Cutter Co., George.
D & W Fuse Co.
Delta-Star Electric Co.
Federal Sign System (Electric).
General Electric Co.
Johns-Manville Co., H. W.
Metropolitan Engineering Co.
Palmer Elec. & Mfg. Co.
Standard Underground Cable Co.
Trio Mfg. Co.
Trumbull Electric Mfg. Co.
Trumbull-Vanderpoel Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
BRACES, Cross Arm.
Bissell Co., F.
Hubbard & Co.
BRACKETS, ARMS AND PINS. (Iron).
Anderson Mfg. Co., Albert & J. M.
Brady Electric Mfg. Co.
Cutter Co., George.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
Faries Mfg. Co.
General Devices & Fittings Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
BRACKETS, Pothead.
Bissel Co., F.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
BRAKES, Dynamo.
Cutler-Hammer Mfg. Co.
BRAKES, Electric.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Sundh Electric Co.
Western Electric Co.
BRAKES, Meter.
Electric Controller & Mfg. Co.
Westinghouse Electric & Mfg. Co.
BRASS AND COPPER.
Bridgeport Brass Co.
BRIDGES.
American Bridge Co.
BRIDGES, RAILROAD AND HIGHWAY.
American Bridge Co.
BRIDGES AND TOWERS, COAL HANDLING.
American Bridge Co.
BRUSHES, Carbon and Graphite.
Calebaugh Self-Lubricating Carbon Co.
Central Electric Co.
Dixon Crucible Co., Joseph.
General Electric Co.
Morgan Crucible Co., Ltd.
Nungesser Carbon & Battery Co.
Stackpole Carbon Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
BRUSHES, Metallic.
Cutler-Hammer Mfg. Co.
General Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
BUFFERS, Motor Driven.
Fairbanks, Morse & Co.
Westinghouse Electric & Mfg. Co.
BUILDINGS, OFFICE AND MILL.
American Bridge Co.
BUNKERS AND HOPPERS.
American Bridge Co.
BURGLAR ALARMS.
Manhattan Electrical Supply Co.
Ostrander & Co., W. R.
Stanley & Patterson.
BUS BAR SUPPORTS.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
BUSHINGS AND LOCKNUTS. (For Conduit.)
Anderson Mfg. Co., Albert & J. M.
Faries Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
Sprague Electric Works.
Thomas & Betts Co.
BUSHINGS, Porcelain Clamping.
Federal Sign System (Electric).
General Electric Co.
Locke, Fred M.
Multi Refillable Fuse Co.
Pass & Seymour, Inc.
BUSHINGS, Socket.
Dickinson Mfg. Co.
Hemming Mfg. Co.
Walpole Tire & Rubber Co.
Western Electric Co.
CABLES.
American Electrical Works.
American Steel & Wire Co.
American Insulated Wire & Cable Co.
Atlantic Insulated Wire & Cable Co.
Belden Mfg. Co.
Brixey, W. R.
Central Electric Co.
Electric Cable Co.
General Electric Co.
Habirshaw Wire Co.
Hazard Mfg. Co.
Kerite Insulated Wire & Cable Co.
Moore, Alfred F.
National Conduit & Cable Co.
Okonite Co., The.
Packard Electric Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Co.
CABLE BELLS.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
CABLE HANGERS.
Anderson Mfg. Co., Albert & F. M.
Bissell Co., F.
Hubbard & Co.
Metropolitan Engineering Co.
Minerallac Electric Co.
Standard Underground Cable Co.
Western Electric Co.
CABLE RACKS.
Cope Estate, T. J.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
General Electric Co.
Metropolitan Engineering Co.
Standard Underground Cable Co.
CABLE TERMINALS.
Standard Underground Cable Co.
CABLE TESTERS.
Metropolitan Engineering Co.
Minerallac Electric Co.
Roller-Smith Co.
Standard Underground Cable Co.
CABLES, Armored. (Flexible.)
Sprague Electric Works.
Standard Underground Cable Co.
Western Conduit Co.
CABLING MACHINES.
New England Butt Co.
CALIBRATORS, Meter.
Fort Wayne Electric Works.
General Electric Co.
Roller-Smith Co.
CANOPY INSULATORS.
Faries Mfg. Co.
General Electric Co.
Mica Insulator Co.
CARBONS, Arc Light.
Central Electric Co.
Frorup & Co., L. E.
General Electric Co.
Reisinger, Hugo.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
CARBONS, Battery.
Manhattan Electrical Supply Co.
Stackpole Carbon Co.
CAR HEATING, Electric.
Johns-Manville Co., H. W.
Simplex Electric Heating Co.
Western Electric Co.
CAR LIGHTING SYSTEMS.
Gould Storage Battery Co.
CARS, DERRICK.
American Bridge Co.
CASTINGS.
Anderson Mfg. Co., Albert & J. M.
Faries Mfg. Co.
Metal Specialties Mfg. Co.
New England Butt Co.
CEMENT MACHINERY.
Allis - Chalmers Manufacturing Co.
CHAINS, Power Transmission.
Morse Chain Co.
CHAINS, "Silent Driving."
Morse Chain Co.
CHAINS, Twin Roller, Bicycle.
Morse Chain Co.
CHANDELIERS.
Beardslee Chandelier Mfg. Co.
Central Electric Co.
Faries Mfg. Co.
CHANGERS, Inc. Lamp.
McGill Mfg. Co.
CHARGING OUTFITS.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
CHOKE COILS.
Anderson Mfg. Co., Albert & J. M.
Delta-Star Electric Co.
General Electric Co.
Metropolitan Engineering Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.
CIGAR LIGHTERS.
General Electric Co.
Metal Specialties Mfg. Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
CIRCUIT BREAKERS, Automatic.
Cutler-Hammer Mfg. Co.
Cutter Co.
Electric Controller & Mfg. Co.
Fort Wayne Electric Works.
General Electric Co.
Roller-Smith Co.
Sundh Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
CLAMPS, Cable Supporting.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
CLAMPS, FLEXIBLE TUBING.
Delta-Star Electric Co.
CLAMPS, Insulator.
Electrical Engineers Equipment Co.
General Devices & Fittings Co.
States Co.
CLEATS, Fibre.
Blake Signal & Mfg. Co.
General Electric Co.
CLEATS, Insulating.
Hemming Mfg. Co.
Minerallac Electric Co.
CLIMBERS, Linemen's.
Klein & Sons, Mathias.
Oshkosh Mfg. Co.
Western Electric Co.
CLOTH, Insulating.
Mica Insulator Co.
Packard Electric Co.
Walpole Tire & Rubber Co.
CLUSTERS.
Benjamin Electric Mfg. Co.
Central Electric Co.
Delta-Star Electric Co.
Faries Mfg. Co.
McGill Mfg. Co.
Western Electric Co.
COAL MINING MACHINERY.
Allis - Chalmers Manufacturing Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.
COILS.
Acme Wire Co.
American Electrical Works.
Belden Mfg. Co.
Crocker-Wheeler Co.
D & W Fuse Co.
General Electric Co.

Digitized by Google

CLASSIFIED INDEX—Continued

Manhattan Electrical Supply Co.
Ostrander & Co., W. R.
Stanley & Patterson.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

COMMUTATOR LUBRICANTS.
Dixon Crucible Co., Joseph.
McGill Mfg. Co.
McLennan & Co., K.

COMPOUNDS, Boiler Cleansing.
Dearborn Chemical Co.
Johns-Manville Co., H. W.

CONDENSERS, Electric.
Leeds & Northup Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CONDENSERS, Steam.
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
Westinghouse Machine Co.

CONDUIT RODS.
Bissell Co., F.
Cope Estate, T. J.
Standard Underground Cable Co.
Western Electric Co.

CONDUIT, Interior.
Alphaduct Co.
American Circular Loom Co.
Central Electric Co.
Clifton Mfg. Co.
Enameled Metals Co.
National Metal Molding Co.
Tubular Woven Fabric Co.
Western Conduit Co.
Western Electric Co.

CONDUIT, Underground, Clay, Composition, Fibre, Wood.
American Conduit Co.
Camp Co., H. B.
Fibre Conduit Co.
Johns-Manville Co., H. W.
McRoy Clay Works.

CONDUIT ENGINEERS & CONTRACTORS.
Gest, G. M.
Graner-Mahoney Contracting Co.
Standard Underground Cable Co.
Turner Improvement Co., J. W.
Westinghouse Electric & Mfg.

CONDUIT FITTINGS.
Killark Electric Mfg. Co.

CONDUIT THREADERS.
Delta-Star Electric Co.

CONNECTORS.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
Fargo Mfg. Co., Inc.
General Devices & Fittings Co.
Metropolitan Engineering Co.
Ohio Brass Co.
Stackpole Carbon Co.

CONSTRUCTION, Engineering.
Arnold Co.
Byllesby & Co., H. M.
Electrical Engineers' Equipment Co.
New England Engineering Co.
Stone & Webster Eng. Corp.
White Companies, J. G.

CONTROLLERS, Printing Press.
Allis - Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

CONVERTERS, ROTARY.
Fairbanks, Morse & Co.
General Electric Co.
Northwestern Electric Co.

COOKING DEVICES, Electric.
Cutler-Hammer Mfg. Co.
Federal Sign System (Electric)
General Electric Co.
Globe Stove & Range Co.
Hughes Electric Heating Co.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

COPPERS, Battery.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Western Electric Co.

CORD, Braided.
Samson Cordage Works.

COUNTING MACHINES.
National Scale Co.

CRANES AND HOISTS.
Allis - Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
Sprague Electric Works.

CRANE MOTORS.
Crocker-Wheeler Co.
Ft. Wayne Electric Works.
General Electric Co.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CROSS ARMS (Wood).
American Bridge Co.
Bissell Co., F.
Humbird Lumber Co.
Lindsley Brothers Co.
Southern Exchange Co.

CURLING IRONS, Electric.
Central Elec. Co.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Westinghouse Electric & Mfg. Co.

CUT-OUTS, Enclosed Fuse, Plug, Combination Rosette, Cut-Out Bases.
C. & J. Electric Works.
Central Electric Co.
Chicago Fuse Mfg. Co.
Commonwealth Edison Co.
D & W Fuse Co.
Detroit Fuse & Mfg. Co.
General Electric Co.
Hart Mfg. Co.
Johns-Manville Co., H. W.
Manhattan Electrical Supply Co.
Multi Refillable Fuse Co.
Paiste Co., H. T.
Pass & Seymour, Inc.
Trio Mfg. Co.
Trumbull Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

CUT-OUTS, Arc Light.
Brady Electric Mfg. Co.
Cutter Co., George.
Ft. Wayne Electric Works.
General Electric Co.
Metropolitan Engineering Co.

CUT-OUTS, Transformer.
Central Electric Co.
D & W Fuse Co.
Delta-Star Electric Co.
General Electric Co.
Metropolitan Engineering Co.
Pass & Seymour, Inc.
Schweitzer & Conrad, Inc.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

CUTTERS, PIPE.
Borden Company, The.

DAMS, MOVABLE.
American Bridge Co.

DECORATIVE LIGHTING.
Central Electric Co.
General Electric Co.
Manhattan Electrical Supply Co.

DERRICKS.
American Bridge Co.

DIE STOCKS.
Borden Co., The.

DIRECT MOTOR DRIVES.
Crocker-Wheeler Co.
Electric Controller & Mfg. Co.
Fairbanks, Morse & Co.
General Electric Co.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

DOOR SWITCHES.
Cutler-Hammer Mfg. Co.
Cutter Co.
Hart Mfg. Co.

DRILLS AND BITS, Electricians'.
Morse Twist Drill & Machine Co.
Hubbard & Co.
Orr & Lockett Hardware Co.

DRINK MIXERS, Motor Driven.
Hamilton-Beach Mfg. Co.
Lindstrom, Smith Co.

DRIVES, Silent Chain.
Morse Chain Co.

ELECTRIC VEHICLES.
General Vehicle Co.

ELECTRO - PLATING MACHINERY.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
Ft. Wayne Electric Works.
General Electric Co.
Sprague Electric Works.
Westinghouse Electric & Mfg. Co.

ELEVATING TRUCKS.
National Scale Co.

ENGINEERS & CONTRACTORS.
American Bridge Co.
Arnold Co.
Badt-Westburg Electric Co.
Byllesby & Co., H. M.
Dixon-Smith Engineering Co.
Electrical Engineers' Equipment Co.
Jackson, D. C. & W. B.
Lyndon, Lamar.
McMeen & Miller.
New England Engineering Co.
Norton & Bird.
Pillsbury, Chas. A.
Sargent & Lundy.
Schott Co., W. H.
Stone & Webster Engineering Corporation.
Turner Improvement Co., J. W.
Western Electric Co.
White Companies, J. G.
Woodmansee & Davidson, Inc.

ENGINES, Gas and Gasoline.
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
Westinghouse Machine Co.

ENGINES, Oil.
Fairbanks, Morse & Co.
Venn-Severn Machine Co.

ENGINES, Steam.
Co.
Allis - Chalmers Manufacturing
Ridgway Dynamo & Engine Co.
Westinghouse Machine Co.

EXTINGUISHERS, Fire.
Electric Operations Co., Inc.
Johns-Manville Co., H. W.
Pyrene Mfg. Co.

FANS, Motor and Disc.
Central Electric Co.
Century Electric Co.
Crocker-Wheeler Co.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
Fort Wayne Electric Works.
General Electric Co.
Hamilton-Beach Mfg. Co.
Hunter Fan & Motor Co.
Manhattan Electrical Supply Co.
Peerless Electric Co.
Robbins & Myers Co.
Sprague Electric Works.
Wagner Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FAULT FINDERS, Electric.
Electric Controller & Mfg. Co.

FIBRE.
Diamond State Fibre Co.

FIRE ALARMS.
The Palmer Electric & Manufacturing Co.

FIREPLACES, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

FITTINGS, Conduit Terminals, Bushings, Entrance Caps.
Killark Electric Mfg. Co.
National Metal Molding Co.
Sprague Electric Works.

FIXTURES, Electric and Gas.
Beardslee Chandelier Mfg. Co.
Benjamin Electric Co.
Central Electric Co.
Delta-Star Electric Co.
Edwards Lighting Fixture Co.
Electric Operations Co., Inc.
Faries Mfg. Co.
Federal Sign System (Electric).
Western Electric Co.
White Co., T. C.

FIXTURES, Indirect Lighting.
Central Electric Co.
Federal Sign System (Electric).
General Electric Co.
Johns-Manville Co., H. W.

FIXTURES, Show Case.
Benjamin Electric Mfg. Co.
Central Electric Co.
Johns-Manville Co., H. W.

FLASHERS, Sign.
Bissell Co., F.
Campbell Electric Co.

FLASHLIGHTS.
Delta Electric Co.
Kruschke, R. C.
Lincoln Electric Works.
Merchant Engineers Corporation.
Metal Specialties Mfg. Co.
Niagara Searchlight Co.
Usona Mfg. Co.

FLAT IRONS, Electric.
Central Electric Co.
Cutler-Hammer Mfg. Co.
General Electric Co.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FLUXES, Soldering.
Allen Co., Inc., L. B.
Blake Signal & Mfg. Co.
Burnley Battery & Mfg. Co.
Chicago Fuse Mfg. Co.
Johns-Manville Co., H. W.
McGill Mfg. Co.
Manhattan Electrical Supply Co.
Western Electric Co.

FORGINGS.
American Bridge Co.

FUSE PLUGS.
Andersen Mfg. Co., Albert & J. M.
D & W Fuse Co.
Daum Co., A. F.
General Electric Co.
Johns-Manville Co., H. W.
Stanley & Patterson.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

FUSE WIRE.
General Electric Co.
Western Electric Co.

FUSES.
Central Electric Co.
Chicago Fuse Mfg. Co.
D & W Fuse Co.
Daum, A. F., Co.
Delta-Star Electric Co.
Detroit Fuse & Mfg. Co.
Economy Fuse & Mfg. Co.
General Electric Co.
Johns-Manville Co., H. W.
Metropolitan Engineering Co.
Multi Refillable Fuse Co.
Schweitzer & Conrad, Inc.
Trio Mfg. Co.
Westinghouse Electric & Mfg. Co.

GATES, HEAD.
American Bridge Co.

GEARS, Rawhide and Composition.
Diamond State Fibre Co.
General Electric Co.
Morse Chain Co.
New Process Gear Corp.

GENERATORS.
Allis - Chalmers Manufacturing Co.
Crocker-Wheeler Co.
Eck Dynamo & Motor Co.
Fairbanks, Morse & Co.
Fort Wayne Electric Works.
General Electric Co.
Ridgway Dynamo & Engine Co.
Triumph Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.

GLASSWARE, Illuminating.
Central Electric Co.
Holophane Works of General Elec. Co.
Pittsburgh Reflector & Illuminating Co.
Western Electric Co.

GLOBES, Arc Light. (Outer and Inner.)
General Electric Co.
Holophane Works of General Elec. Co.
Phoenix Glass Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

GRAPHITE.
Dixon Crucible Co., Joseph.

GRINDERS.
Hamilton-Beach Mfg. Co.
Wisconsin Electric Co.

GROUND CLAMPS.
Blackburn Specialty Co.
Federal Sign System (Electric).
General Electric Co.
Hart Mfg. Co.
Hubbard & Co.
Sprague Electric Works.
Thomas & Betts Co.
Western Electric Co.

GROUNDING DEVICES.
Blackburn Specialty Co.
Federal Sign System (Electric).

GUARDS, Inc. Lamp.
Benjamin Electric Mfg. Co.
Flexible Steel Lacing Co.
Hubbell, Inc., Harvey.
Johns-Manville Co., H. W.
McGill Mfg. Co.

GUY CLAMPS.
American Steel & Wire Co.
Hubbard & Co.

HAIR DRYERS, Electric.
Central Telephone & Elec. Co.
Hamilton-Beach Mfg. Co.
Lindstrom, Smith Co.
Shelton Electric Co.

HANGERS, Conduit and Moulding.
Mineralac Electric Co.
Western Electric Co.

HANGERS AND CLAMPS.
Bissell Co., F.
Mineralac Electric Co.
Ohio Brass Co.
Ostrander & Co., W. R.
Pass & Seymour, Inc.
Sprague Electric Co.
Standard Underground Cable Co.
Thomas & Betts Co.
White Co., T. C.

HEATERS, Electric.
Cutler-Hammer Mfg. Co.
General Electric Co.
Johns-Manville Co., H. W.
Simplex Electric Heating Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

HEATING SYSTEMS, Exhaust Steam.
American District Steam Co.

HOISTING MACHINERY, Electric Mine.
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
General Electric Co.

HOUSES, Pole or Pilot.
Bissell Co., F.

HYDRAULIC MACHINERY.
Allis - Chalmers Manufacturing Co.

INSTRUMENTS.
Bristol Co.
Electric Controller & Mfg. Co.
Fort Wayne Electric Works.
General Electric Co.
Johns-Manville Co., H. W.
Leeds & Northup Co.
Manhattan Electrical Supply Co.
Metropolitan Engineering Co.
Roller-Smith Co.
Schweitzer & Conrad, Inc.
States Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg. Co.
Weston Electrical Instrument Co.

INSULATING CEMENTS.
Dickinson Mfg. Co.
Walpole Tire & Rubber Co.
Westinghouse Electric & Mfg. Co.

INSULATING MACHINERY.
Hubbell, Inc., Harvey.
New England Butt Co.

INSULATING PAINTS AND COMPOUNDS.
Chicago Mica Co.
Dickinson Mfg. Co.
Johns-Manville Co., H. W.
McGill Mfg. Co.
Mica Insulator Co.
Mineralac Electric Co.
Packard Electric Co.
Sherwin-Williams Co.
Standard Paint Co.
Standard Underground Cable Co.
Walpole Tire & Rubber Co.
Westinghouse Electric & Mfg. Co.

INSULATION, Hard Rubber Composition, Etc.
Dickinson Mfg. Co.
General Bakelite Co.
Hemming Mfg. Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, Arc Lamp.
Anderson Mfg. Co., Albert & J. M.
Cutter Co., George.
General Electric Co.
Johns-Manville Co., H. W.
Westinghouse Electric & Mfg. Co.

INSULATORS, Glass.
General Electric Co.
Hemingray Glass Co.
Locke, Fred M.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, High Voltage.
Dickinson Mfg. Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.

Digitized by Google

CLASSIFIED INDEX—Continued

General Electric Co.
Locke, Fred M.
Ohio Brass Co.
Thomas, R., & Sons Co.
Westinghouse Electric & Mfg. Co.

INSULATORS, Wood.
Mineralac Electric Co.
Westinghouse Electric & Mfg. Co.

IRIDIO-PLATINUM.
Baker & Co., Inc.

JARS, Battery (Glass).
Hemingray Glass Co.

JOINTS, Cable.
General Electric Co.

JOINTS, Fixture Insulating.
Faries Mfg. Co.
Federal Sign System (Electric).
Thomas & Betts Co.

KITCHEN CABINETS.
Federal Sign System (Electric).

LACQUER, Metal.
General Bakelite Co.

LAMPS, Arc.
Anderson Mfg. Co., Albert & J. M.
Central Electric Co.
Fort Wayne Electric Works.
General Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

LAMPS, Incandescent.
Central Electric Co.
D & M Lamp & Lighting Co.
Deuth & Co.
Edison Lamp Works of General Electric Co.
Franklin Electric Mfg. Co.
Hygrade Inc. Lamp Co.
Kentucky Electrical Co., Inc.
Lux Mfg. Co.
Metalyte Co., Inc.
National Lamp Works of General Electric Company, comprising the following member divisions:
American Electric Lamp Division.
Banner Electric Division.
Boston Economy Lamp Division.
Brilliant Electric Division.
Bryan-Marsh Electric Division.
Buckeye Electric Division.
Colonial Electric Division.
Columbia Incandescent Lamp Division.
Economical Electric Lamp Division.
Elux Miniature Lamp Division.
Federal Miniature Lamp Division.
Fostoria Incandescent Lamp Division.
General Incandescent Lamp Division.
Monarch Incandescent Lamp Division.
Munder Electric Division.
Packard Lamp Division.
Peerless Lamp Division.
Shelby Lamp Division.
Standard Electric Division.
Sterling Electric Lamp Division.
Sunbeam Incandescent Lamp Division.
New York Electric Lamp Co.
Western Electric Co.
Westinghouse Lamp Co.

LAMPS, Vapor and Vacuum Tube
Cooper Hewitt Electric Co.
General Electric Co.

LANTERNS.
Central Telephone & Elec. Co
Federal Sign System (Electric).
Manhattan Electrical Supply Co.
Metal Specialties Mfg. Co.
Merchant Engineers Corp.
Usona Mfg. Co.

LIGHTING PLANTS.
Crocker-Wheeler Co.
Fairbanks, Morse & Co.
General Electric Co.
Ridgway Dynamo & Engine Co.
Westinghouse Electric & Mfg. Co.

LIGHTNING ARRESTERS.
Anderson Mfg. Co., Albert & J. M.
Central Electric Co.
Delta-Star Electric Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.

LIGHTS, Desk.
Aladdin Lamp Corporation.
Delta Electric Co.
Faries Mfg. Co.
Federal Sign System (Electric).
Johns-Manville Co., H. W.
Stanley & Patterson.
Usona Mfg. Co.

LIGHTS, Stage.
Bissell Co., F.
General Electric Co.
Kliegl Bros.
Universal Electric Stage Lighting Co.

LINE MATERIALS.
Anderson Mfg. Co., Albert & J. M.
Central Electric Co.
General Electric Co.
Hubbard & Co.
Johns-Manville Co., H. W.
Locke, Fred M.
Ohio Brass Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

LOCOMOTIVES, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

LUBRICANTS.
Dearborn Chemical Co.
Dixon Crucible Co., Joseph.

LUGS.
Chicago Fuse Mfg. Co.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
General Electric Co.
Multi Refillable Fuse Co.
Trumbull Electric Mfg. Co.

MAGNETIC SWITCH CONTROLLERS.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Sundh Electric Co.
Westinghouse Electric & Mfg. Co.

MAGNETOS, MAGNETO-GENERATORS AND BELLS.
Manhattan Electrical Supply Co.
Western Electric Co.

MAGNETOS, Ignition.
General Electric Co.
Manhattan Electrical Supply Co.

MAGNETS, Electro.
Acme Wire Co.
Belden Mfg. Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Manhattan Electrical Supply Co.
Sundh Electric Co,
Western Electric Co.
Westinghouse Electric & Mfg. Co.

MAGNETS, Lifting.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Sundh Electric Co.
Western Electric Co.

MAGNETS, Permanent.
Western Electric Co.

MARINE FIXTURES.
Benjamin Electric Mfg. Co.
Delta-Star Electric Co.
General Electric Co.

MAST ARMS.
Brady Electric Mfg. Co.
Cutter Co., George.
Fort Wayne Electric Works.
Pittsburgh Transformer Co.

MEASURING MACHINES (For Wire Measuring).
Minneapolis Electric & Construction Co.
New England Butt Co.

METAL FITTINGS.
Peru Electric Co.

METAL SHEARS.
Chicago Patented Tools Co.

METERS, Recording.
Bristol Co.
General Electric Co.
Schweitzer & Conrad, Inc.
Westinghouse Electric & Mfg. Co.

MICA.
Chicago Mica Co.
Mica Insulator Co.
Munsell & Co., Eugene.
Star Mica Mining Co., Inc.

MINING MACHINERY (Motor Driven).
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

MOLDED INSULATION.
Cutler-Hammer Mfg. Co.
General Bakelite Co.
Hemming Mfg. Co.
Westinghouse Electric & Mfg. Co.

MOTORS AND DYNAMOS.
Advance Electric Co.
Allis - Chalmers Manufacturing Co.
Central Electric Co.
Century Electric Co.
Crocker-Wheeler Co.
Eck Dynamo & Motor Co.
Emerson Electric Mfg. Co.
Fairbanks, Morse & Co.
Ft. Wayne Electric Works.
General Electric Co.
Hamilton-Beach Mfg. Co.
Kentucky Electrical Co., Inc.
Lincoln Electric Co.
Pan Electric Mfg. Co.
Peerless Electric Co.
Ridgway Dynamo & Engine Co.
Robbins & Myers Co.
Sprague Electric Works.
Triumph Electric Co.
Wagner Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
Wisconsin Electric Co.

MOULDING.
National Metal Molding Co.
Stanley & Patterson.
Trumbull Electric Mfg. Co.

OZONIZERS.
Federal Sign System (Electric).
General Electric Co.

PACKING, Steam.
Johns-Manville Co., H. W.
New York Insulated Wire Co.

PAINTS, Preservative.
Dixon Crucible Co., Joseph
Johns-Manville Co., H. W.
Standard Paint Co.
Waipole Tire & Rubber Co.
Western Electric Co.

PANELBOARDS.
Starrett Electric Co.
Trio Mfg. Co.
Trumbull - Vanderpoel Electric Mfg. Co.

PAPER, Insulating Paper, Fuller Board, Press Board.
Diamond State Fibre Co.

PATENT SOLICITORS.
Duvall, Edw. S.
Howe, Thomas.
Siggers, E. G.

PHOTOMETERS, Lamp Testing.
Leeds & Northup Co.

PHOTOMETER STANDARDS.
Electrical Testing Laboratories.

PIGTAILS AND FLEXIBLE LEADS.
Belden Mfg. Co.
Reme Wire Co.

PINS AND BRACKETS, Wood.
Bissell Co., F.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
Mineralac Electric Co.
Ohio Brass Co.

PIPE COVERINGS, STEAM.
American District Steam Co.
Johns-Manville Co., H. W.

PLATFORMS (Pole Seats).
Bissell Co., F.
Hubbard & Co.
Oshkosh Mfg. Co.

PLATINUM.
American Platinum Works.
Baker & Co., Inc.

PLIERS, Wire Cutting.
Johns-Manville Co., H. W.
Klein & Sons, Mathias.

PLUGS AND RECEPTACLES, Flush.
Delta-Star Electric Co.
General Electric Co.
Hart Mfg. Co.
Manhattan Electrical Supply Co.
Trumbull Electric Mfg. Co.

PLUGS AND RECEPTACLES, Stage.
Chelten Electric Co.
General Electric Co.
Hubbell, Inc., Harvey.
Kutsch, L. W.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Western Electric Co.

POLES, Concrete.
American Steel & Wire Co.

POLES, TREATED.
Lindsley Bros. Co.
Page & Hill Co.
Valentine-Clark Co.

POLES, TROLLEY.
American Bridge Co.

POLES, Wood.
Bell Lumber Co.
Bissell Co., F.
Burk & Co., Dennis.
Crawford Cedar Co.
Deal Lumber Co., L. K.
Duluth Log Co.
Fowler Co., John H.
Humbird Lumber Co.
Larson Bros. Lumber Co.
Lindsley Bros. Co.
MacGillis & Gibbs Co., Inc.
National Pole Co.
Naugle Pole & Tie Co.
Page & Hill Co.
Sandpoint Lumber & Pole Co., Ltd.
Southern Exchange Co.
Sterling & Son Co., W. C.
Torrey Cedar Co.
Valentine-Clark Co.
Western Electric Co.
Zenith Cedar Co.

POLE STEPS.
American Steel & Wire Co.
Anderson Mfg. Co., Albert & J. M.
Cutter Co., George.
Hubbard & Co.
Oshkosh Mfg. Co.

PORCELAIN, Special Shapes.
Cook Pottery Co.
Findlay Electric Porcelain Co.
General Porcelain Co.
Pass & Seymour, Inc.
Peru Electric Co.
Star Porcelain Co.
Thomas, R., & Sons Co.
Westinghouse Electric & Mfg. Co.
White Co., T. C.

PORCELAIN, Standard.
Cook Pottery Co.
General Electric Co.
General Porcelain Co.
Illinois Electric Porcelain Co.
Ohio Brass Co.
Pass & Seymour, Inc.
Star Porcelain Co.
Thomas, R., & Sons Co.
Westinghouse Electric & Mfg. Co.
White Co., T. C.

PORTABLES, Electric Reading Lamps.
Aladdin Lamp Corporation.
Daisy Woodcraft Co.
Faries Mfg. Co.
Franks Mfg. Co.
Ideal Lamp Mfg. Co.
Johns-Manville Co., H. W.
Leindorf Electric Light Co., Inc.
Metal Specialties Mfg. Co.
Phoenix Glass Co.
Usona Mfg. Co.
Wallace Novelty Co.

POSTS, Lamp.
Central Electric Co.
Cutter Co., George.
Delta-Star Electric Co.
King Foundry Co.
Metropolitan Engineering Co.
Southern Foundry Co.

POTENTIOMETERS.
Leeds & Northrup Co.

POTHEADS AND SLEEVES.
Bissell Co., F.
Brady Electric Mfg. Co.
Central Electric Co.
Delta-Star Electric Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
General Electric Co.
Mineralac Electric Co.
Okonite Co., The.
Schweitzer & Conrad, Inc.
Standard Underground Cable Co.

POWER TRANSMISSION CHAINS.
Morse Chain Co.

PRESERVATIVES, Wood.
General Bakelite Co.
Lindsley Brothers Co.

PRODUCERS, Gas.
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
Westinghouse Machine Co.

PROJECTORS, Electric. (Search - Lights.)
Fort Wayne Electric Works
General Electric Co.
Niagara Searchlight Co.

PROJECTORS, Telephone.
D & W Fuse Co.

PYROMETERS, Electric.
Bristol Co.
Leeds & Northrup Co.

PULLEYS, Arc Lamp.
Fort Wayne Elec. Works.
Cutter Co., George.
Fairbanks, Morse & Co.

PUMPS, STEAM AND POWER.
Fairbanks, Morse & Co.

PUMPS, Water.
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.

PUSH BUTTONS.
Central Electric Co.
Chelten Electric Co.
Cutler-Hammer Mfg. Co.
Manhattan Electrical Supply Co
Pass & Seymour, Inc.
Western Electric Co.

RACKS AND RINGS, Telephone Distributing.
Bissell Co., F.
Hubbard & Co.

RADIATORS, Luminous.
General Electric Co.
Lee Electric Radiator Co.

RAIL BONDS.
American Steel & Wire Co.
General Electric Co.
Johns-Manville Co., H. W.
Ohio Brass Co.
Rail Joint Co.
Western Electric Co.

RAIL JOINTS.
Rail Joint Co.
Ohio Brass Co.
Western Electric Co.

RAIL BOND TESTERS.
Roller-Smith Co.

RAILWAY SPECIALTIES, Electric.
Anderson Mfg. Co., Albert & J. M.
Blake Signal & Mfg. Co.
General Electric Co.
Johns-Manville Co., H. W.
Ohio Brass Co.
Rail Joint Co.
Western Electric Co.
Westinghouse Electric & Mfg Co.

RECEPTACLES, Sign.
Benjamin Electric Mfg. Co.
Federal Sign System (Electric)
General Electric Co.
Pass & Seymour, Inc.
Stanley & Patterson.

RECEPTACLES, Weatherproof.
Federal Sign System (Electric).
General Electric Co.
Pass & Seymour, Inc.
Stanley & Patterson.

RECORDERS, Time.
Bristol Company.

RECTIFIERS.
General Electric Co.
Wagner Elec. Mfg. Co.
Westinghouse Electric & Mfg Co.

REELS, Wire.
Klein & Son, Mathias.
Minneapolis Elec. & Const. Co
Oshkosh Mfg. Co.

REFLECTORS, Mirror.
Holophane Works of General Elec. Co.
Johns-Manville Co., H. W.
Pittsburgh Reflector & Illuminating Co.

REPAIRS, Armature.
Boustead Electric & Mfg. Co.
Commonwealth Edison Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

RESISTANCE, Banks and Units.
Cutler-Hammer Mfg. Co.
Dixon Crucible Co., Jos.
Electric Controller & Mfg. Co.
General Electric Co.
Sprague Electric Works.
Sundh Electric Co.
Ward Leonard Electric Co.
Western Electric Co.

Digitized by Google

CLASSIFIED INDEX—Continued

Westinghouse Electric & Mfg. Co.

RESISTANCE WIRE & RIBBON.
American Steel & Wire Co.
Belden Mfg. Co.
Driver-Harris Wire Co.
General Electric Co.
Moore, Alfred F.

REVERSING CONTROLLERS FOR CRANES, ETC.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

RHEOSTATS.
Allis - Chalmers Manufacturing Co.
Campbell Electric Co.
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Fort Wayne Electric Works.
General Electric Co.
Sundh Electric Co.
Sprague Electric Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

ROLLER BEARINGS.
Hyatt Roller Bearing Co.

RUNWAYS, CRANE.
American Bridge Co.

SCALES.
Fairbanks, Morse & Co.

SECOND HAND MACHINERY.
Boustead Electric & Mfg. Co.
General Electric Co.
Gregory Electric Co.

SHADE HOLDERS.
Bridgeport Brass Co.
Faries Mfg. Co.
General Electric Co.
Hubbell, Inc., Harvey.
Western Electric Co.

SHADES, ASBESTOS.
Asbeste-Gleam Mfg. Co.

SHADES, Metallic.
Benjamin Electric Mfg. Co.
Central Electric Co.
Cutter Co., George.
Faries Mfg. Co.
Federal Sign System (Electric).
Hubbell, Inc., Harvey.
Ostrander & Co., W. R.
Holophane Works of General Elec. Co.
Pass & Seymour, Inc.

SHEDS, COAL STORAGE.
American Bridge Co.
Fairbanks, Morse & Co.

SHEDS, TRAIN.
American Bridge Co.

SHEETS, Iron and Steel.
American Sheet & Tin Plate Co.

SHOCK ABSORBERS.
Benjamin Electric Mfg. Co.

SHOE DRYERS, ELECTRIC.
Hamilton-Beach Mfg. Co.

SIGNS, Electric.
Federal Sign System (Electric).

SLATE.
Davis Slate & Mfg. Co.

SLEEVINGS.
Belden Mfg. Co.
Chicago Mica Co.
Johns-Manville Co., H. W.
Standard Underground Cable Co.

SLEEVES, Paper.
Standard Underground Cable Co.

SOCKETS AND RECEPTACLES.
Benjamin Electric Mfg. Co.
Best Electric Co.
Central Electric Co.
Cutler-Hammer Mfg. Co.
Dickinson Mfg. Co.
Faries Mfg. Co.
Federal Sign System (Electric).
General Electric Co.
Hubbell, Inc., Harvey.
Johns-Manville Co., H. W.
Ostrander & Co., W. R.
Pass & Seymour, Inc.
Trumbull Electric Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.
Wirt Co.

SOCKETS, LOCKING.
Best Electric Co.
General Electric Co.
Pass & Seymour, Inc.

SOLDERING IRONS.
Manhattan Electrical Supply Co.
Simplex Electric Heating Co.
Ward Leonard Electric Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

SPRINGS.
American Platinum Works.
American Steel & Wire Co.
Manross & Sons, F. N.

SPROCKETS, Silent Chain.
Morse Chain Co.

STACKS.
American Bridge Co.

STAGE LIGHTING APPARATUS.
Anderson Mfg. Co., Albert & J. M.
General Electric Co.
Johns-Manville Co., H. W.
Sundh Electric Co.

STANDARD CELLS.
Leeds & Northrup Co.
Weston Electrical Instrument Co.

STAPLES AND TACKS, Insulating.
Blake Signal & Mfg. Co.

STATIONS, COALING.
American Bridge Co.
Fairbanks, Morse & Co.

STATIONS, ELEVATED RAILWAY.
American Bridge Co.

STEEL, Structural and Tool.
American Bridge Co.

STERILIZERS, Instrument.
Cutler-Hammer Mfg. Co.
Simplex Electric Heating Co.
Westinghouse Electric & Mfg. Co.

STOKERS, Mechanical.
Babcock & Wilcox Co.
Westinghouse Machine Co.

STOVES, ELECTRIC.
General Electric Co.
Globe Stove & Range Co.
Hughes Electric Heating Co.
Lindstrom, Smith Co.
Manhattan Electrical Supply Co.
Westinghouse Electric & Mfg. Co.

STRAIN INSULATORS.
Anderson Mfg. Co., Albert & J. M.
General Electric Co.
Johns-Manville Co., H. W.
Ohio Brass Co.

STREET LIGHTING FIXTURES, Incandescent.
Benjamin Electric Mfg. Co.
Brady Electric Mfg. Co.
Central Electric Co.
Cutter Co., George.
Delta-Star Electric Co.
Federal Sign System (Electric.
Fort Wayne Electric Works.
General Electric Co.
Hubbell, Inc., Harvey.
Pittsburgh Transformer Co.

SUB-STATIONS, OUTDOOR.
Delta-Star Electric Co.
Railway & Industrial Engineering Co.
Schweitzer & Conrad, Inc.

SUPPLIES, Electrical.
Bissell & Co., F.
Central Electric Co.
Commonwealth Edison Co.
Illinois Electric Co.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Western Electric Co.

SWITCHBOARDS. (Switchboards and Panel Boards.)
Allis - Chalmers Manufacturing Co.
Electric Controller & Mfg. Co.
Electrical Testing Co.
Electrical Testing Laboratories.
Fort Wayne Electric Works.
General Electric Co. (
Globe Electric Co.
Metropolitan Engineering Co.
Starrett Electric Co.
Trio Mfg. Co.
Trumbull Electric Mfg. Co.
Trumbull-Vanderpoel Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

SWITCHBOARDS, Theater.
Delta-Star Electric Co.
Electrical Testing Co.
Electrical Testing Laboratories.
Trumbull Electric Mfg. Co.

SWITCHES.
Allis - Chalmers Manufacturing Co.
Anderson Mfg. Co., Albert & J. M.
Benjamin Elec. Mfg. Co.
Bissell Co., F.
Central Electric Co.
Chelten Electric Co.
Columbia Metal Box Co
Crocker-Wheeler Co.
Cutler-Hammer Mfg. Co.
Cutter Co., George.
D & W Fuse Co.
Delta-Star Electric Co.
Detroit Fuse & Mfg. Co.
Electric Controller & Mfg. Co.
Electrical Engineers' Equipment Co.
General Devices & Fittings Co.
General Electric Co.
Hart Mfg. Co.
Hubbell, Inc., Harvey.
Johns-Manville Co., H. W.
Manhattan Electrical Supply Co.
Metropolitan Engineering Co
Mineralac Electric Co.
Newton Mfg. Co.
Ostrander & Co., W. R.
Palmer Elec. & Mfg. Co.
Pass & Seymour, Inc.
Sundh Electric Co.
Schweitzer & Conrad, Inc.
Trio Mfg. Co.
Trumbull Electric Mfg. Co.
Trumbull-Vanderpoel Elec. Mfg. Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

TANKS, OIL STORAGE.
American Bridge Co.

TANKS, WATER.
American Bridge Co.

TAPE, INSULATING.
American Electrical Works.
Belden Mfg. Co.
Central Electric Co.
Chicago Mica Co.
D & W Fuse Co.
General Electric Co.
Johns-Manville Co., H. W.
Kerite Insulated Wire & Cable Co.
Marion Insulated Wire & Rubber Co.
Mica Insulator Co.
Mineralac Electric Co.
New York Insulated Wire Co.
Packard Electric Co.
Okonite Co., The.
Standard Paint Co.
Standard Underground Cable Co.
Walpole Tire & Rubber Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

TAPS, Current.
Benjamin Electric Mfg. Co.
Hubbell, Inc., Harvey.
Jordan Bros., Inc.
Manhattan Electrical Supply Co.
Pass & Seymour, Inc.

TELEPHONES AND SWITCHBOARDS.
Central Electric Co.
Central Telephone & Electric Co.
Manhattan Electrical Supply Co.
Stanley & Patterson.
Western Electric Co.

TESTING LABORATORIES.
Electrical Testing Laboratories, Inc.

THERMOMETERS, Electric.
Bristol Company.
Leeds & Northrup.

TIES, PRESSED STEEL.
American Bridge Co.

TIME SWITCHES.
Hartford Time Switch Co.

TOGGLE BOLTS.
Cutter Co., George.

TOOLS, Cable Pulling.
American Steel & Wire Co.
General Electric Co.
Hazard Mfg. Co.
Hubbard & Co.
Packard Electric Co.
Roebling's Sons Co., John A.
Safety Insulated Wire & Cable Co.

TOOLS, Commutator Truing.
Fort Wayne Electric Works.
General Electric Co.
Jordan Bros., Inc.

TOOLS, Linemen's.
Central Electric Co.
Hubbard & Co.
Klein & Sons, Mathias.
Oshkosh Mfg. Co.
Schweitzer & Conrad, Inc.
Smith & Hemenway Co., Inc.
Sprague Electric Works.

TOOLS, Pipe Fitting.
Borden Company, The.

TOOLS, Portable Electric Polishers, Buffers, Drills, Grinders, Hammers.
Clark Electric Co., Jas., Jr.
Emerson Electric Mfg. Co.
Fort Wayne Electric Works.
General Electric Co.
Hamilton-Beach Co.
Orr & Lockett Hardware Co.
Robbins & Meyers Co.
Sprague Electric Works.
Western Electric Co.

TOOLS, Threading.
Borden Company, The.

TORCHES AND FURNACES, Gasoline.
Bridgeport Brass Co.
McGill Mfg. Co.
Prest-O-Lite Co., Inc.

TOWERS, ELECTRIC, TRANSMISSION.
American Bridge Co.

TOWERS, STEEL TRANSMISSION.
American Bridge Co.

TOYS AND NOVELTIES.
Manhattan Electrical Supply Co.
Stanley & Patterson.

TRANSFORMERS.
Allis - Chalmers Manufacturing Co.
Central Electric Co.
Crocker-Wheeler Co.
Duncan Electric Mfg. Co.
Fort Wayne Electric Works.
General Electric Co.
Kuhlman Electric Co.
Manhattan Electrical Supply Co.
Moloney Electric Co.
Packard Electric Co.
Pittsburgh Transformer Co.
Wagner Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

TRANSMISSION CHAINS.
Morse Chain Co.

TRANSMISSION MACHINERY.
Allis - Chalmers Manufacturing Co.
Fairbanks, Morse & Co.
Morse Chain Co.

TRANSMISSION MATERIAL.
General Electric Co.
Johns-Manville Co., H. W.

TREE INSULATORS.
Anderson Mfg. Co., Albert & J. M.
Cutter Co., George.
Dickinson Mfg. Co.
Ohio Brass Co.

TROLLEY WHEELS.
General Electric Co.

TROLLEYS & CHAIRS.
Bissell Co., F.
Oshkosh Mfg. Co.
White Co., T. C.

TRUSSES, ROOF.
American Bridge Co.

TUBING, Brass and Copper.
Alphaduct Co.
Bridgeport Brass Co.
Faries Mfg. Co.

TURBINE GOVERNORS.
Allis - Chalmers Manufacturing Co.
General Electric Co.
Westinghouse Machine Co.

TURBINES, STEAM.
Allis - Chalmers Manufacturing Co.
General Electric Co.
Ridgway Dynamo & Engine Co
Westinghouse Machine Co.

TURBINES, Water.
Allis - Chalmers Manufacturing Co.

UNDERGROUND INSTALLATIONS.
Gest, G. M.
Graner-Mahoney Contracting Co
Metropolitan Engineering Co.
Standard Underground Cable Co
Turner Improvement Co., J. W

VACUUM CLEANERS.
Central Electric Co.
Federal Sign System (Electric)
Lindstrom, Smith Co.
Western Electric Co.
Wisconsin Electric Co.

VARNISH, Insulating.
Chicago Mica Co.
General Electric Co.
Mineralac Electric Co
Packard Electric Co.
Sherwin-Williams Co.
Standard Paint Co.
Standard Underground Cable Co.
Walpole Tire & Rubber Co.
Westinghouse Electric & Mfg. Co.

VIBRATORS.
Hamilton-Beach Mfg. Co.
Lindstrom, Smith Co.
Shelton Electric Co.

WASHERS, Clothes (Motor Driven).
Automatic Elec. Washer Co.
Capital Electric Co.
Fairbanks, Morse & Co.
Federal Sign System (Electric)
Horton Mfg. Co.
Meadows Mfg. Co.
Western Electric Co.
White Lily Mfg. Co.

WATTMETERS, Integrating.
Duncan Electric Mfg. Co.
Federal Sign System (Electric)
Fort Wayne Electric Works.
General Electric Co.
Roller-Smith Co.
Sangamo Electric Co.
Westinghouse Elec. & Mfg. Co

WINDERS, Electro-Magnet.
Belden Mfg. Co.
Hubbard & Co.

WINDLASSES, Arc Lamp.
Brady Electric Mfg. Co.
Cutter Co., George.
Hubbard & Co.

WIRE ASBESTOS COVERED.
Belden Mfg. Co.
Johns-Manville Co., H. W.

WIRE, Bare and Insulated.
American Electrical Works
American Insulated Wire & Cable Co.
American Steel & Wire Co.
Atlantic Insulated Wire & Cable Co.
Belden Mfg. Co.
Bridgeport Brass Co.
Chicago Fuse Mfg. Co.
D & W Fuse Co.
Detroit Insulated Wire Co
Driver-Harris Wire Co.
Electric Cable Co.
General Electric Co.
Habirshaw Wire Co.
Hazard Mfg. Co.
Indiana Rubber & Insulated Wire Co.
Kerite Insulated Wire & Cable Co.
Lowell Insulated Wire Co.
Mass. Electric Mfg. Co.
Marion Insulated Wire & Rubber Co.
Moore, Alfred F.
National Conduit & Cable Co
New York Insulated Wire Co
Okonite Co., The.
Phillips, Eugene F.
Phillips Insulated Wire Co.
Roebling's Sons Co., John A
Rome Wire Co.
Safety Insulated Wire & Cable Co.
Simplex Wire & Cable Co.
Standard Underground Cable Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

WIRE, Enameled.
Acme Wire Co.
American Steel & Wire Co.
Belden Mfg. Co.
Mass. Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

WIRELESS APPARATUS.
Manhattan Electrical Supply Co

Digitized by Google

ALPHABETICAL INDEX TO ADVERTISEMENTS

A

Acme Wire Co. 11
Allis-Chalmers Mfg. Co. 2
American Bridge Co. 43
American Circular Loom Co. .. 7
American Conduit Mfg. Co. ... 60
American District Steam Co. .. 57
American Electrical Works ... 60
American Steel & Wire Co. ... 10
Anderson Mfg. Co., Albert & J. M. 16
Arnold Co. 57
Atlantic Insulated Wire & Cable Co. 10
Automatic Elec. Washer Co., Inc. 13

B

Babcock & Wilcox Co. 45
Badt-Westburg Electric Co. 57
Baker & Co., Inc. 44
Barstow & Co., W. S. 57
Beardslee Chandelier Mfg. Co. 14
Belden Manufacturing Co. 12
Blake Signal & Mfg. Co. 4
Boston-Economy Lamp Division of General Electric Co. 16
Brady Electric Mfg. Co. 50
Bridgeport Brass Co. 60
Briner, C. J. & F. E. 44
Bristol Co. 60
Burnely Battery & Mfg. Co. ... 4
Byllesby & Co., H. M. 57

C

Central Electric Co. 13
Century Electric Co. 46
Chicago Fuse Mfg. Co. 7
Chicago Patented Tools Co. 12
Clifton Mfg. Co. 8
Crawford Cedar Co. 51
Crocker-Wheeler Co. 47
Cutler-Hammer Mfg. Co. 18

D

Davis Slate & Mfg. Co. 12
Delta Star Electric Co. 43
Diamond State Fibre Co. 43
Driver-Harris Wire Co. 60
Duluth Log Co. 50
Duncan Electric Mfg. Co. 17
Duvall, E. S. 46

E

Eck Dynamo & Motor Co. 45
Economical Electric Lamp Div. of General Electric Co. 16
Economy Fuse & Mfg. Co. 3
Electric Bond & Share Co. 16
Electric Cable Co. 60
Electric Machinery Co. 45
Electric Storage Battery Co. .. 4
Electrical Engineers' Equipment Co. 4
Electrical Testing Laboratories. 57
Emerson Electric Mfg. Co. 60

F

Fairbanks, Morse & Co. 19
Fibre Conduit Co. 8
Fort Wayne Electric Works of General Electric Co. 48
Fowler Co., John H. 51

G

General Electric Co. ..20, 21, 22, 23
Gest, G. M. 8
Gregory Electric Co. 44

H

Hart Mfg. Co. 5
Hartford Time Switch Co. 17
Hazard Mfg. Co. 12
Help Wanted 44
Hemming Mfg. Co. 6
Holladay, Negstad & Co., Inc. 57
Howe, Thomas 57

I

Indiana Rubber & Ins. Wire Co. 24

J

Jackson, D. C. Wm. B. 57
Johns-Manville Co., H. W. 9

K

Kentucky Electrical Co., Inc.. 14
Killark Electric Mfg. Co. 8
Kinney, Harry A. 57
Klein & Sons, Mathias. 13
Kuhlman Electric Co. 17

L

Light & Development Co. of St. Louis 57
Lindsley Bros. Co. 51
Lowell Insulated Wire Co. 10
Lux Mfg. Co. 14
Lyndon, Lamar. 57

M

Manhattan Electrical Supply Co. 6
Manroes & Sons, F. N. 13
Marion Insulated Wire & Rubber Co. 60
McLennan Co., K. 44
McMeen, Samuel G. 57
Metropolitan Engineering Co. .. 11
Miller, Kempster B. 57
Minneapolis Electric & Construction Co. 50
Miscellaneous 44
Moloney Electric Co. 3
Moore, Alfred F. 10
Morgan Crucible Co., Ltd. 45

N

National Conduit & Cable Co. .. 10
National Lamp Wks. of General Electric Co. 15
National Metal Molding Co. 8
National Pole Co. 51
National Scale Co. 12
Naugle Pole & Tie Co. 51
New England Butt Co. 10
Newton Mfg. Co. 7
New York Insulated Wire Co.. 60
Northwestern Electric Co. 46
Norton & Bird. 57
Nungesser Carbon & Battery Co. 16

O

Okonite Co. 24, 60
Ostrander & Co., W. R. 45

P

Page & Hill Co. 51
Palmer Electric & Mfg. Co. 12
Pan Electric Mfg. Co. 45
Partridge Lumber Co., T. M. .. 51
Peerless Electric Co. 46
Peru Electric Co. 43
Phillips Insulated Wire Co. 60
Pillsbury, Charles L. 57
Pittsburgh Transformer Co. 16
Positions Wanted 44

R

Ridgway Dynamo & Eng. Co.. 45
Roebling's Sons Co., John A. .. 10
Rome Wire Co. 60
Roth Bros. & Co. 45

S

Safety Ins. Wire & Cable Co.. 12
Samson Cordage Wks. 46
Sandpoint Lumber & Pole Co., Ltd. 51
Sangamo Electric Co. 16
Sargent & Lundy. 57
Schwetizer & Conrad, Inc. 6
Siggers, E. G. 57
Simplex Electric Heating Co. .. 13
Simplex Wire & Cable Co. 24
Sprague Electric Works of General Electric Co. 11
Standard Paint Company. 6
Star Mica Mining Co., Inc. 4
Sterling & Son Co., W. C. 51
Stone & Webster Eng. Corp. .. 57
Sundh Electric Co. 4

T

Torrey Cedar Co. 51
Trumbull Electric Mfg. Co. 13
Tubular Woven Fabric Co. 8

U

Underwriters' Laboratories. 57
Utilities Indemnity Exchange.. 3

V

Valentine-Clark Co. 51

W

Wagner Electric Mfg. Co. 1
Walpole Tire & Rubber Co. 6
Want Advertisements 44
Ward Leonard Electric Co. 4
Western Electric Co. 49
Westinghouse Electric & Mfg. Co. 59
Weston Elec. Instrument Co. .. 24
White Companies, J. G. 57
Woodmansee & Davidson, Inc.. 57

WHO'S WHO IN THE ELECTRICAL FIELD?

Read the Answer in the Names Above

Digitized by Google

ELECTRICAL MECHANICAL CONSULTING

Directory of Engineers

CONTRACTORS SPECIAL INTERESTS

American District Steam Company
Engineers and Contractors for Central Station Heating Systems
General Offices and Works
North Tonawanda, N. Y.
New York West St. Bldg.
Chicago First Nat'l Bk. Bldg.
Seattle Hoge Bldg.

D. C. & Wm. B. JACKSON
ENGINEERS
CHICAGO Harris Trust Bldg.
BOSTON 248 Boylston St.
Plans, Specifications, Supervision of Construction
General Superintendence and Management
Examinations and Reports
Financial Investigations and Rate Adjustments

CHARLES L. PILLSBURY
CONSULTING, MECHANICAL and ELECTRICAL ENGINEER
Consulting Engineer to Minnesota State Board of Control
Suite 805, Metropolitan Life Bldg.
MINNEAPOLIS, MINN.

THE ARNOLD COMPANY
ENGINEERS
CONSTRUCTORS
Electrical—Civil—Mechanical
105 S. La Salle Street, CHICAGO

HARRY A. KINNEY
CONSULTING and CONTRACTING ELECTRICAL ENGINEER
Specialist in the designing and building of Storage Battery Lighting Plants, etc.
1889—LANSING, MICH.—1915

Frederick Sargent, Wm. S. Monroe, Ayres D. Lundy, James Lyman
SARGENT & LUNDY
ENGINEERS
1412 EDISON BLDG.
72 W. Adams Street
CHICAGO

BADT-WESTBURG ELECTRIC CO.
ELECTRICAL ENGINEERS
Western Representatives of
Weston Electrical Instrument Co.
Ward Leonard Electric Co.
Suite 832 Monadnock Block Chicago

The Light and Development Co.
OF ST. LOUIS
Operators of Electric, Gas, Water and Street Railway Properties
Engineers—Experts in Public Utilities Problems
Suite 750, Railway Exchange Building
ST. LOUIS, MO.

STONE & WEBSTER ENGINEERING CORPORATION
CONSTRUCTING ENGINEERS
BOSTON, MASS.

H. M. BYLLESBY & CO.
ENGINEERS
New York Trinity Bldg. Chicago Continental and Commercial Bank Bldg. Tacoma Wash.

LAMAR LYNDON
CONSULTING ELECTRICAL ENGINEER
Long Distance Power Transmission and Alternating Current Problems a Specialty
2 Rector Street New York

Underwriters' Laboratories
Under the Direction of the National Board of Fire Underwriters
W. H. Merrill, Manager
Principal Office and Testing Station: Chicago
Branch Offices in all Principal Cities of the United States and Canada
New York Office, 135 William St.
London Office, 48 Westminster Palace Gardens

Electrical Testing Laboratories, Inc.
Electrical and Mechanical Laboratories.
Tests of Electrical Machinery, Apparatus and Supplies. Materials of Construction, Coal, Paper, etc. Inspection of Material and Apparatus at Manufactories.
80th St. and East End Ave., New York, N. Y.

McMEEN and MILLER
(Incorporated)
Samuel G. McMeen, Kempster B. Miller, Leigh S. Keith
ELECTRICAL and MECHANICAL ENGINEERS
1454 Monadnock Block CHICAGO
407 Electric Building CLEVELAND

THE J·G·WHITE COMPANIES
Engineers Financiers — Contractors Operators
43 EXCHANGE PLACE, NEW YORK

HOLLADAY, NEGSTAD & CO., Inc.
Consulting Engineers
Power Plants, Utilities, Industries, Designs, Estimates, Valuations, Reports, Organization and Management
109 N. Dearborn St. Chicago, Ill.

NORTON and BIRD
WILLIAM J. NORTON PAUL P. BIRD
ENGINEERS
Rate Surveys, Preparations of Rate Schedules, Appraisals, Examinations, Reports, Special Investigations of Public Utility Properties.
111 West Monroe St. Chicago, Ill.

WOODMANSEE & DAVIDSON, INC.
ENGINEERS
First National Bank Building, CHICAGO

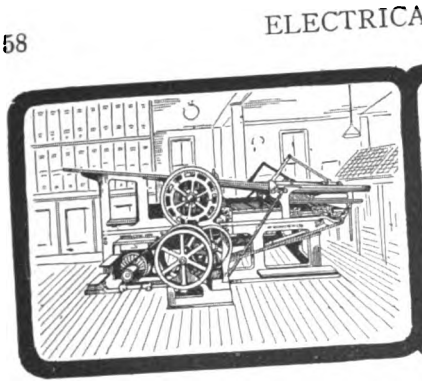
THOMAS HOWE
E. E. Cornell, 1896 LLB. N. U. Law School, 1904
PATENTS
Long practical experience as Engineer and Patent Attorney with prominent electrical Companies including soliciting electrical patents and prosecuting electrical cases before the courts.
No. 2 Rector Street, NEW YORK

A card in this Directory insures an invitation to offer bids on Municipal, Industrial and Private Engineering Projects, Light and Heating, Power Transmission, Hydro Electric Developments, Modern Efficiency Methods, and General Civil, Mechanical and Electrical Engineering. Write for rates.

W. S. BARSTOW & CO.
INCORPORATED
CONSULTING and CONSTRUCTION ENGINEERS
PUBLIC SERVICE PROPERTIES
FINANCED AND MANAGED
50 Pine Street New York

PATENTS TRADEMARKS and COPYRIGHTS
Send your business direct to Washington. Saves time and insures better service. Personal Attention Guaranteed. 30 Years Active Practice.
Write for terms—Book free.
E. G. SIGGERS, Patent Lawyer
Suite 20-25 National Union Building. Washington, D. C.

Digitized by Google



Publisher to Advertiser

Last Call!!

There is just time to get your announcement into the Prosperity Inaugural Number of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN—our NEW YEAR'S ISSUE, published January 1, 1916.

Buying policy will be influenced and shaped by what the buyers read in this important issue. Don't neglect the opportunity of ringing the bell—send copy and cuts, leaving to our Service Department the duty of dressing your message attractively.

Last forms close Wednesday, Dec. 29.

Act Now!!

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

608 South Dearborn St.
CHICAGO

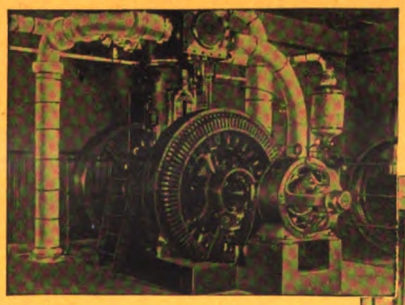
Digitized by Google

Westinghouse Alternators Have Mica-Insulated Armature Coils

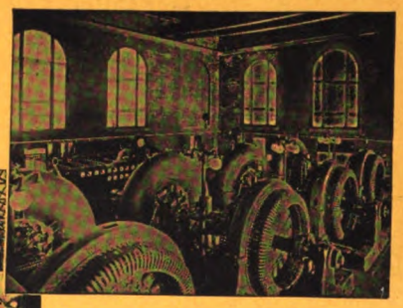
MICA is resilient and springy, holding coils tightly in the slots. It is one of the strongest insulating materials known; it is unaffected by static discharge; and is uninjured by high temperature.

Mica has been used by the Westinghouse Company for over twenty years, and during this long experience it has perfected its designs, its shop equipment for manufacture, and its method of applying Mica to armature coils.

Long Life and Continuity of Service require its use on large capacity, and high voltage alternators; smaller units are better when it is used.

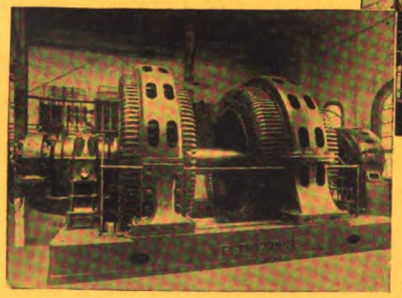


A 250 Kva., 2400 Volt steam driven unit—Mica Insulated Generator.

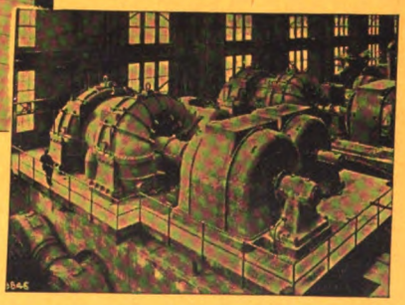


Four 1000 Kva., 13,800 Volt Water Wheel Driven Units—Mich Insulated Generators.

The First Large Water Wheel Units installed in America, Generators Mica Insulated. Twenty years' service. Still good.



A 6800 Kva. Frequency Changer set, 13,200 and 4000 Volt Alternating, both Mica Insulated.



A 30,000 Kw. Steam Turbine Unit. Generator Mica Insulated.

Westinghouse Electric & Manufacturing Co.

East Pittsburgh, Pa.

Atlanta, Ga.
Baltimore, Md.
Birmingham, Ala.
Bluefield, W. Va.
Boston, Mass.
Buffalo, N. Y.
Butte, Mont.
Charleston, W. Va.
Charlotte, N. C.
Chicago, Ill.
Cincinnati, Ohio.
Cleveland, Ohio.
Columbus, Ohio.
*Dallas, Tex.
Dayton, Ohio.
Denver, Colo.
Detroit, Mich.
*El Paso, Tex.
*Houston, Tex.
Indianapolis, Ind.
Joplin, Mo.
Kansas City, Mo.
Louisville, Ky.
Los Angeles, Cal.
Memphis, Tenn.
Milwaukee, Wis.
Minneapolis, Minn.
New Orleans, La.
New York, N. Y.
Omaha, Neb.
Philadelphia, Pa.
Pittsburgh, Pa.
Portland, Ore.
Rochester, N. Y.
St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Seattle, Wash.
Syracuse, N. Y.
Toledo, Ohio.
Washington, D. C.
*W. E. & M. Co. of Texas.

129

Digitized by Google

AMERICAN ELECTRICAL WORKS

1870 - EUGENE F. PHILLIPS - 1882. AMERICAN ELECTRICAL WORKS

Bare and Insulated Wire and Cables
Galvanized Iron Wire and Strands
Power and Telephone Cables

PHILLIPSDALE, R. I.

NEW YORK CHICAGO CINCINNATI
165 Broadway 112 W. Adams St. Traction Bldg.

ECCO INVINCIBLE

BETTER THAN CODE

It exceeds the code specification requirements in all essentials.
Certified copy of test on each coil furnished upon request.

Electric Cable Company, 17 Battery Place, New York

OKONITE
TRADE MARK
REG. U.S. PAT. OFFICE.

INSULATED WIRES & CABLES

THE STANDARD BY WHICH ALL OTHERS ARE JUDGED

THE OKONITE COMPANY
253 Broadway, New York

Bristol's Recording Instruments Pay For Themselves Over and Over

The records guide the engineer and inspire him to do his best work. Bristol's Recording Instruments automatically and continuously produce permanent records and guide the operator by telling him the story of past performances.

Write for Bulletin M-161.

The Bristol Co., Waterbury, Conn.

The Grand Prize has been awarded to The Bristol Company for their exhibit of Recording Instruments at the Panama-Pacific Exposition.

For 30 Years the Standard

INSULATED WIRES TRADE MARK "O.K." AND CABLES

"O. K." Weatherproof Wire
"Parac" Rubber Covered Wire
Bare Copper Wire
Slow-Burning Weatherproof Wire
Railway Feeder Wire
Slow-Burning Wire

PHILLIPS INSULATED WIRE CO.
PAWTUCKET, R. I.
Mexican Branch: Cia Mexicana de Alambres "Phillips," Mexico City

MARION NEW CODE

RUBBER COVERED WIRES AND CABLES

MEET EVERY REQUIREMENT

MARION INSULATED WIRE AND RUBBER CO.
MARION, INDIANA

Prices and Quality Always Right

CHICAGO
541-557 W. Washington Blvd.

Do not place your order for trolley wire until you have investigated **"Phono-Electric."**

Bridgeport Brass Company
Bridgeport, - - - Connecticut

Bare and Tinned Copper Wire
Magnet Wire, Rubber Covered Wire

ROME WIRE CO., Rome, N. Y.

GET YOUR COPY OF THE

NEW PRICE RAVEN *BOOKLET* CORE

RUBBER COVERED WIRE
Ask for booklet 23-R

NEW YORK INSULATED WIRE CO. NEW YORK
Agencies and Branches
CHICAGO BOSTON SAN FRANCISCO

Emerson Motors

1 h.p. and less

Single-phase repulsion start types.
Split-phase induction motors.
Direct current motors.
Large Stocks—Prompt Shipments.
No motors sold to the user!

The Emerson Electric Mfg. Co.
2032 Washington Ave., St. Louis, Mo.
50 Church St., New York City

THE STANDARD RESISTOR FOR "Nichrome"

QUALITY HEATING DEVICES

DRIVER-HARRIS WIRE CO.
HARRISON (NEWARK), N. J.
BRANCHES
CHICAGO MANCHESTER, ENG.

"WIREDUCT"

TRADE MARK

Inner lining of sized duck — every foot fished before shipped

The American Conduit Mfg. Co.,
Pittsburgh, Pa.

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

UNIVERSITY OF MICHIGAN
3 9015 08006 8979

Digitized by Google